the e.g.u. NEWSLETTER

NEWSLETTER & INFORMATION SERVICE OF THE E.G.U.

ISSUE 12, JULY 2005
AVAILABLE ON-LINE AT www.the-eggs.org

12

Global implications of Arctic climate processes and feedbacks - GLIMPSE

GA²LEN The European Community's network on allergies and asthma

The NOAH's ARK Project

Low temperatures in the Arctic stratosphere

Paper: ISSN 1027-6343
Online: ISSN 1607-7954

Report on the GIFT and NaRAs workshops organized by the EGU Committee on Education at Vienna

Global to Local: An Educational Perspective of Earth System Science as Presented at the 2005 EGU General Assembly - a report by three American teachers

A recent trip to Vienna, Austria reaffirmed the notion that education at the grass roots level is not so different from country to country where teachers are using all types of creative methods to engage and enlighten their students. The European Geosciences Union (EGU) along with American Geophysical Union (AGU) invited three teachers from the United States to join about 70 teachers from all over Europe to attend the EGU Annual General Assembly. During the first three days of the conference, these three teachers with their new colleagues attended educational workshops embedded in the schedule of the EGU General Assembly.

The meeting began with the **Natural Risks Assessment (NaRAs)** Workshop where the teachers were introduced to scientists from around Europe who are part of seismographs in schools project. The aspirations for the project are to place the seismographs in schools all over Europe, and the success of this project is almost guaranteed given the enthusiasm of the participants. The United States has a similar project in the United States hosted by IRIS where many schools have seismographs in their classrooms and data is collected continuously. The balance of the day included presentations by European educators and who shared creative classroom ideas on a number of dynamic earth topics. Everyone agreed that the presentation by Chris King from Keele University in the United Kingdom included a number of excellent inquiry-based learning activities for the dynamic earth theory. The activities were extremely demonstrative in getting the point across to students about the difference between and a theory and a fact, and the activities all used easily acquired materials.

The **Geophysical Information for Teachers (GIFT) Workshop** took place over the next two days of the meeting and the general theme of the 2005 workshop was "The History of the Earth." This theme was far too broad for every aspect of Earth History to be addressed, thus the Committee on Education for the EGU chose to select major but somewhat ill known aspects of the Earth's evolution. The information was presented by leading scientists in their field – many of which were responsible for creating the scientific theories that were discussed. The lectures were by far the most informative, state of the art, scientific presentations that many of us had ever heard. Included in the two days were presentations on classroom activities related to the topics discussed in the lectures. These inquiry-based hands-on activities will help the teachers educate their students in the new science content in ways that all the students will learn.

The three teachers from the United States began disseminating their resources from their EGU General Assembly immediately upon their return to their home states. Workshops, newsletter articles, and collaborations are a few of the ways these teachers have started their efforts of spreading the word about their fabulous experiences in Vienna. They are all committed to life-long learning and to seeking the best materials for their students, and the EGU General Assembly provided an excellent venue to ensure teachers are provided top-notch professional development opportunities and students are receiving the best education possible. AGU and EGU are to be highly commended for placing education on their list of priorities.

Colleen Campos,
Laredo Middle School, Laredo, CO, USA
Margaret Holzer,
Chatham High School, Chatham, NJ, USA
Richard McHenry,
Leon High School, Tallahassee, FL, USA

Ocean Sciences: Prize winners of the 2005 YSOPP awards

Ocean Sciences: Prize winners of the 2005 YSOPP awards

Luc Rainville, from Woods Hole Oceanographic Institution (lrainville@whoi.edu), and **Luis Quaresma,** from the Instituto Hidrográfico of the Portuguese Navy (luis.quaresma@hidrografico.pt), were honoured by the Yound Scientists Outstanding Poster Paper (YSOPP) award during the last EGU assembly in Wien, for their papers Propagation of low-mode internal waves through the ocean (by Rainville, L.) and Non-linear internal waves over the Western Portuguese inner shelf generated at Nazare canyon (by Quaresma, L.S., Vitorino, J., and da Silva, J.C.B).

The abstracts of their opapers are given below.

Propagation of low-mode internal waves through the ocean, by Luc Rainville (Geophysical Research Abstracts, Vol. 7, 05524, 2005)

The baroclinic tides play a significant role in the energy budget of the abyssal ocean. While basic generation and propagation principles are essentially understood, a clear picture of real-world generation and propagation conditions is only now emerging. To advance this effort, we develop a ray model to quantify the effects of spatially variable topography, stratification, planetary vorticity and mesoscale currents on the horizontal propagation of internal gravity modes.

A representative mesoscale field, derived weekly from Topex/Poseidon altimetric measurements, is used to quantify the refraction of tidally generated internal waves at the Hawaiian Ridge. The path of mode 1 is only slightly affected by typical currents, although its phase becomes increasingly random as the distance from its source increases. The effect of the currents becomes more dramatic as mode number increases. For modes 3 and higher, wave phase can vary by ± ð only a few wavelengths from the source. This phase variability reduce the magnitude of the baroclinic signal seen in altimetric data, creating a fictitious energy loss along the propagation path.

In the Topex/Poseidon observations, the mode-1 M2 internal tide does appear to lose significant energy as it propagates south-westward from the Hawaiian Ridge. Our simulations suggest that phase modulation by mesoscale flows could be responsible for a large fraction of this apparent loss. In contrast, northeast-propagating internal tides should experience limited refraction. The apparent energy loss seen in the altimetric data might indeed be real.

Non-linear internal waves generated at Nazaré canyon: observations over the W Portuguese inner shelf, by L.S. Quaresma, J. Vitorino, and J.C.B. da Silva (Geophysical Research Abstracts, Vol. 7, 10135, 2005)

In situ observations of non-linear internal waves (NIW) propagating near Nazaré submarine canyon head (39 45'N / 009 15'W) and evidence of their impact over local sediment dynamics are presented and discussed in this work. Previous studies based on synthetic aperture radar (SAR) images showed strong NIW activity over the Western

Portuguese shelf during the summer. These studies suggest a shelf-break generation of NIW packets that propagate shoreward and arrive to the inner shelf as dissipated thermocline perturbations. The analysis of recent SAR images from Nazaré region, show the generation of NIW at the submarine canyon rim (very close to the shore) and their propagation over the inner shelf with possible bottom cover impact.

To study this activity, as well as its impact in the local sediment dynamics, a program of observations was conducted in this area during the 2004 summer upwelling season. Two moorings with termistores chains/currentmeters and a bottom lander equipped with up-looking/down-looking ADCP's and turbidity sensors were deployed at preselected locations. A simultaneous ASAR ENVISAT image was obtained during the observation, as well as CTD/nephelometry profiles and bottom sediment samples. The results reveal the propagation of strong internal waves with high bottom boundary layer velocities and highly correlated re-suspend sediment blooms. The collected data allowed a detail characterization of these processes. This work is a contribution to the European project EUROSTRATAFORM, whose objectives include the study of the specific canyon systems dynamics and related sedimentary impacts on the European continental margin.

New EGU journal: Climate of the Past

Climate of the Past is an international scientific journal dedicated to the publication and discussion of research articles, short communications and review papers on the climate history of the Earth.

The main subject areas of the new EGU journal are:

* reconstructions of past climate based on instrumental and historical data as well as proxy data from marine and terrestrial (including ice) archives;

* development and validation of new proxies, improvements of the precision and accuracy of proxy data;

* theoretical and empirical studies of processes in and feedback mechanisms between all climate system components in relation to past climate change on all space and time scales;

* simulation of past climate and model-based interpretation of palaeo climate data for a better understanding of present and future climate variability and climate change;

CP follows the innovative two-stage publication concept of the EGU which involves a scientific discussion forum to:

* foster scientific discussion;

* enhance the effectiveness and transparency of scientific quality assurance;

* enable rapid publication;

* make scientific publications freely accessible.

In the first stage, papers that pass a rapid access-review by one of the editors are immediately published on the Climate of the Past Discussions (CPD) website. They are then subject to interactive public discussion, during which the referee's comments (anonymous or attributed), additional short comments by other members of the scientific community (attributed) and the author's replies are also published in CPD. In the second stage, the peer-review process is completed and, if accepted, the final revised papers are published in CP. To ensure publication precedence for authors, and to provide a lasting record of scientific discussion, CPD and CP are both ISSN-registered, permanently archived and fully citable.

Climate of the Past (CP) and Climate of the Past Discussions (CPD) are published by the Copernicus GmbH on behalf of the European Geosciences Union (EGU).

Co-Editors-in-Chief are Gerald Ganssen, Martin Claussen, Denis-Didier Rousseau, Eric Wolff. They are assisted by a board of 30 Editors. The home page of the journal is at www.climate-of-the-past.net

Biogeosciences: A quick start!

A review of the journal status after one year of publication, by its Chief Editors.

The open access journal Biogeosciences (BG), launched by EGU in March 2004, experienced a quick start. As of today (June 2005) the journal received 67 submissions, 50 papers were published in Biogeosciences Discussions (BGD) and 24 in Biogeosciences. The three largest contributors for submission are Germany, Belgium and the US (respectively 19, 8 and 7 submissions).

The editorial board is striving to process manuscripts in a timely manner. This is accomplished with great success. The initial decision (acceptance for publication in BGD) is taken within 18 days of submission. The median time between submission of a revised manuscript and final decision for publication in BG is 14 days.

Finally, the median time between submission and final publication in BG is about 4.5 months. Note that this latter time not only reflects the efficiency of the editorial process but also the efficiency of authors to revise their paper according to the referee's comments to the satisfaction of the handling editor, and to proof-read the paper.

One special issue on "Coastal Biogeochemistry", edited by H. Thomas and A. Borges, was published. Another one on "Nitrogen oxides (NO, NO2, N2O) emissions from European forest ecosystems (NOFRETETE)" edited by K. Butterbach-Bahl, K. Pilegaard and F. Meixner is being processed.

The journal is now monitored and evaluated by the Institute for Scientific Information (ISI). Upon completion of this process, hopefully in the next year, Biogeociences will be included in the ISI products Current Contents and Web of Science, and will afterwards get its first impact factor.

Biogeosciences has enjoyed a strong support from EGU during its launch phase as page charges have been waived since the launch of the journal. The EGU council has decided to cut the cost of page charges for all its journals by about 25%. Such policy is quite exceptional in scientifc publishing,

where subscriptions and page charges increase, sometimes considerably, every year. It demonstrates the dedication of EGU to provide extremely affordable open-access journals to the community. The new pricing is 15 euros for latex submissions and 22 euros for Word submissions. To help EGU launch new journals and start to cover our costs, we have decided to levy page charges from 1st September, that is 3 months before our initial plan.

We are often asked about the rejection rate. It is currently 20% for BGD and 23% for BG, which make a global rejection rate of 39%. This rate is surprisingly high as we expected a rejection rate lower than for traditional journals. However, we would like to stress that a low rejection rate does not mean that the quality of the published papers is low.

The rejection rate of a traditional journal involves two components. The first component relates to the quality of the paper and to the scientific standing of the journal. We want no compromise with this component, as the ultimate aim is to reach the status of a very highly regarded journal. The second component relates to the limitation of the total number of pages that can be published every year. Such limitation does not exist in a web-based journal.

Even the first component of the rejection rate mentioned above cannot be compared with that of a classical journal because the transparent review process has many benefits over the traditional one, including quality control. The full transparency leads to a better quality of submissions (because authors do not want to embarrass themselves during the open review), to more thorough and thoughtful referees' reports (because they will be published, anonymously or not), to full accountability of the handling editor (who is named in the final paper), as well as to unlimited input from the community.

The editorial board invites you to check the Journal web site (http://www.biogeosciences.net) and to consider Biogeosciences as an outlet for publishing your best papers.

Jean-Pierre Gattuso and Juergen Kesselmeier
Co-Editors-in-Chief, Biogeosciences
bg-chief-editors@copernicus.org

EGU Assembly 2005

Participation statistics

We had 8067 participants at the last EGU 2005 General Assembly, which took place in Wien earlier this spring. Germany, France, the U.S.A., Italy and the U.K. were the countries with the more participations in the Assembly. About 12.400 abstracts were submitted to the Assembly and 10.200 contributions were presented.

The general impressions from the Assembly, which the last years was taking place in Nice but moved to Wien this year were generally very positive. The Austria Convention Centre which hosted the Assembly was conceived as more agreable than the Acropolis Center in Nice by most participants. The overall layout of the rooms resulted in less walking, rooms were larger and hence "popular" sessions were not so crowded as in Nice.

EGU Office

1354 - Germany
912 - France
906 - United States of America
731 - Italy
729 - United Kingdom
351 - Austria
337 - Switzerland
283 - Spain
246 - Netherlands
180 - Russian Federation
167 - Japan
144 - Belgium
141 - Canada
132 - Norway
125 - Sweden
120 - Czech Republic
92 - Poland
83 - Denmark
82 - Finland
73 - Australia
73 - Greece
71 - Hungary
62 - Portugal
62 - Taiwan
47 - Israel
43 - Slovak Republic

Suggestions solicited for EGU 2006

You can make suggestions for a session and/or for a convener and/or for a co-convener to the programme Committee

Dear Colleague,

The next General Assembly of the European Geosciences Union (EGU 2006) will be held again at the congress centre: Austria Centre Vienna (ACV) in Vienna, Austria, from 2-7 April 2006 with an early registration, the opening ceremony and the icebreaker reception taking place on Sunday, 2 April 2006. The address of the web site is:

http://meetings.copernicus.org/egu2006/

We hereby would like to invite you to take an active part in organizing the scientific programme of that conference. If you have any suggest for a session and/or for a convener and/or for a co-convener, please select “Call-for-Programme” on the conference web site, choose your programme area, and find the corresponding Provisional Programme (Skeleton Programme) compiled by the officers of the respective EGU Division or Section incl. the input received from the community at the last business meetings or later. Please, proceed as indicated on the top of the various programmes to include your suggestions.

The general Call-for-Programme will be open for the months of July and August 2005, while in September 2005 the Programme Committee will compile the final Call-for Papers Programme from all of the suggestions received. During October- December 2005 there will be the period of an open Call-for-Papers.

Please, inform your colleagues about these opportunities. We are looking forward to seeing you in Vienna in April 2006.

Arne Richter
EGU Executive Secretary
On behalf of the EGU 2006 Programme Committee

New Master Course on remote sensing

The ESPACE Master Course connects know-how in spacecraft technology and orbit mechanics with applications in Earth System Science, Remote Sensing and Navigation.

Master's course:

The new Master of Science program ESPACE has succefully passed all university bodies-aprobation by the German state ministry of education is expected soon. Start of the program is planned for October 2005 (winter term 2005/06).

ESPACE is a collaboration of different institutes:

* Astronautics, TUM
* Astronomical and Physical Geodesy, TUM
* Geodesy and Navigation, UFAF
* Geophysics, LMU
* Photogrammetry and Cartography, TUM
* Remote Sensing Technology, DLR

ESPACE is coordinated at the faculty of civil and geodetic engineering of Technische Universitat Munchen, Munich, Germany.

Postal address:

ESPACE
Technische Universitat Munchen
Institut fur Astronomische und Physikalische Geodasie
Arcisstrasse 21
80290 Munchen
Germany
e-mail, fax and phone:
e-mail: info@espace-tum.de
fax: ++49 (0)89 289 231 78
phone: ++49 (0)89 289 231 90 (Secretariat, Mrs. Rechel)

Objectives of the Master's course

Satellite techniques gain more and more in importance for Earth sciences and engineering. Design, development and data analysis of respective satellite missions require knowledge from a broad spectra of disciplines. Usually relevant university programs only cover parts of this spectra, respectively.

ESPACE connects know-how in spacecraft technology and orbit mechanics with applications in Earth System Science, Remote Sensing and Navigation. The programme is focused on methodologies.

ESPACE provides a unique center of education on the level of a master's and doctoral program. It takes advantage of the Munich situation with its unique concentration of expertise in:

* 3 universities (Technische Universität München, Ludwig-Maximilian University, University of the Federal Armed Forces)
* research institutions (such as the German Aerospace Center, DLR)
* space industry (such as EADS or Kayser-Threde)

ESPACE offers a 2-years international Master of Science program.

* The first year of the programme covers foundations of space engineering and science as well as an introduction to remote sensing, geo-sciences and navigation.
* The 3rd term allows the students to specialize in either Earth System Science or Remote Sensing or Navigation and Positioning.
* The 4th and last term will be devoted to a master's thesis.

Tuition fees:

TUM is a German state university financed by taxes. Therefore there are no tuition fees, except for an enrolment fee of about 85 EUR per semester. As a consequence TUM does not provide financial support to the students.

Housing and living:

The ESPACE program does not care for housing and living of the students. However, there is the Center of International Affairs of TUM and the Studentenwerk (Office of Students Services in Munich) who take care of you.

Living in Munich is not cheap. You might need up to 600 EUR per month (depending on accomodation).

* Orientation month of TUM's Center of International Affairs: The Center of International Affairs offers an orientation month at the beginning of each semester. This includes walks to public authorities etc. For more information please check the informations for international students.
* Service Package of Studentenwerk: The Studentenwerk offers a servies package including accomodation. Please register there as soon as possible because rooms are limited. Be aware that there is no guarantee for accomodation via Studentenwerk.

Requirements:

Bachelor or Diploma degree or equivalent from an internationally recognized university in science or engineering (such as mathematics, physics, informatics, mechanical/electrical/aerospace engineering, geodesy, geophysics).

Certificate of English language ability (the whole course is given in english).

Application:

More information of the programme, as well as application guidelines and documents can be found at http://www.espace-tum.de/

Deadline:

Application deadline for winter term 2005/06 (starting October 2005) is July 15th, 2005.

First Mars Express Science Conference summary

Clearer image of Mars takes shape after one year of observations of the Red Planet by ESA's Mars Express spacecraft.

Methane, formaldehyde, signs of recent glaciers and a frozen sea are some of the results presented during a press conference at ESA's European Space Research and Technology Centre (ESTEC), Noordwijk, in the Netherlands.

Water, climate, volcanic and geological activity, habitability and eventually the search for life on Mars are issues that the six operating instruments on board Mars Express have begun to address in the first year of operations.

Overview of scientific instruments

OMEGA

OMEGA, the Mars Express Visisble and Infrared Mapping spectrometer, has been looking at the surface and its minerals. It found out that along the past three thousand million years no permanent oceans or lakes were present on the planet. However, liquid water must have been present before that time, in the early history of the planet. OMEGA was able to spot visible signs of it, left today in the clays identified in cratered terrains, and in hydrates, minerals, which can only form in presence of water. The observed lack of extended areas of carbonateds indicates that the atmosphere of Mars, mainly composed by carbon dioxide, had not had the chance to combine with the surface, so it must have been massively lost in the early history of the planet, excluding the possibility of a long-term greenhouse effect. Today, Mars water reservoir is mainly constituted by ice concentrated at the two polar caps, where OMEGA has alsoidentified extended areas of gypsum.

SPICAM

SPICAM, the Ultraviolet and Atmospheric Spectrometer has started providing fundamental information about the present habitability of Mars. It provided the first global climatologic picture of the ozone at Mars, and measured the presence of water vapour in the atmosphere. Observations show that on Mars, ozone is 300 times less than on Earth, implying that planet's protection from ultraviolet radiation coming from the sun is very inefficient. The mixture between ozone and water vapour, increasing the present of oxidizers molecules, associated with much solar ultraviolet radiation at ground level, make the martian environment hostile to the presence of surface life as we now it. SPICAM was also able to confirm a chemistry model, only predicted so far, by question as to whether the increase of water vapour recorded in Earth's stratosphere will also contribute to ozone destruction and consequently to global warming on our planet.

PFS

PFS, the Mars Express Planetary Fourier Spectrometer, had been looking into the composition and properties of the Matrian atmosphere. The detection by PFS of methane and possible formaldehyde is providing new hints to answer the question as to whether life on Mars existed in the past or still exists on the planet today. Methane is a possible marker of biological activity, even if other possibilities, like the presence of active volcanism, also explain it. Formaldehyde can be considered as an oxidation product of methane. If this is the case on Mars, it means that a production mechanism of methane (150 tons per year) must be on work on Mars. PFS has also observed that the distribution of water, that of methane and that of formaldehyde largely match, pointing to a common underground source of water and methane.

HRSC

Providing detailed images of Mars has been the job of HRSC, the Mars Express High Resolution Stereo Camera. HRSC is compiling the first complete atlas of Mars in colour and 3D. HRSC provided the best details imagery of the surface, identifying spectacular signs of resent glacial, fluvial and volcanic activity. The latest image delivery shows gigantic waterfalls, huge glaciers and grand outflow channels left their signs in the Kasei Valley region. Near Mars's equator, HRSC has identified what it seems to be a 5 million year old frozen sea of water, which has probably prevented from disappearing by a layer of volcanic ash. At the north pole, HRSC has taken the first ever 3D pictures of the layer of the water ice and dust, and has photographed fields of volcanic cones showing signs of very recent volcanic activity.

MaRS

Among a variety of objectives, MaRS, the Radio Science Experiment onboard Mars Express, had been looking into the highest layers of Mars's atmosphere (ionosphere), and into the way that Mars's gravity field changes when large masses of ice form and disappear in the course of seasons. MaRS has started to tell us about atmospheric conditions at Mars in different times of a normal martian day. MaRS observed that in the morning, at dawn, the ionosphere of Mars is refilled by an avalanche of electrons and other charged particles caused by the radiation coming from the rising Sun. Looking at the Southern hemisphere, during the martin winter, MaRS provided the first detailed martian weather reports: low atmospheric pressure (4 millibar), very cold air (between -143°C and -130°C) and carbon dioxide snowfall.

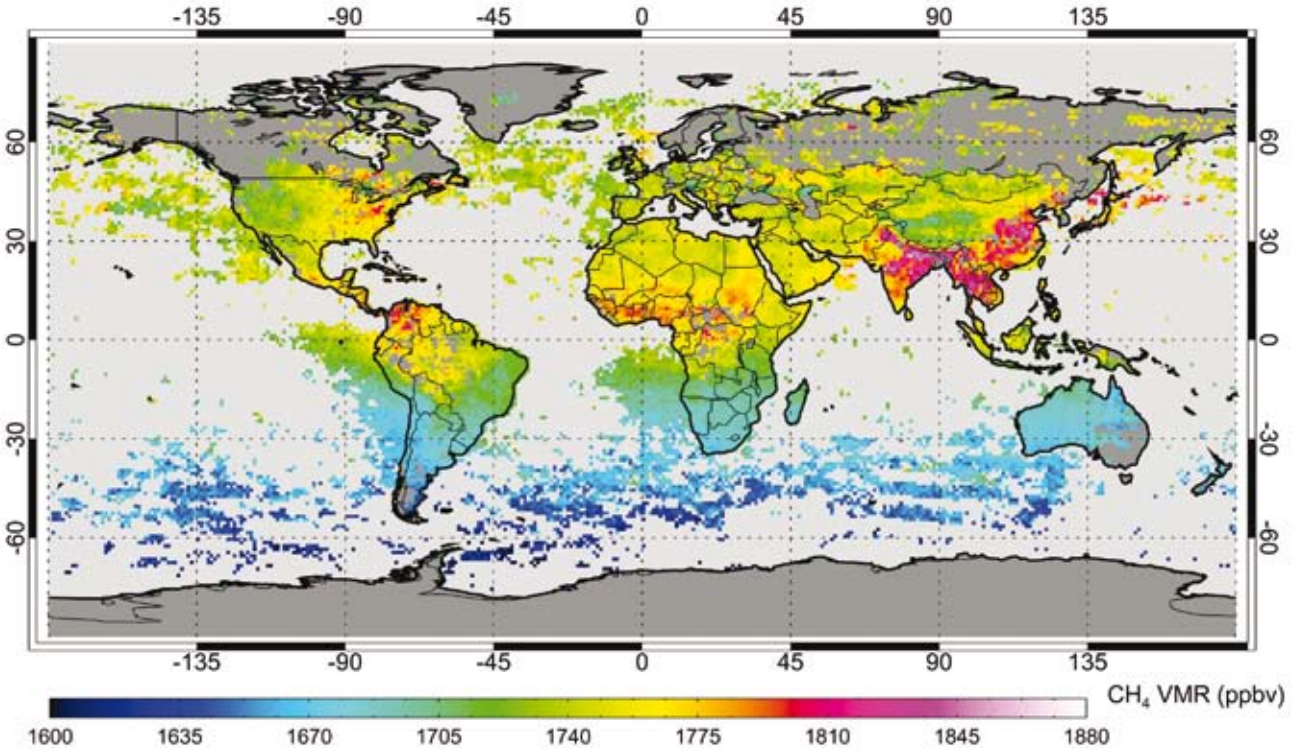
ASPERA

ASPERA, the Energetic Nutral Atoms Analyser onboard Mars Express, has accurately measured the way particles in Mars's tenuous atmosphere interact with the energetic particles given off the Sun, the so called 'solar wind'. The measurements reveal that the atmosphere of Mars is slowly eroding away because of the solar wind, which penetrates much further down into the atmosphere than previously thought. But ASPERA has also observed that Mars itself is radiating into space. This outflow, the planetary wind, is energized in unexpected high velocities at low altitudes by the solar wind. The planetary wind dominated by atomic- and molecular oxygen, apparently originates form dissociated water.

On the other hand, scientists are more and more convinced that life was possible and actually existed on Mars in the distant past. After a long discussion on this topic, about three quarters of the over 200 participants to the First Mars Express Conference expressed their view that Mars must have had some sort of living organisms when the planet was much younger.

Global methane distribution by Envisat

The SCIAMACHY sensor aboard Envisat has performed the first space-based measurements of the global distribution of near-surface methane, one of the most important greenhouse gases. The results show larger than expected emissions across tropical land regions.



SCIAMACHY measurements of column-averaged mathane VMR, in ppb, averged over the time period of August through November 2003 on a 1° x 1° horizontal grid (Credits: University of Heidelberg/KNMI).

The SCIAMACHY sensor aboard Envisat has performed the first space-based measurements of the global distribution of near-surface methane, one of the most important greenhouse gases. As reported in Thursday's issue of Science Express, the results show larger than expected emissions across tropical land regions.

The report concerns work carried out by the Institute of Environmental Physics (IUP) at the University of Heidelberg in cooperation with the Royal Netherlands Meteorological Institute (KMNI), based on interpretation of methane observations made by the SCanning Imaging Absorption SpectroMeter for Atmospheric ChartographY (SCIAMACHY) instrument, aboard Envisat.

A comparison was made between space-based methane observations and model simulations for atmospheric methane for the time period August to November 2003.

"In general the observations agree very well with the model", explains Christian Frankenberg of IUP. "For example, the measurements confirm the occurrence of enhanced methane concentrations over the Ganges plains in India as well as parts of China caused by emissions from rice paddies and domestic ruminants such as cattle."

"However in large parts of the tropics there is a considerable difference. It cannot yet be concluded which source category or combination of source categories is responsible for the discrepancy. Potential candidates include wetlands, biomass burning, termites, ruminants or a hitherto unknown source."

Methane is among the six greenhouse gases addressed by the Kyoto Protocol that went into operation last month.

Methane traps heat over 21 times more heat per molecule than CO2. The amount of methane in the atmosphere has more than doubled since pre-industrial times, an increase attributed to human activities including energy production and farming.

"The overall global source strength of methane is relatively well known," Frankenberg adds. "However the spatial distribution of the emissions, the variations over the year and their division into difference source categories – which is of particular importance for emission monitoring – are still very uncertain. Natural sources of methane are particularly uncertain, and anthropogenic emission estimates rely mostly on socio-economic figures."

Principal Investigator for the SCIAMACHY instrument is John Burrows, also leader of the University of Bremen Institute of Environmental Physics: "SCIAMACHY was primarily selected for flight because of its ability to measure stratospheric ozone and related species. However it was also proposed to

investigate the retrieval of trace constituents from the troposphere, the lowest region of the atmosphere.

"When SCIAMACHY was conceived, many scientists thought it would be impossible to obtain any useful results from the troposphere: there are many issues to be overcome for example the cloud cover, the low reflectivity from the surface, and the fact that stratospheric species lie between the troposphere and the satellite.

"Our calculations showed that it is possible and we are now finding it can be done. The instrument is being used to retrieve the columns of several key tropospheric trace gases - not only methane but also nitrogen dioxide, carbon monoxide and dioxide, sulphur dioxide, formaldehyde, bromine monoxide, water vapour, and ozone are retrieved. In addition SCIAMACHY yields many important cloud and aerosol parameters as well as ocean colour."

Into the future, Professor Burrows and his team have also proposed the Geostationary Scanning Imaging Absorption spectrometer (GeoSCIA) an instrument which would - if selected for flight - provide the high temporal and spatial sampling required for a truly representative picture of tropospheric scales and processes.

ESA

EUFAR offers access to 24 research aircraft

The European Commission supports access to EUropean Fleet for Airborne Research aircraft for research campaigns.

EUFAR aims at integrating the activities of the European fleet of instrumented aircraft in the field of environmental research in the atmospheric, marine, terrestrial and earth sciences. It is an FP6 I3 (Framework Programme 6, Integrated Infrastructure Initiative) programme with a duration of 4 years, starting October 2004. It involves 24 partners, 24 aircraft, 12 expert-groups and operates with a budget of 5 M¤.

The 24 instrumented aircraft range from an ultra-light aircraft carrying few kilograms at a low speed, to a 4 turbo-jet aircraft carrying several tonnes of instrumentation payload.

The project will offer 100 % support for 44 user groups each flying 10-flight-hour projects (450 flight hours).

Priority will be given to new inexperienced users and researchers from countries which do not operate similar infrastructures. The online evaluation procedure should be fast and effective.

Before being offered the funded flight hours, applicants must satisfy some Eligibility Criteria and pass the Selection Procedure.

Eligibility Criteria

Applicants must:

* Come from a member or associate country of the European Union
* Come from a different European Country than the one operating the aircraft
* Have no personal/direct links with the selected aircraft operator
* Have the resources to ensure that the generated data will be analysed and disseminated
* Be prepared to write a description of work

The selection of applicants will be based on:

* Logistic & Feasibility
* Scientific merit
* Educational Impact

Contact: eufar@meteo.fr

Read more, join the network and apply at: www.eufar.net

Florence Rivé
EUFAR administrator
Meteo-France CNRM/GMEI
42, av CORIOLIS
31057 Toulouse - FRANCE
Phone: +33 5.61.07.98.38
Fax: +33 5.61.07.96.27

DFG Awards 2004 Bernd Rendel Prize - Six Young Geoscientists Honoured

The Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) awarded the Bernd Rendel Prize to six young researchers from the field of geology on 25 February 2005 in Toebingen, Germany.

02 March 2005.- The Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) awarded the Bernd Rendel Prize to six young researchers from the field of geology on 25 February 2005 in Tuebingen, Germany. This is the second time that the prize has been given since its inception in 2002. The awards, worth ¤2000 each, are designed to enable young scientists who have not yet received their doctorate to take part in international conferences and symposia.

The prizewinners:

Raik Bachmann, GeoForschungsZentrum Potsdam

During his studies, Raik Bachmann focussed on the quality of ores and stones found in volcanic rock. He founded the student chapter of the Society of Economic Geologists (SEG), the largest scientific organisation of individual members with interests in the field of economic geology, in Freiberg in 2000.

Bodo Bookhagen, University of California, Santa Barbara

In his thesis, which he completed at Potsdam University in 2004, Bodo Bookhagen dealt with the topic of climate changes and landscape evolution in the formation of the Himalaya. In 2003, his work took him to the University of California, Berkeley, where he joined the geomorphology group.

Eva Gebauer, University of Tuebingen

The evolutional history and development of therapsids, a group of land vertebrates similar to mammals, is the focal point of Eva Gebauer's research. These vertebrates, which represent the link between mammals and reptiles, are also the subject of her doctoral thesis.

Yvonne Hamann, University of Leipzig

In her doctoral research Yvonne Hamann is studying the effects of short-term climate change on the environment in the eastern Mediterranean. During her graduate studies, the geologist also pursued research in sedimentology and palaeontology, underlining her interest in interdisciplinary topics.

Gregor Knorr, University of Hamburg

The focal point of Gregor Knorr's research is the modelling and analysis of climate dynamics during deglaciation at the end of ice ages. His doctoral thesis centres on his 3D circulation model for the Atlantic Ocean, the results of which have been published in the scientific journal "Nature".

Merle Katharina Richter, University of Bayreuth

For her dissertation Merle Katharina Richter developed a combined procedure which enabled her to obtain fossil DNA from soil. In this work the young geologist was able to prove the significance of cattle and boars in the diet of pre-Columbian Indians.

The prize is named after geology student Bernd Rendel, who died at an early age. The prize is funded by proceeds from the Bernd Rendel Foundation, which is administered by the Donors´ Association for the Promotion of Science and Humanities.

The prize ceremony was held during the 8th Crafoord Symposium on 25 February 2005 at the University of Toebingen.

Further steps towards a European space policy

In consultation with private and public stakeholders, the Space Council is working on the definition of a coherent space policy and associated programmes, covering the activities of the EU, ESA and their Member States.

Paris, 7 June 2005.- The second meeting of the Space Council concomitant meeting of the ESA Council at ministerial level and of the European Union Competitiveness Council (Internal Market/Industry/Research) was held at the Kiem Conference Centre in Luxembourg today (Tuesday 7 June).

In consultation with private and public stakeholders, the Space Council is working on the definition of a coherent space policy and associated programmes, covering the activities of the EU, ESA and their Member States. The objective is to endorse, at the third Space Council meeting planned for November this year, a European space policy and European space programme for the period to 2013.

The orientations for a European space programme are based on the Framework Agreement between the European Community and ESA and on the ESA Convention. At this second meeting, the Space Council confirmed that the European space policy should cover mainly the following:

* a European space strategy,
* a European space programme matching the strategy and reflecting associated costs and funding sources,
* a commitment by the main contributors as to their roles and responsibilities,
* the key principles of implementation.

The aim of the strategy is to develop increasingly advanced space systems according to user needs. All the benefits derived from associated services will have to be shared by all. The EU will have to identify user needs and

build a political will around them. ESA and its Member and Cooperating States will develop future space technologies and systems and pursue excellence in space-based scientific research.

Priorities within the European space programme see the EU focusing on space-based applications to contribute to the achievement of its policies, particularly Galileo and the Global Monitoring for Environment and Security programme (GMES). ESA will focus on space exploration and on the basic tools on which the exploitation and exploration of space each depend. Securing guaranteed access to space through a complete, competitive family of launchers, pursuing excellence in space science, and exploiting its know-how in the exploration of the planetary system and in developing technologies to maintain a competitive space sector will be among ESA's main tasks.

The investments needed for these priorities for the EU, ESA and Member States will be identified in the coming months and go through each organisation's normal budgetary and programmatic approval procedures. By coordinating efforts, the players will ensure that new investments bring additional outcomes. Financing sources for space-related activities for the EU are the Seventh Framework Programme of research, technology and development, the trans-European network programme, and the competitiveness and innovation programme. ESA draws on Member States' contributions to mandatory and optional programmes.

EU space-related programmes will be managed in line with an efficiency criterion, in accordance with the Framework Agreement, and will benefit from ESA's technical and management experience, in cooperation with the relevant agencies and entities in Europe. ESA programmes will be managed in line with its Convention. Decisions on future programmes taken at ESA's ministerial Council meeting in December this year, and discussions on future EU financial prospects, will make it possible to determine whether the programme is consistent with the ambitions of the European space policy.

The second meeting of the Space Council was chaired jointly by Ms Edelgard Bulmahn, German Minister for Education and Research and current Chair of the ESA Council at ministerial level, and Mr François Biltgen, Minister for Labour and Employment, Minister for Culture, Higher Education and Research in Luxembourg, and current Chair of the EU Competitiveness Council. The meeting was also attended by Mr Günter Verheugen, European Commission Vice-President, in charge of enterprise, industry, competitiveness and space matters and by Mr Jean-Jacques Dordain, Director General of the European Space Agency.

German Minister Edelgard Bulmahn said: " Today we are sending an important signal: ESA and EU are moving ahead on their way to put space at the service of the European citizen and the Policies of the EU. Building on the long-standing experience of ESA, the European Space Programme will enable Europe to face the political, economical and scientific challenges of tomorrow."

Luxembourg Minister François Biltgen said: "By agreeing on essential elements of the future European space policy, we have today taken a considerable step forward towards establishing a joint European space programme. Thus, the groundwork has been laid for the third Space Council planned for end-2005 to endorse a European space policy and programme."

Commission Vice-President Günter Verheugen stated : "I am grateful for the full support the Space Council has given the Commission today. We will now work full speed ahead and complete our proposal for a European space policy and programme. This will identify programme priorities for future European development of space applications."

ESA Director General Jean-Jacques Dordain said: "ESA has just turned 30. Thanks to the continuous support of its Member States, it has grown to make the European space sector one of the foremost competitors in the world and at the same time has become a respected partner. Now the European space policy is being integrated within the wider ambitions of Europe and space is set to become a much larger and more integrated undertaking in our future. ESA is prepared to adapt in order to take on an even greater role for Europe."

Background:

The Space Council was established in order to coordinate and facilitate cooperative activities between the European Community and ESA through their Framework Agreement, which was adopted in 2003 and entered into force in May 2004.

The first Space Council meeting took place in Brussels on 25 November 2004.

The EC-ESA Framework Agreement has two main aims. The first is the coherent, gradual development of an overall European space policy, which will specifically seek to link demand for services and applications using space systems in support of EU policies with the supply through ESA of space systems and infrastructures necessary to meet that demand. ESA is acting de facto EU implementing agency.

The second aim of the Agreement is to establish a common basis and appropriate practical arrangements for efficient and mutually beneficial cooperation between ESA and the European Community, fully respecting the institutional and operational frameworks of each institution, to facilitate the setting up of joint initiatives and to provide a stable framework for EC-ESA cooperation to benefit all European citizens.

Over the last three years, the EU and ESA have worked together to outline a European space policy that identifies and prioritises objectives for space. The European space programme expected to be endorsed by a Space Council session at the end of 2005 will constitute a common platform including all activities and measures to be undertaken by the EC, ESA and other stakeholders in order to achieve the objectives set by the European space policy.

The European space programme will be drawn up in light of the overall recommendations set out in the White Paper on Space, an action plan adopted by the European Commission in November 2003 for implementing an enlarged European space policy. Drafted in cooperation with ESA, the White Paper includes proposals for joint EC-ESA initiatives and takes the Framework Agreement as its basis for implementation.

ESA PR No.29-2005

Experts support the creation of a European Research Council

An expert group set up by the European Commission to examine the likely impact of a European Research Council has found that a pan-European mechanism funding frontier research would have a major effect on the level of excellence of research in Europe.

Brussels, 21 April 2005.- The report "Frontier Research: The European Challenge" is the result of the work of a high-level group set up by the Commission, chaired by William C. Harris of the Science Foundation Ireland, and composed ofeminent scientists, research managers and economists from Europe and the United States. The group was asked to examine the effects and benefits of creating a new European funding mechanism to support the very best research carried out at the frontiers of knowledge.

The report identifies a series of key challenges facing European research that a European Research Council (ERC) could help address. These include:

* Reinforcing excellence, with a focus on new, fast-growing research areas
* Staying ahead in a world of growing scientific and technological competition
* Linking science to technological innovation
* Competing for talent and attracting the best researchers
* Encouraging greater investment from the private sector

The High Level Group of experts also identified a number of important impacts and benefits above and beyond what can be achieved by national funding mechanisms:

* The ability to recognize, encourage and support the best talent through direct competition at pan-European level
* Selectivity and agility, enabling resources to be focused on excellent research in the most promising areas for the future
* Providing high status and visibility for truly excellent research leaders
* Dynamic structural effects on the European research system by helping national research structures to adapt to the evolving European Research Area
* Economic benefits by nurturing science-based industry and attracting more R&D intensive firms in Europe
* Benefits to society from investing quickly in the knowledge necessary to tackle major issues.

The group also concluded that the potential benefits of the ERC could not be realised by other means. Unless Europe makes a commitment to frontier research, it risks becoming a continent of imitators rather than innovators.

The Commission has proposed the establishment of an ERC within its proposal for the next Framework Programme for Research. An Identification Committee, composed of independent experts from the world of science and chaired by Lord Patten of Barnes, is currently in the process of identifying possible members of the Governing Council of the ERC, who will be the guarantors of the autonomy and focus on excellence that are fundamental to its success.

To read the report:
http://europa.eu.int/comm/research/future/pdf/hleg_fullreport_frontier_research_april2005.pdf

The executive summary of the report:
http://europa.eu.int/comm/research/future/pdf/hleg_execsum_frontier_research_april2005.pdf

Catherine Audouze-Ouannes,
Press and Information Officer,
DG Research,
European Commission
Tel: +32.2.296 66 72
Email:
Catherine.Audouze-Ouannes@cec.eu.int

SeaWiFS is back

NASA recently amnounced that they had signed a new contract with Orbimage that will provide the ocean research community continued access to the global SeaWiFS data set.

NASA recently amnounced that they had signed a new contract with Orbimage that will provide the ocean-colour research community with continued access to the global (4 km) SeaWiFS data set. Orbimage has already provided NASA with all the global data from 24 December 2004 (end date of the previous contract) to the present, which will soon be processed and available under the same terms and conditions as the previous contracts. NASA will post further details in the near future.

Source: IOCCG website

Increases in coastal phytoplankton

However, 4 of the 5 oligotrophic mid-ocean gyres (Atlantic and Pacific) showed declines in chlorophyll over the 6 years of the study.

In a recent study published in Geophysical Research Letters (Vol. 32, L03606, doi:10.1029/2004GL021808, 2005), Gregg, Casey and McClain demonstrated that phytoplankton concentrations have increased by more than 4 percent over the past six years on a global scale.

They used SeaWiFS data from 1998 - 2003 to show that most of the increase occurred in coastal (<200 m deep) regions such as the Patagonian Shelf, Bering Sea, the eastern Pacific, southwest Africa, and the Somalian coast. Although the global open ocean exhibited no significant change, 4 of the 5 oligotrophic mid-ocean gyres (Atlantic and Pacific) showed declines in chlorophyll over the 6 years. In all but the North Atlantic gyre, these were associated with significant increases in sea surface temperature in at least one season. These results suggest that in the mid-ocean gyres, the decrease in phytoplankton concentrations may be related to warming oceans. The cause of the coastal increase in phytoplankton concentrations was not known, but could be a sign of nutrient stress (e.g. land run-off depositing agricultural fertilizers and other nutrients in the oceans), or other factors.

Source: IOCCG website

Ocean Colour: Revised proposal for Visible Spectral Reflectance

IOCCG Office requests your comments again for a new term for Ocean Colour

Earlier on this year, the IOCCG sent out a request for comments on a proposed new name for ocean colour, Sea Spectral Reflectance (SSR). We were overwhelmed with comments and suggestions, which we have taken seriously and would like to thank all those who took the trouble to reply. The majority of respondents (91%) were in favour of a new name for ocean colour, while the remaining 9% preferred to continue using the term “ocean colour”. Of those in favour of a new name, only 43% agreed to the use of SSR, while the reamainder provided alternative suggestions.

We have learned that SSR is already used by many in the remote sensing field to mean Sea Surface Roughness, as associated with SAR data. We would like to thank Gay Mitchelson-Jacob (Centre for Applied Oceanography, Menai Bridge, UK) for pointing this out. Several other respondents also pointed out that the term “sea” limited the meaning to oceans, and requested that we use an acronym with broader connotations to include inland waters.

Our revised proposal is for the term Visible Spectral Radiance (VSR), and we now solicit further comments from the ocean-colour community. This term is neutral on the issue of fresh water versus oceans, and indeed is broad enough to acknowledge that what we are used to thinking of as ocean-colour devices are also used over land. It will have clear units and dimensions. Although the term “visible” does not include the near-IR range used for atmospheric correction, it is the visible bands that are actually used for the quantification of ocean colour.

We do not propose to suppress the use of the name ocean colour. For example, in some cases it might be preferred to use the designation Visible Spectral Radiance (Ocean Colour).

We would appreciate you comments once again, which can be sent to the IOCCG Project Office (ioccg@mar.dfo-mpo.gc.ca) with the subject line “Ocean-Colour Name?”

IOCCG

€ 50 000 for good satellite navigation ideas

European entrepreneurs, small businesses, academia and research institutes have the chance to win business development support worth € 50 000 if they come up with the best idea for an innovative use of Galileo, Europe's coming global navigation satellite system.

24 May 2005.- European entrepreneurs, small businesses, academia and research institutes have the chance to win business development support worth € 50 000 if they come up with the best idea for an innovative use of Galileo, Europe's coming global navigation satellite system.

The Galileo Masters 2005 competition, which has ESA's European Space Incubator as one of its sponsors, is being run under the patronage of the Bavarian Minister for Economic Affairs, Dr Otto Wiesheu. Its aim is to encourage small enterprises across Europe to think up new satellite navigation applications for Galileo, expected to reach full operational capability in 2008.

This year's competition will focus on seven high-tech regions across Europe: London (UK), Gothenburg (Sweden), Nice-Sophia Antipolis (France), the Czech Republic, Varese (Italy), South-Holland (the Netherlands) and Munich (Germany).

A team of experts for each region will choose the best ideas for satellite navigation applications from their area and from these the overall winner will be selected.

All the winners will be given a free stand at the International SYSTEMS IT and Telecommunication Fair in Munich in October, offering a chance to make business contacts and meet possible clients. The stands will be within the Satellite Navigation Area of the fair, one of the main attractions at last year's SYSTEMS event that had more than 65 000 visitors.

The overall winner will be provided with an office for six months within their region's 'business incubator', together with consultancy and promotional support. Altogether the prizes are estimated to be worth around €50 000.

Call for novel exploitation of navigation systems

This year, ideas for the present and the future are being accepted. Applications for the GPS, GLONASS and EGNOS systems already in operation are also being considered, as Galileo will significantly enhance all three.

According to the competition organisers, by 2015 over 400 million satellite navigation users will have created more than 100 000 new jobs within the European aerospace and electronics industry. Therefore it is important to start thinking about the possibilities that will open up as Galileo becomes operational.

Last year's winner was German company HCL Technologies. Their winning idea was an inexpensive device to help developing-nation fishermen decide where best to cast their nets.

To find out information about the signal and then use it for a novel application is the sort of thinking we are looking for in small companies," said Christian Stammel from Anwendungszentrum Oberpfaffenhofen, an European Space Incubator Network member and one of the competition organizers.

"Companies must wake up now because in four years they will have to move their businesses in a direction for Galileo."

Kick-off meeting in ESTEC

"This competition is an incentive for more Galileo applications and increases the innovative entrepreneurship. It is important for Europe's space industry as it creates novel utilisations for our navigation systems and in the end will generate income for their technology," said Bruno Naulais, manager of ESA's European Space Incubator (ESI) at the regional kick-off meeting in ESTEC.

Toine van Kessel from Siemens Automotive added that such a competition could be a very effective way to visualise opportunities for future business relationships between established industry and start-up companies. He stressed Siemens' interest in cooperating with innovative start-ups and SMEs.

Prof. Dr Bernard Katzy from the University of Leiden and CeTIM (Centre for Technology and Innovation Management) emphasised the importance of clustering innovations on regional levels: "With good innovation networks in place on regional level, through cooperation between these regions, innovation on European level is much better managed and achieved. This competition is a good start to activate such clusters around Europe for Galileo applications."

The Galileo Masters 2005 competition opened on 1 May and closes on 30 June 2005. Participants can apply via the Galileo Masters website, where they will also find more information.

Galileo satellite navigation system

Galileo will be Europe's global navigation satellite system, developed jointly by the European Commission and ESA, providing a highly accurate, guaranteed global positioning service under civilian control. It will be interoperable with GPS and GLONASS, the two other global satellite navigation systems.

A user will be able to take a position with the same receiver from any of the satellites, in any combination. By offering dual frequencies as standard, however, Galileo will deliver real-time positioning accuracy down to the metre range, which is unprecedented for today's publicly available systems.

Galileo will provide considerable economic and social benefits globally, and to Europe in particular. The European Commission will continue overseeing the programme during the implementation in all programmatic and political aspects and the European Space Agency will assume responsibility for the development of the Galileo infrastructure.

The fully deployed Galileo system will consist of 27 operational satellites plus three active spares and is planned to be in commercial operation by 2008, with the first test satellite due to launch by the end of this year.

More information

- Galileo Masters 2005 (http://www.galileo-masters.com/)

Source: ESA Press Release

ESA and ECMWF sign agreement to exchange information and expertise

An agreement signed yesterday by Director-General of ESA and Director of the (ECMWF) establishes long-term cooperation between these two organisations.

1 June 2005.- An agreement signed at ESA Headquarters in Paris yesterday by Director-General Jean Jacques Dordain of ESA and Director Dominique Marbouty of the European Centre for Medium-Range Weather Forecasts (ECMWF) and attended by ESA Earth Observation Director Volker Liebig establishes long-term cooperation between these two international organisations.

"This signature marks formal recognition of long established relationships and complementary interests linking ESA and the European Centre for Medium-Range Weather Forecasts (ECMWF)," said Director-General Dordain.

Mr. Marbouty stated: "ECMWF has established a worldwide reputation for its extensive use of satellite data in the field of numerical weather prediction. It has demonstrated the positive impact of ESA satellite data in the Centre's numerical model output, while contributing to the validation and calibration of the instruments on board such satellites.

"The agreement, by giving a framework to such activities, further strengthens the application of ESA's space-based Earth Observation, particularly regarding the Earth Explorer programme."

Director of ESA Earth Observation, Liebig added: "The excellent work of the Centre highlights the utility of Earth Observation satellites in the fields of meteorology and the environment and contributes to the continuous improvement of our instrument data quality. ECMWF also helps us to ensure that the design of our instruments is efficiently matched to the needs of users and their eventual benefit."

Intended as an umbrella to cover activities already in place as well as future activities, the agreement pledges the exchange of information and expertise as well as the setting up of regular bi-lateral meetings and fixed points of contact.

ESA and ECMWF began working together more than two decades ago, in 1983, when ECMWF supplied cloud cover predictions in support of the Metric Camera experiment on ESA\'s first Spacelab mission. In the mid-1980s ECMWF began investigating the feasibility of employing ESA satellite data such as scatterometer winds, altimeter wave height and synthetic aperture radar (SAR) spectra. In the course of the 1990s these data were introduced into the ECMWF analysis.

Back in the summer of 1995, the occurrence of Hurricane Luis in the tropical Atlantic – famous as the 'QE2 hurricane' that sent a 29-metre high rogue wave over the luxury liner - helped spur on the adoption of the ERS scatterometer. ECMWF analysis at the time showed a significant improvement in short-term forecasting of tropical cyclones when scatterometer data was included.

Today ECMWF routinely assimilates near-real time data from ERS-2 and Envisat into its weather forecasts. It also validates results from these satellites' instruments on an ongoing basis, comparing their data on meteorological events to other ground and space-based sources and their numerical model outputs. In turn, the Centre uses archived ESA datasets as benchmarks to assess and improve the performance of its numerical models.

ECMWF is also a major user of the Meteosat series of weather satellites, developed and built by ESA in cooperation with Eumetsat, the European Organisation for the Exploitation of Meteorological Satellites. ECMWF is currently preparing in view of the launch of MetOp, the first polar-orbiting joint venture between ESA and Eumetsat, foreseen for April 2006.

The new agreement allows for the continuation of current projects and activities and access to data, as well as educational and fellowship exchanges between ESA and ECMWF. It also strengthens the application of cooperation in areas such as ESA\'s Earth Explorer Programme.

ECMWF is set to play a key role in future ESA Earth Explorer missions. The Centre has the task of processing vertical wind fields from the ADM- Aeolus mission and will be employing climate-related data from the SMOS (Soil Moisture and Ocean Salinity) mission.

The two organisations will also cooperate and share information on their activities for the Global Earth Observation System of Systems (GEOSS) - an international effort setting up a system to share environmental information – as well as Global Monitoring for Environment and Security (GMES), a joint initiative between ESA and the European Union to establish an independent global monitoring capability for the continent, also serving as the European contribution to GEOSS.

SOURCE: ESA Press Release

Greece becomes 16th ESA Member State

Following its ratification of the ESA Convention, Greece has now become ESA's 16th Member State. The official announcement was made to the ESA Council on 16 March by Per Tegnér, Chairman of the ESA Council.

2 March 2005.- Following its ratification of the ESA Convention, Greece has now become ESA's 16th Member State. The official announcement was made to the ESA Council on 16 March by Per Tegne'r, Chairman of the ESA Council.

Cooperation between ESA and the Hellenic National Space Committee began in the early 1990s and in 1994 Greece signed its first cooperation agreement with ESA. This led to regular exchange of information, the award of fellowships, joint symposia, mutual access to databases and laboratories, and studies on joint projects in fields of mutual interest.

In September 2003 Greece formally applied to join ESA. Subsequent negotiations were followed in the summer of 2004 by the signing of an agreement on accession to the ESA Convention by Jean-Jacques Dordain, ESA Director General on behalf of ESA, and by Dimitris Sioufas, the Minister for Development, on behalf of the Greek Government.

Greece already participates in ESA's telecommunication and technology activities, and the Global Monitoring for Environment and Security Initiative. Now, with the deposition of its instrument of ratification of the Convention for the establishment of ESA with the French Government on 9 March 2005, Greece becomes the 16th ESA Member State.

ESA

Super-Eruptions Pose Global Threat "5-10 Times More Likely Than Asteroid Impact"

...according to an assessment of a Geological Society of London working group

The occurrence of a super-eruption would have severe environmental effects and might threaten global civilisation. This is the assessment of a Geological Society of London working group [1] composed of senior Earth Scientists. The effects of a super-eruption would be comparable to those predicted for the impact of a 1km-diameter asteroid with the Earth. In fact, super-eruptions are 5-10 times more likely to occur than such an impact. The assessment of the working party has been presented to the UK Government's Natural Hazard Working Group.

Many very large volcanoes on the Earth are capable of colossal eruptions with global consequences. Such eruptions are quite frequent on a "geological" timescale, although not one has occurred on Earth in the short time that an interdependent human civilisation has existed. However, our present civilisation depends on global trade and food production, air travel and space-borne communications, all of which could be at considerable risk if a super-eruption occurred.

There may be several super-eruptions large enough to cause a global disaster every 100,000 years. This means super-eruptions are a significant global humanitarian hazard. They occur more frequently than impacts of asteroids and comets of comparable damage potential.

Prof. Steve Sparks FRS (University of Bristol), co-lead author, said: "Several of the largest volcanic eruptions of the last few hundred years, such as Tambora (1815), Krakatoa (1883) and Pinatubo (1991) have caused major climatic anomalies in the two to three years after the eruption by creating a cloud of sulphuric acid droplets in the upper atmosphere. These droplets reflect and absorb sunlight, and absorb heat from the Earth - warming the upper atmosphere and cooling the lower atmosphere. The global climate system is disturbed, resulting in pronounced, anomalous warming and cooling of different parts of the Earth at different times.

Prof. Stephen Self (Open University) said: "Super-eruptions are up to hundreds of times larger than these, and their global effects are likely to be much more severe. An area the size of North America can be devastated, and pronounced deterioration of global climate would be expected for a few years following the eruption. They could result in the devastation of world agriculture, severe disruption of food supplies, and mass starvation. These effects could be sufficiently severe to threaten the fabric of civilisation."

The report concludes: "Problems such as global warming, impacts by asteroids and comets, rapid use of natural resources and nuclear waste disposal require world leaders and governments to address issues with very long-term consequences for the global community. Sooner or later a super-eruption will happen on Earth and this issue also demands serious attention. While it may in future be possible to deflect asteroids or somehow avoid their impact, even science fiction cannot produce a credible mechanism for averting a super-eruption. The point is worth repeating. No strategies can be envisaged for reducing the power of major volcanic eruptions."

The Working Group has recommended:

* Investment in research to improve our understanding of regional and global impacts of major volcanic eruptions.

* Research to determine more accurately the composition and amounts of volcanic gases and dust released in super-eruptions – these are the major factors governing widespread environmental effects.

* An expanded programme to produce a comprehensive inventory of large magnitude explosive eruptions in recent geological times, such as the initiative started under the auspices

of the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) [http://www-volcano.geog.cam.ac.uk/database/ on www.iavcei.org]

* Initiatives to improve public understanding of the nature of volcanic hazards with regional and global effects.

* Establishment of a multidisciplinary Task Force to consider the environmental, economic, social, and political consequences of large magnitude volcanic eruptions. As in the case of impacts by asteroids and comets, these proposed activities will be best developed by collaboration within an international context.

[1] Sparks, R S J & Self, S et al., 2005: Super-eruptions: global effects and future threats: Report of a Geological Society of London Working Group. Other authors include: Dr. David Pyle (Cambridge University), Dr. Clive Oppenheimer (Cambridge University), Dr. Hazel Rymer (Open University), and Dr. John Grattan (University of Wales, Aberystwyth). Published at: www.geolsoc.org.uk/supereruptions.

The Geological Society of London

Geodynamic and metabolic cycles in the Hadean

A chemical sedimentary environment was required both for the emergence of chemosynthesis and of oxygenic photosynthesis, the two innovations that did most to change the nature of our planet

High-degree melting of hot dry Hadean mantle at ocean ridges and plumes resulted in a crust about 30 km thick, overlain in places by extensive and thick mafic volcanic plateaus. Continental crust, by contrast, was relatively thin and mostly submarine. At constructive and destructive plate boundaries, and above the many mantle plumes, acidic hydrothermal springs at around 400^{O}C contributed Fe and other transition elements as well as P and H_2 to the deep ocean made acidulous by dissolved CO2 and minor HCl derived from volcanoes. Away from ocean ridges, submarine hydrothermal fluids were cool (below or near 100^{O}C), alkaline (pH around 10), highly reduced and also H_2-rich. Reaction of solvents in this fluid with those in ocean water was catalyzed in a hydrothermal mound, a natural self-restoring flow reactor and fractionation column developed above the alkaline spring. The mound consisted of brucite, Mg-rich clays, ephemeral carbonates, Fe-Ni sulfide and green rust. Acetate and glycine were the main products, some of which were eluted to the ocean. The rest, along with other organic byproducts were retained and concentrated within Fe-Ni sulfide compartments. These compartments, comprising the natural hydrothermal reactor, consisted partly of greigite (Fe_5NiS_8). It was from reactions between organic modules confined within these inorganic compartments that the first prokaryotic organism evolved. These acetogenic precursors to the bacteria diversified and migrated down the mound and into the ocean floor to inaugurate the “deep biosphere”. Once there they were protected from cataclysmic heating events caused by large meteoritic impacts. Geodynamic forces led to the eventual obduction of the deep biosphere into the photic zone where, initially protected by a thin veneer of sediment, the use of solar energy was mastered and photosynthesis emerged. The further evolution to oxygenic photosynthesis was effected as catalytic [Mn,Ca]-bearing molecules that otherwise would have been interred in minerals such as ranci´eite and hollandite in shallow marine manganiferous sediments, were sequestered and invaginated within the cyanobacterial precursor where, energized by light, they could oxidize water. Thus, a chemical sedimentary environment was required both for the emergence of chemosynthesis and of oxygenic photosynthesis, the two innovations that did most to change the nature of our planet.

Whole paper (open-access) available at
http://www.copernicus.org/EGU/bg/bg/2/97/bg-2-97.pdf

M. J. Russell and N. T. Arndt, Geodynamic and metabolic cycles in the Hadean, Biogeosciences, 2, 97–111, 2005.

Changes of daily surface ozone maxima in Switzerland in all seasons from 1992 to 2002

Influence of the meteorological variability on the daily maximum ozone concentrations at 12 low-elevation sites north of the Alps in Switzerland during the four seasons in the 1992–2002 period.

An Analysis of Covariance (ANCOVA) was used to derive the influence of the meteorological variability on the daily maximum ozone concentrations at 12 low-elevation sites north of the Alps in Switzerland during the four seasons in the 1992–2002 period. The afternoon temperature and the morning global radiation were the variables that accounted for most of the meteorological variability in summer and spring, while other variables that can be related to vertical mixing and dilution of primary pollutants (afternoon global radiation, wind speed, stability or day of the week) were more significant in winter. In addition, the number of days after a frontal passage was important to account for ozone build-up in summer and ozone destruction in winter. The statistical model proved to be a robust tool for reducing the impact of the meteorological variability on the ozone concentrations. The explained variance of the model, averaged over all stations, ranged from 60.2% in winter to 71.9% in autumn. The year-to-year variability of the seasonal medians of daily ozone maxima was reduced by 85% in winter, 60% in summer, and 50% in autumn and spring after the meteorological adjustment. For most stations, no significantly negative trends (at the 95% confidence level) of the summer medians of daily O_3 or O_x (O_3+NO_2) maxima were found despite the significant reduction in the precursor emissions in Central Europe. However, significant downward trends in the summer 90th percentiles of daily O_x maxima were observed at 6 sites in the region around Zürich (on average −0.73 ppb yr-1 for those sites). The lower effect of the titration by NO as a consequence of the reduced emissions could partially explain the significantly positive O_3 trends in the cold seasons (on average 0.69 ppb yr-1 in winter and 0.58 ppb yr-1 in autumn). The increase of O_x found for most stations in autumn (on average 0.23 ppb yr-1) and winter (on average 0.39 ppb yr-1) could be due to increasing European background ozone levels, in agreement with other studies. The statistical model was also able to explain the very high ozone concentrations in summer 2003, the warmest summer in Switzerland for at least ~150 years. On average, the measured daily ozone maximum was 15 ppb (nearly 29%) higher than in the reference period

summer 1992–2002, corresponding to an excess of 5 standard deviations of the summer means of daily ozone maxima in that period.

Whole paper (open-access) available at
http://www.copernicus.org/EGU/acp/acp/5/1187/acp-5-1187.pdf

Ordóñez C., H. Mathis, M. Furger, S. Henne, C. Hüglin, J. Staehelin, A. S. H. Prévôt, Changes of daily surface ozone maxima in Switzerland in all seasons from 1992 to 2002 and discussion of summer 2003, Atmos. Chem. Phys., 5, 1187-1203, 2005.

The carbon budget of terrestrial ecosystems at country-scale- a European case study

Carbon-oriented land management in Europe should focus on three levels, namely protection of existing large carbon stores, reversing the current carbon losses from arable soils by adopting revised management schemes and preserving the current carbon sink in European forests.

The authors summed estimates of the carbon balance of forests, grasslands, arable lands and peatlands in Europe to obtain country-specific estimates of the terrestrial carbon balance during the 1990s.

The authors conclude that in order to be effective, carbon-oriented land management in Europe should focus on three levels: 1) Disturbance of wetlands or old-growth forests results in a rapid loss of carbon, whereas carbon uptake proceeds at a much slower rate. Thus, protection of existing large carbon stores is critical. 2) Reversing the current carbon losses from arable soils by adopting revised management schemes that enhance carbon inputs to the soil and reduce soil disturbance. 3) Preserving the current carbon sink in European forests. This could be achieved by adopting less-disturbing management practices, by substituting fossil fuels with wood products and by creating more protected forest reserves.

Whole paper (open-access) available at
http://www.copernicus.org/EGU/bg/bg/2/15/bg-2-15.pdf

Janssens I.A., A. Freibauer, B. Schlamadinger, R. Ceulemans, P. Ciais, A. J. Dolman, M. Heimann, G. J. Nabuurs, P. Smith, R. Valentini, and E. D. Schulze, The carbon budget of terrestrial ecosystems at country-scale – a European case study, Biogeosciences, 2, 15–26, 2005.

Stratospheric water vapor trends

A transient model simulation of the 40-year time period 1960 to 1999 shows a stratospheric water vapor increase over the last two decades of 0.7 ppmv and, additionally, a short-term increase after major volcanic eruptions.

A transient model simulation of the 40-year time period 1960 to 1999 with the coupled climate-chemistry model (CCM) ECHAM4.L39(DLR)/CHEM shows a stratospheric water vapor increase over the last two decades of 0.7 ppmv and, additionally, a short-term increase after major volcanic eruptions. Furthermore, a long-term decrease in global total ozone as well as a short-term ozone decline in the tropics after volcanic eruptions are modeled. In order to understand the resulting effects of the water vapor changes on lower stratospheric ozone chemistry, different perturbation simulations were performed with the CCM ECHAM4.L39(DLR)/CHEM feeding the water vapor perturbations only to the chemistry part. Two different long-term perturbations of lower stratospheric water vapor, +1 ppmv and +5 ppmv, and a short-term perturbation of +2 ppmv with an e-folding time of two months were applied. An additional stratospheric water vapor amount of 1 ppmv results in a 5–10% OH increase in the tropical lower stratosphere between 100 and 30 hPa. As a direct consequence of the OH increase the ozone destruction by the HO_x cycle becomes 6.4% more effective. Coupling processes between the HO_x-family and the NO_x/ClO_x-family also affect the ozone destruction by other catalytic reaction cycles. The NO_x cycle becomes 1.6% less effective, whereas the effectiveness of the ClOx cycle is again slightly enhanced. A long-term water vapor increase does not only affect gas-phase chemistry, but also heterogeneous ozone chemistry in polar regions. The model results indicate an enhanced heterogeneous ozone depletion during antarctic spring due to a longer PSC existence period. In contrast, PSC formation in the northern hemisphere polar vortex and therefore heterogeneous ozone depletion during arctic spring are

not affected by the water vapor increase, because of the less PSC activity. Finally, this study shows that 10% of the global total ozone decline in the transient model run can be explained by the modeled water vapor increase, but the simulated tropical ozone decrease after volcanic eruptions is caused dynamically rather than chemically.

Whole paper (open-access) available at

http://www.copernicus.org/EGU/acp/acp/5/1257/acp-5-1257.pdf

Stenke A. , V. Grewe, Simulation of stratospheric water vapor trends: impact on stratospheric ozone chemistry, Atmos. Chem. Phys., 5, 1257-1272, 2005.

Effects of the future European emission regulation (2015) for the upper Rhine valley

The paper presents a general methodology for the elaboration of emission scenarios and gives examples of applications at local and regional scales for air quality management.

Air quality modeling associated with emission scenarios has become an important tool for air quality management. The set-up of realistic emission scenarios requires accurate emission inventories including the whole methodology used to calculate the emissions. This means a good description of the source characteristics including a detailed composition of the emitted fluxes. Two main approaches are used. The so-called bottom-up approach that relies on the modification of the characteristics of the sources and the top-down approach whose goal is generally to reach standard pollutant concentration levels. This paper is aimed at providing a general methodology for the elaboration of such emission scenarios and giving examples of applications at local and regional scales for air quality management. The first example concerns the impact of the installation of the urban tramway in place of the road traffic in the old centre of Strasbourg. The second example deals with the use of oxygenated and reformulated car fuels on local (Strasbourg urban area) and regional (upper Rhine valley) scales. Finally, we analyze in detail the impacts of the incoming European emission regulation for 2015 on the air quality of the upper Rhine valley.

Whole paper (open access) available at

http://www.copernicus.org/EGU/acp/acp/5/1257/acp-5-1257.pdf

Ponche, J.-L. and Vinuesa, J.-F., Emission scenarios for air quality management and applications at local and regional scales including the effects of the future European emission regulation (2015) for the upper Rhine valley, Atmos. Chem. Phys., 5, 999-1014, 2005.

Global implications of Arctic climate processes and feedbacks - GLIMPSE

A presentation of simulations of the past 500 years

by Dr. Martin Stendel

The climate of the last five centuries has been simulated with a state of the art coupled model driven with all relevant forcings, both natural (solar variability, volcanic aerosol) and anthropogenic (greenhouse gases, sulfate aerosol, land-use changes). Different from previous GCM studies, the latitudinal dependence of volcanic aerosol and the changing land cover have been taken into account . A clear signature of individual extreme events such as the "year without a summer" 1816 is found. Strong warming is simulated since 1850, in particular over land, going along with increased zonal flow. Circulation anomalies are simulated with similarity to observed and reconstructed anomalies, for example during the Late Maunder Minimum (LMM). The model is able to reproduce some of the observed or reconstructed regional patterns. Cooling during the LMM and at the end of the 18th century is smaller than in other studies, due to the relatively small variations in solar activity and the relatively modest volcanic forcing applied here. Cooling events are not restricted to Europe and North America, but cover most of the Northern Hemisphere. Colder than average conditions go along with a decrease in pressure difference between low and high latitudes and increased meridional flow, favouring positive sea ice anomalies east of Greenland and around Iceland, leading to widespread negative temperature anomalies over Europe. Characteristic blocking patterns are found over Western Europe, in particular during autumn which contribute to the advection of cold air.

Background

The Arctic exhibits substantial natural variability and climate change simulations suggest that it is a region of the world where climate change as a result of increased greenhouse gas concentrations is likely to be largest. The impacts of this warming, including the melting of sea and inland ice and changes to terrestrial and marine ecosystems are likely to be significant (IPCC, 2001). Projections of future climate changes are complicated by complex interactions and nonlinear feedbacks of the Arctic climate system with other parts of the world as a result of global teleconnections. For this reason, current estimates of future climate changes for the Arctic based on coupled atmosphere-ocean general circulation models (GCMs) vary significantly, indicating a 2 to 6 K warming of the Arctic by the year 2070, with considerable uncertainty and large model-to-model differences (Källén et al., 2001). Not only do the model results disagree in the magnitude of changes, but especially in the regional distribution of these changes.

Understanding how the Earth's climate system "works", documenting its variability and determining the extent to which climate is predictable are scientific challenges that have enormous socioeconomic relevance. Because climate is an integrated system of interacting components, climate research requires a perspective view. We therefore seek to find answers to the following questions: What are the global consequences of natural changes in the Arctic climate system? Is the Arctic climate system as sensitive to anthropogenic and external variations as global climate models suggest so far? These questions are investigated at the scale of both the regional (pan-Arctic) and the global scale by improved regional and global climate model simulations. Aside from the fact that the Arctic is a significant component of the global climate system, there is growing evidence that it has a strong influence on and interaction with European climate. For instance, the export of low salinity waters has the potential to influence the overturning cell of the global ocean through control of convection in the subpolar gyres, which in turn feed the North Atlantic and European climate.

Consequently, the main objective of the EU funded project GLIMPSE (Global implications of Arctic climate processes and feedbacks) is to advance our understanding of the key physical processes in the oceans, cryosphere, atmosphere and land and their interactions, including natural variability and abrupt changes, which control Arctic climate and have the potential of global implications and consequences. The goals of the project are to evaluate and improve global and regional climate models and ultimately construct fully coupled regional atmosphere-

ocean-ice models. The general aim of GLIMPSE is to improve Europe's ability to assess climate variability and to develop capabilities for prediction on decadal time scales and on this basis to assist policymakers in their socio-economic decisions on environmental issues. The assessment of potential impacts of climate change has generally so far relied on model data from coarse resolution GCMs which are incapable of resolving spatial scales less than about 300 km. These models include therefore only a limited physical representation of the coupled atmosphere-ice-ocean-land-biosphere system and are generally insufficient in simulating the spatial structure of temperature and precipitation in areas of complex topography (e.g. Greenland and Alaska). The description of regional and local atmospheric circulation systems (narrow jet cores, mesoscale convective systems, see-breeze circulations, shallow stable planetary boundary layers) and the representation of high-frequency processes (e.g. precipitation frequency, intensity distribution, surface wind variability, snow redistribution) are likewise insufficient to provide accurate information. Regional models, on the other hand, depend on accurate boundary conditions that they obtain from the respective driving GCMs. It is therefore essential to improve both global and regional models in parallel. The combined use of coupled GCMs and regional climate models is a powerful resource for improving our understanding of nonlinear decadal scale variations with their large amplitudes, strong regional ocean, sea ice and land surface feedbacks and potential global implications and consequences. This will provide the scientific basis for applying regional climate models to integrated impact studies of climate change scenarios in the Arctic and European North with highly increased credibility on the regional scale.

In general terms, major limitations of studies of climate variability and change in the Arctic have so far been the lack of

(a) adequate horizontal and vertical resolution,

(b) long-term integrations and

(c) coordination between the climate modelling communities involved (European, U.S. and Canadian).

All three issues are addressed in the GLIMPSE project. The coordination goes beyond a strict European effort in that GLIMPSE liaises with U.S. and Canadian groups by coordinating numerical experimentation and data analysis through the definition of common frames of reference for model intercomparison and validation. An ensemble approach is used to provide useful measures of uncertainties by utilising two state-of-the-art coupled general circulation models and three regional climate models (RCMs). Such a comprehensive research effort has never been carried out before. The coordinated efforts within one European project and with the leading American and Canadian groups (Lynch and Curry, 2000) can be expected to enhance our knowledge of model weaknesses related to Arctic processes in a comprehensive way, and based on this, to enable the quantification of uncertainties associated with rapid past and possible future climate changes.

To achieve this, GLIMPSE is:

• addressing and reducing deficiencies in Arctic modelling by the development of improved physical parameterisations of Arctic climate feedbacks in RCMs;

• applying these improved parameterisations into coarser resolution coupled GCMs to determine and understand their global influences;

• assessing the implications of these results for abrupt climate changes on decadal time scales in the past and in the future.

Approach

GLIMPSE is using the following approach:

1. High-resolution climate simulations for the Arctic are conducted with state-of-the-art RCMs with currently used physical parameterisation schemes and validated against a new set of Arctic ground-based, balloon-borne observations plus additional satellite data which have been collected during the SHEBA year (Surface heat budget of the Arctic Ocean, October 1997 to October 1998) to quantify model biases and their uncertainties. The extensive field observations in the high Arctic (Fig. 1) provide by far the best available satellite products for any period in the Arctic and are the foundation for the improvement of atmospheric model parameterisations.

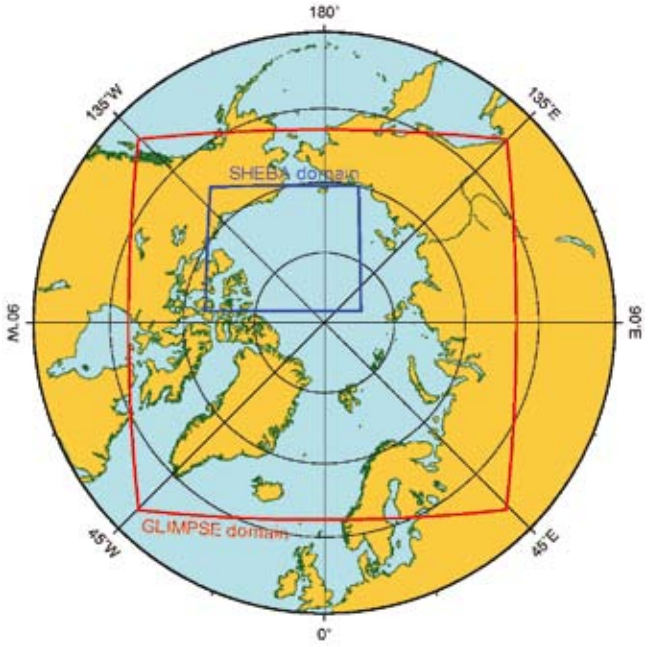


Fig. 1: The GLIMPSE and the SHEBA domains.

2. Based on comparisons with SHEBA data, parameterisations and the description of feedbacks in RCMs are improved. This includes the description of cloud – water vapour – radiation feedbacks, turbulence schemes in the shallow planetary boundary layer, the hydrological cycle with emphasis on precipitation minus evaporation feedbacks as well as land surface and permafrost processes. Annual runs with the three participating RCMs have been conducted in the pan-Arctic GLIMPSE domain (Fig. 1), and candidates for modifications in the parameterisation have been identified: alternative parameterisations for the albedo over sea ice, snow and snow-covered ice (Költzow et al., 2003; Benkel et al., in prep.), permafrost schemes (investigation of the validity of the zero-flux assumption in the lowest soil layer) and the vertical resolution within the stable boundary layer.

3. The interannual variability and global consequences of the improved description of Arctic climate processes and feedbacks and the regional and temporal patterns connected to de-cadal to centennial variability in the Arctic are investigated in long (500 years) GCM simulations with fixed and variable external forcing. We have carried out a simulation under the influence of a comprehensive set of natural and anthropogenic forcings: volcanic and anthropogenic aerosol, solar variability,

greenhouse gases and land use changes for the period 1500 to 2000. It will be this part of the project that will be described in detail below. The aim is to assess variability in GCMs and RCMs as a function of model formulation, external forcing processes and internal variability, to allow for the determination of uncertainties in climate scenarios, to assess the risk of climate change due to regional feedbacks, and ultimately, to develop fully coupled atmosphere-ice-ocean models with improved parameterisations for the whole Arctic.

4. Regional models are driven with time slices from the coupled GCM simulations described above to assess the potential of rapid regional climate shifts like the "Little Ice Age" on socio-economic systems in Europe and particularly in the Arctic.

Partners

The GLIMPSE consortium consists of 7 partners: Alfred Wegener Institute for Polar and Marine Re-search, Potsdam (AWI), coordinator: Klaus Dethloff, Norwegian Meteorological Institute, Oslo (DNMI), Rossby Centre, Swedish Meteorological and Hydrological Institute, Norrköping (SMHI), Danish Meteorological Institute, Copenhagen (DMI), Stockholm University, Department of Earth Science and Geography, University of Tromsö, Norwegian College of Fishery Science, Tromsö (NCFS), Institute for Coastal Research, GKSS Research Centre, Geesthacht (GKSS).

A public GLIMPSE web site has been set up at http://www.awi-potsdam.de/www-pot/atmo/glimpse/.

A 500 year climate simulation incorporating a comprehensive set of forcings

Introduction

Considerable attention has recently been paid to the evolution of climate and in particular temperature over the last couple of centuries. Since we do not have a sufficient amount of direct measurements prior to about 1850, proxy data (tree rings, ice cores, corals and historical documents) must be used to assess the climate of earlier times. In order to put the temperature evolution of the 20th century into a longer-term context, estimates of natural variability (internal variations of the climate system in absence of external forcings) as well as forced variability (both natural and anthropogenic) are required. Several of such multi-century reconstructions exist and have received considerable attention, e.g. Mann et al.'s "hockey stick" (Mann et al., 1999). Others have recently been presented e.g. by Huang et al. (2000), Briffa et al. (2001) and Esper et al. (2002), the first based on borehole temperatures, the other two on tree rings. An extensive review paper by Jones and Mann (2004) puts these and other estimates of past temperature variability in context. Recently, using idealised proxy records obtained from a coupled model simulation, von Storch et al. (2004) argued that centennial variability may have been larger than these empirical reconstructions indicate. Climate reconstructions based on proxies have inherent uncertainties. The resolvable variables and the regions for which these reconstructions are derived are not necessarily identical. As an example, tree growth is sensitive to temperature and precipitation, but the actual ring thicknesses will depend on which quantity is the limiting factor. In such a situation, multi-century transient climate simulations can help us to gain understanding of the temperature variations of past centuries and of the underlying physical processes when conducted with state-of-the-art coupled general circulation models. Results of these simulations agree broadly with the reconstructions of Mann et al. (1999) and other authors in that there was an extended period until the mid-19th century with temperatures lower than present, often (somewhat incorrectly, see Jones and Mann, 2004) termed the Little Ice Age (LIA). In order to conduct such a transient simulation, it is essential to be able to quantify all the various natural and anthropogenic forcings that are at play as realistic as possible.

Our work differs from previous publications by two aspects: we have included a latitude dependence of volcanic aerosol and a description of land use changes in the forcing. Aspects of the forcing data sets are described in detail in Stendel et al. (2004), and we give only a short overview here.

Model

In this study, we use the coupled ocean-atmosphere model ECHAM4-OPYC3. Its atmospheric part, ECHAM4, is described in Roeckner et al. (1999). The ocean model is an extended version of the OPYC model (Oberhuber, 1993), which consists of sub-models for the interior ocean, the surface mixed layer and sea-ice. Ocean and atmosphere are quasi-synchronously coupled, exchanging information once per day. An annual flux correction for freshwater and momentum is applied, based on present-day climate conditions. Further details about the model can be found, e.g., in Stendel et al. (2000), and references therein.

Forcings

Natural forcings include solar irradiation variability and volcanic emissions, and anthropogenic forcings include time-dependent concentrations of greenhouse gases and chlorofluorocarbons (CFCs), land use changes and a simplified tropospheric sulphur cycle. Orbital variations can be neglected due to the comparatively short period that is investigated here.

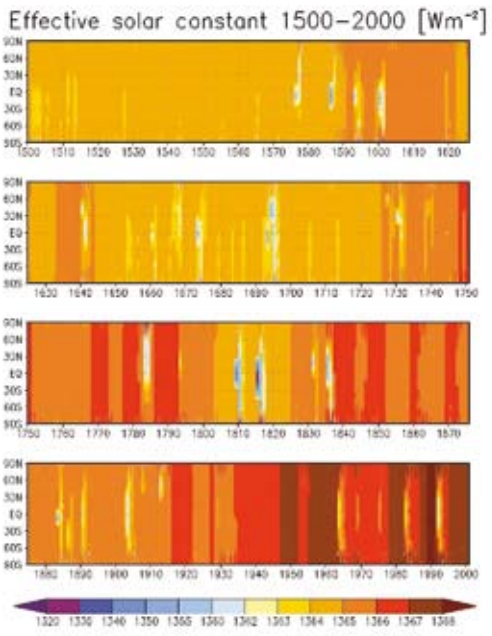


Fig. 2: Effective solar constant, expressed as the sum of solar forcing and the effect of volcanic aerosols.

For solar irradiation, we used the data set of Lean et al. (1995, updated), covering the period 1500 to 2000 with annual resolution. A low-frequency trend with an increase of total solar irradiation by about 0.2% from the Maunder Minimum until today is visible, see Fig. 2). Apart from volcanic activity (see below), the figure clearly shows several minima in solar irradiance, in particular the Spörer Minimum in the first part of the 16th century, the well-known Maunder Minimum (about 1650 to 1715), and the Dalton Minimum in the early 19th century. Since then, a general increase in irradiance is evident.

The Robertson et al. (2001) annually and latitude-resolving volcanic optical depth dataset has been used for the period 1500 to 1889. This index is obtained from the observation of sulfate aerosol in ice cores. From these, one can calculate the perturbation in optical depth following the procedure of Stothers (1984), which can be expressed as anomalous radiative forcings at the tropopause for the solar and long wave part following Andronova et al. (1999). From 1890 on, we have used the monthly-resolved data of Ammann et al. (2003). Note that there is considerable uncertainty about the actual amount of volcanic aerosol ejected into the stratosphere, resulting in a difference by a factor of 6 between two recent datasets (Robertson et al., 2001 and Crowley, 2000) even for well-documented eruptions like Tambora, 1815.

The annual concentrations of greenhouse gases (CO_2, CH_4 and N_2O) are also taken from Robertson et al. (2001). They have been obtained from ice core data. For the well-mixed carbon dioxide, one measurement from Law Dome (Antarctica) is sufficient. For methane, which is less well mixed, time series from both hemispheres have been averaged, and for N_2O, an average of a number of Antarctic records was used. The concentrations of halocarbons (CFCs) have been taken from observations described in the 3rd IPCC assessment report (Nakicenovic et al., 2000).

In contrast to previous studies, we also take into account the effects of anthropogenic vegetation changes. We use the so-called HYDE "A" data set (Klein Goldewijk, 2001) which includes on a 0.5° by 0.5° grid croplands as well as areas used as pasture, which are estimated from population densities as well as estimates of livestock, gross domestic product and industrial production. The vegetation classes were assigned to the ECHAM vegetation classes (Claussen, 1994; Hagemann et al. 1999) and interpolated to the model grid. Then, differences to present-day conditions for background albedo, forest and vegetation ratio, leaf area index and surface roughness are determined. The dataset shows large-scale deforestation in Europe in the 18th century, in the western U.S. in the second half of the 19th century and, more recently in East Asia (not shown here).

ECHAM4 has a simplified tropospheric sulfur cycle described in detail in Roeckner et al. (1999). Sulfur emissions with their actual geographical positions are given as decadal means from 1860 on. The transformation to sulfate, semi-Lagrangian transport of the sulfate aerosols as well as dry and wet deposition of sulfate particles from the atmosphere (Feichter et al., 1996) are taken into account. The indirect aerosol effect on cloud albedo, following Boucher and Lohmann (1995) and Lohmann and Feichter (1997), is also included. In addition, the tropospheric ozone concentration is allowed to vary as a result of prescribed concentrations of anthropogenic precursor gases (OH-, NO_3-, O_3, H_2O_2) whose concentrations are given for 1860 and 1985 and linearly interpolated in between (Roelofs and Lelieveld, 1995).

Experiment setup

The model was spun down from present-day to AD1500 conditions by applying the pre-industrial values of all the forcings described above. After a period of 500 years, the model variables had asymptotically approached nearly constant values. From this starting point, an unforced control simulation and a forced experiment including all forcings have been run for 500 years each. For an estimation of the effect of land-use changes, an additional simulation was run for the last three hundred years using constant vegetation for 1700.

Evolution of surface temperature and comparison to proxy data

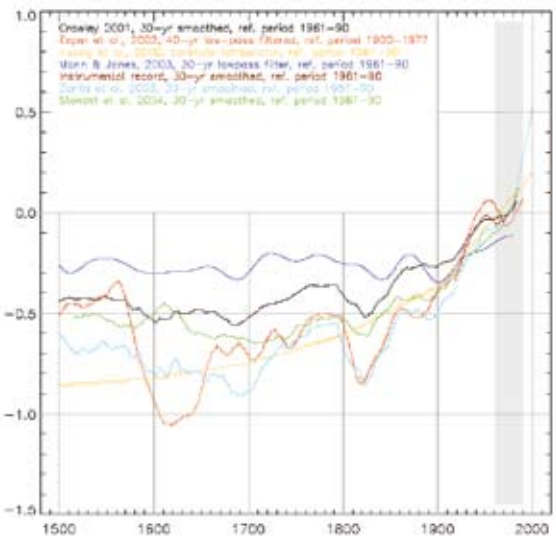


Fig. 3: Near surface temperature anomalies 1500-2000 for the instrumental record, the reconstructions of Huang et al. (2000), Esper et al. (2002) and Mann and Jones (2003), the model simulations of Crowley (2001) and Zorita et al. (2004) and for this study.

In Fig. 3, we show the simulated evolution of global near-surface temperature with reconstructions from instrumental observations, an energy balance model (Crowley, 2001), dendrochronologies (Esper et al., 2002), borehole data (Huang et al., 2000), Mann et al.'s (2003) multi-proxy reconstruction and a model simulation with the same atmospheric model in coarser resolution, but a different ocean model (Zorita et al., 2004). Temperatures in our study generally follow the proxy data, with negative anomalies during the Late Maunder Minimum (late 17th and early 18th century) and around 1830, as well as a strong temperature increase since the mid-19th century. Compared to the simulation by Zorita et al., the negative anomalies in our simulation are smaller. This can be explained by the considerably larger solar variability and volcanic forcing that has been used in their data set. Large volcanic eruptions can influence global temperature on a time scale of several years. The most striking example follows the eruption of Tambora in 1815. The "year without a summer" 1816 following this event (Harington, 1992; Robock, 1994) is evident in the simulation (not shown). Other examples of major volcanic events leaving an imprint in the global temperature curve include Laki on Iceland in 1783 and Krakatoa (Indonesia) in 1883. Also the "1809 event" (clearly visible in ice cores, the responsible volcano remaining unknown, see Budner and Cole-Dai, 1993)

can be identified. While the model is able to depict the direct radiative effects of large volcanic eruptions, it fails to simulate flow anomalies triggered by tropical eruptions (Robock and Mao, 1995; Shindell et al., 2001b) which tend to cool the polar stratosphere and therefore strengthen the polar vortex, leading to warmer than normal temperatures in the winter following such an eruption in large parts of Europe. Warm periods in the early 17th century and in the second half of the 18th century are likely caused by increased solar irradiation.

To assess the regional distribution of anomalies during the Late Maunder Minimum (LMM), we compare simulated and reconstructed (Luterbacher et al., 2003) seasonal temperature anomalies over Europe from the 200 year average 1500-1700. Fig. 4 shows winter (DJF) temperatures as an example. According to the reconstruction, the LMM period was characterised by colder than average winter conditions over most of the continent and positive anomalies over most of Scandinavia. The model is able to depict this general pattern and thus seems to have skill to simulate large scale regional climate changes. Simulated cold anomalies in summer, however, extend too far south (not shown). The general increase of blocking situations during the LMM (compare Luterbacher, 2001) is also simulated.

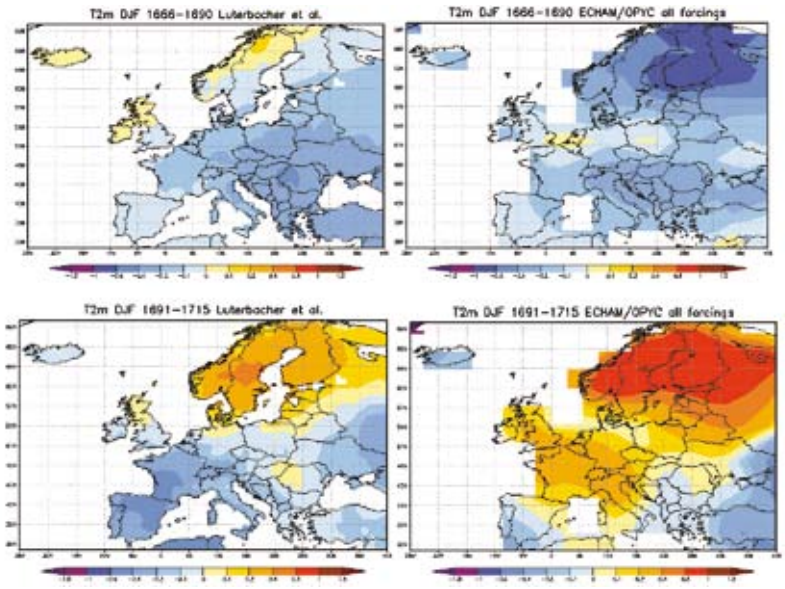


Fig. 4: Late Maunder Minimum winter (DJF) temperature anomalies [K] from the average 1500-1700 for 1666-1690 (upper panel) and 1691-1715 (lower panel). Left column: empirical reconstructions (Luterbacher et al., 2003), right column: this study.

To assess the effect of vegetation changes, we have conducted a sensitivity experiment where background albedo, forest and vegetation ratio, leaf area index and surface roughness were held constant at 1700 values. While the global effect of vegetation changes is small (less than 0.1 K), differences up to -0.3 K are simulated over Europe in the 18th and over the US Great Plains in the 19th century with the full forcing simulation being colder. There is also a modest reduction in temperature over south eastern Asia in the first half of the 20th century. This is in agreement with estimates from transient experiments by Matthews et al. (2003), but smaller than the results reported by Matthews et al. (2004) using an interactively coupled vegetation model.

Multidecadal circulation anomalies

In order to further assess typical Atlantic-European circulation anomalies in the model, a time series of European temperature anomalies was constructed, covering the same area as the Luterbacher et al. data. From this time series, several 25 year segments were chosen: a particularly cold period centred on 1788, a warm spell centred on 1612 and two periods covering the onset (1666-1690) and the end (1691-1715) of the LMM. For these periods, temperature (both near-surface and deep-soil), precipitation, sea ice cover and 500 hPa height (sea level pressure is very similar) were compared to the average 1500-1700. As an example, we here show these fields for autumn of the second cold period (Fig. 5). During cold periods in winter (DJF), positive sea ice anomalies are found in the Greenland / Iceland region. Over Eurasia, we find a general weakening of the zonal circulation by either anomalous high pressure in the polar region or anomalous low pressure over most of Eurasia. Both types of circulation anomalies favour positive sea ice anomalies near Iceland and along Greenland's east coast. There are also large cold anomalies over Northeast Europe due to anomalous snow cover. In summer (JJA), cold periods are also characterised by a simulated weakening of the zonal circulation, caused by either anomalous high pressure over Greenland or anomalous low pressure over most of Europe/Asia. Both circulation patterns go along with a southwest displacement (and probably weakening) of the Azores high and generally tend to transport cool Atlantic air masses into most of Europe. The most striking circulation anomalies occur in autumn (SON) where, even in the 25 year average, a 500 hPa anomaly of more than 20 gpm is simulated over Western Europe.

The North Atlantic Oscillation (NAO)

There is evidence from reconstructions by Luterbacher et al. (2002) and Glück and Stockton (2001) for a strong increase in zonality since the mid-19th century. Such an increase for the last 150 years - with the notable exception of the 1940s that were characterised by low NAO indices in the European-Atlantic region – is also visible in the first EOF (explaining 37% of the variance) of our simulation (not shown here). Corroborating results by Zorita et al. (2004) - obtained with quite a different forcing - we find a shift of the NAO index from negative to positive values approximately halfway through the LMM. A circulation pattern with high pressure over the British Isles is given by EOF2, which explains almost a fifth of the variance. The corresponding PC has a large loading during most of the LMM, thus corroborating our findings about the increase of blocking patterns discussed above.

The thermohaline circulation

Rahmstorf and Ganopolsky (1999) report of a general slowing down of the Atlantic thermohaline circulation (THC) under global warming conditions, caused by the decrease of surface water density by either increased warming or an anomalous freshwater flux. However, in ECHAM4/OPYC, we do not find

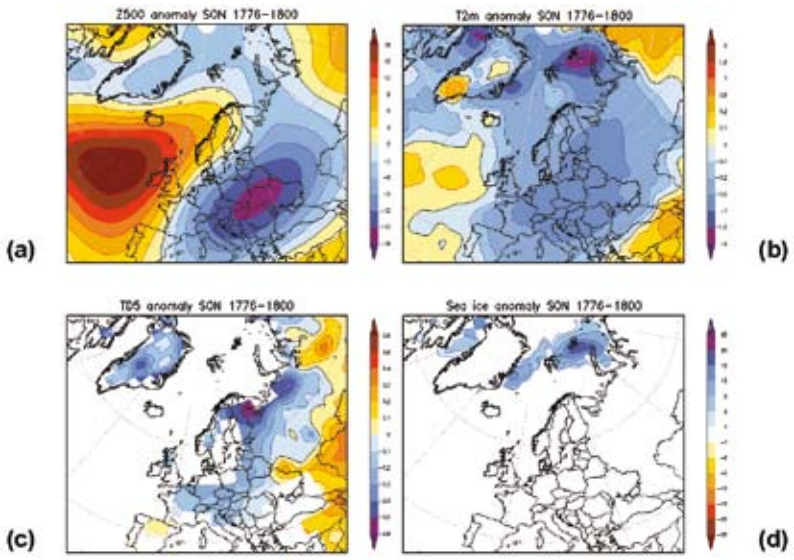


Fig. 4: Late Maunder Minimum winter (DJF) temperature anomalies [K] from the average 1500-1700 for 1666-1690 (upper panel) and 1691-1715 (lower panel). Left column: empirical reconstructions (Luterbacher et al., 2003), right column: this study.

a particular sensitivity to changes in the forcing. This is a particular property of this model: Under warming conditions, the stability of the THC is caused by a poleward transport of anomalously saline water (caused by anomalous evaporation) from the tropical Atlantic. This remote effect is able to compensate for the local effects in the North Atlantic which tend to decrease the density of surface water through warming and increase in freshwater flux (Latif et al., 2000). The opposite is true for cooling conditions. Therefore, the THC remains rather stable throughout the simulation.

Discussion

Near-surface temperatures as well as deep soil temperatures well below the long-term average are simulated for extended periods, including the LMM. We find an accompanying decrease in solar irradiation and an increase in volcanic activity during the same periods. The fact that there is a clear response in our simulation despite the relatively small forcing (compared to Zorita et al., 2004) can be explained by the large impact of extratropical volcanoes on high-latitude temperatures (see e.g. Laki on Iceland in 1784) in the solar part of the spectrum. Latitudinal resolution (as well as correct placement in time) of the volcanic aerosol is therefore essential. As suggested by Shindell et al. (2001a), a decrease in radiative forcing, caused by less solar irradiation and/or volcanic aerosol, leads to a decrease in the upper tropospheric temperature gradient between tropics and high latitudes, a decreased northward momentum transport and therefore to a weakening of the NAO. This is the case in ECHAM despite the rather simplified representation of the stratosphere. Such quasipersistent circulation anomalies could lead to positive sea ice anomalies east of Greenland and around Iceland, regions that are particularly sensitive to circulation changes in ECHAM (Stendel et al., 2000), but probably also in reality. There is historical evidence (e.g., Lamb, 1982) for above average ice conditions around Iceland during the LMM. Once such a cold anomaly has evolved, it can persist for quite some time, perhaps influenced from the lower boundary by widespread below average soil temperatures. The effect may be further en-hanced by freezing of previously unfrozen ground in the transition zone to permafrost. Such a weakening of the zonal circulation could, on average, persist for several years and lead to cold conditions in Europe except in summer, where the thawing of the upper layer acts as a blocker from the deeper frozen soils. It would also go along with an increase of blocking situations. It remains to be examined if there is a dependence on resolution, since the remarkable increase in blockings is not apparent in the coarser resolution (T30) in Zorita et al.'s simulation.

In contrast to the mechanisms discussed above, the weakening of the ocean gyre circulation, as described in Zorita et al. (2004) does not seem to play a prominent role for the present model, as the local freshening in the northern oceans is compensated by the transport of saline waters from the tropics. The level of externally forced variability in our simulation is larger than in Crowley's (2000) energy balance model. It is also larger than several reconstructions suggest, in particular that of Mann and Jones (2003). In our reconstruction, the LMM is the coldest period of the past 500 years which is also true for the Zorita et al. simulation with much larger forcing than used here. We conclude that state-of-the art climate models are able to simulate multidecadal circulation anomalies such as the LMM, even under conservative forcing assumptions. In view of past climate evolution, the warm conditions at the end of the 20th century are highly unusual and unprecedented for at least the last five centuries.

In comparison to high resolution empirical climate reconstructions, the model is able to some extent to simulate regional climate anomalies, mainly in winter (DJF), suggesting that there is a memory effect for soil moisture that is not adequately covered in ECHAM's rather simple soil scheme. However, as can be seen in the years following large volcanic eruptions, it mainly reacts to the reduced insolation, but fails to reproduce the dynamical effects following such forcing anomalies.

Acknowledgments

GLIMPSE is a research project (contract EVK2-CT-2002-00164) supported by the European Commission under the 5th Framework Programme. Results by the following GLIMPSE participants are discussed or quoted: A. Benkel, J.H. Christensen, K. Dethloff, M.Ø. Költzow, P. Kuhry, I.A. Mogensen, B. Rockel and H. von Storch.

References

Ammann, C.M., G.A. Meehl, W.M. Washington and C.S. Zender, 2003: A monthly and latitudinally varying volcanic forcing dataset in simulations of 20th century climate. Geophys. Res. Lett. 30, 10.1029/2003GL016875.

Andronova, N.G., E.V. Rozanov, F. Yang, M.E. Schlesinger and G.L. Stenchikov, 1999: Radiative forcing by volcanic aerosol from 1850 to 1994. J. Geophys. Res. 104, 16807-16826.

Boucher, O., and U. Lohmann, 1995: The sulfate-CCN-cloud albedo effect: A sensitivity study with two general circulation models. Tellus B47, 281–300.

Briffa, K.R., T.J. Osborn, F.H. Schweingruber, I.C. Harris, P.D. Jones, S.G. Shiyatov and E.A. Va-ganov, 2001: Low-fre-

quency temperature variations from a northern tree ring density network. J. Geophys. Res. 106, 2929-2942.

Budner, D. and J. Cole-Dai, 2003: The number and magnitude of large volcanic eruptions between 904 and 1865 AD: Quantitative evidence for a new South Pole ice core. In: Volcanism and the Earth's atmosphere. Geophys. Monogr. 139, American Geophysical Union.

Claussen, M., U. Lohmann, E. Roeckner, and U. Schulzweida, 1994: A global data set of land-surface parameters. MPI Report 135, Max-Planck-Institut für Meteorologie, Hamburg.

Crowley, T.J., 2000: Causes of climate change over the last 2000 years. Science 289, 270-277.

Esper, J., E.R. Cook and F.H. Schweingruber, 2002: Low-frequency signals in long tree-ring chronologies fore reconstructing past temperature variability. Science 295, 2250-2253.

Feichter, J., E. Kjellström, H. Rodhe, F. Dentener, J. Lelieveld and G.J. Roelofs, 1996: Simulation of the tropospheric sulfur cycle in a global climate model. Atm. Env. 30, 1693-1707.

Feichter, J., U. Lohmann and I. Schult, 1997: The atmospheric sulfur cycle and its impact on the shortwave radiation. Clim. Dyn. 13, 235-246.

Glück, M.F. and C.W. Stockton, 2001: Reconstruction of the North Atlantic Oscillation, 1429-1983. Int. J. Clim. 21, 1453-1465.

Hagemann, S., M. Botzet, L. Dümenil, and B. Machenhauer, 1999: Derivation of global GCM boundary conditions from 1 km land use satellite data. MPI Report 289, Max-Planck-Institut für Meteorologie, Hamburg.

Harington, C.R. (ed.), 1992: The year without a summer? – World climate in 1816. Canadian Museum of Nature, Ottawa, 576 pp.

Huang, S.H., N.H. Pollack and P.Y. Shen, 2000: Temperature trends over the past five centuries reconstructed from borehole temperatures. Nature 403, 756-758.

IPCC, 2001: Climate change 2001: The scientific basis. Contribution of WG I to the 3rd Assessment of the Intergovernmental Panel on Climate Change (J.T. Houghton et al., eds.). Cambridge University Press.

IPCC, 2001: Climate change 2001: Impacts, adaptation and Vulnerability. Contribution of WG II to the 3rd Assessment of the Intergovernmental Panel on Climate Change (McCarthy et al., eds.). Cambridge University Press.

Jones, P.D. and M.E. Mann, 2004: Climate over past millennia. Rev. Geophys. 42, 2003RG00143.

Källén, E., V. Kattsov, J. Walsh and E. Weatherhead, 2001: Report from the Arctic Climate Impact Assessment modeling and scenarios workshop, 29-31 January 2001, Stockholm.

Lynch, A.H. and J.A. Curry, 2000: Application of SHEBA data to understanding and simulating the cloud-radiation feedback: regional model perspective. NSF-OPP0084291.

Klein Goldewijk, K., 2001: Estimating global land use change over the past 300 years: the HYDE database. Glob. Biogeochem. Cycl. 15, 415-433.

Køltzow, M., S. Eastwood and J. E. Haugen, 2003: Parameterization of snow and sea ice albedo in climate models. Norwegian Met. Inst. Rep. 149.

Lamb, H.H., 1982: Climate, history and the modern world. Methuen & Co, London. Latif, M., E. Roeckner, U. Mikolajewicz and R. Voss, 2000: Tropical stabilization of the thermohaline circulation in a greenhouse warming simulation. J. Climate 13, 1809-1813.

Lean, J., J. Beer and R. Bradley, 1995: Reconstruction of solar irradiance since 1610: implications for climate change. Geophys. Res. Lett. 22, 3195-3198.

Lohmann, U., and J. Feichter, 1997: Impact of sulfate aerosols on albedo and lifetime of clouds: A sensitivity study with the ECHAM4 GCM. J. Geophys. Res. 102, 13685–13700.

Luterbacher, J., 2001: The Late Maunder Minimum. In: Jones, P.D., A.E.J. Ogilvie, T.D. Davies and K.R. Briffa (eds.): History and climate: Memories of the future? Kluwer Academic/Plenum Publishers, New York, Boston, Dordrecht, London, Mos-cow, 295 pp.

Luterbacher, J., E. Xoplaki, D. Dietrich, P.D. Jones, T.D. Davies, D. Portis, J.F. González-Rouco, H. von Storch, D. Gyalistras, C. Casty and H. Wanner, 2002: Extending North Atlantic Oscillation records back to 1500. Atm. Sci. Lett. 20, 114-124.

Luterbacher, J. D. Dietrich, E. Xoplaki, M. Grosjean and H. Wanner, 2004: European seasonal and annual temperature variability, trends and extremes since 1500. Science 303, 1499-1503.

Mann, M.E., R.S. Bradley and M.K. Hughes, 1999: Northern Hemisphere temperatures during the past millennium: Inferences, uncertainties and limitations. Geophys. Res. Lett. 26, 759-762.

Mann, M.E. and P.D. Jones, 2003: Global surface temperatures over the past two millennia. Geophys. Res. Lett. 30, 10.1029/2003GL017814.

Matthews, H.D., A.J. Weaver, M. Eby and K.J. Meissner, 2003: Radiative forcing of climate by historical land cover change. Geophys. Res. Lett. 30, 27-1 - 27-4.

Matthews, H.D., A.J. Weaver, K.J. Meissner, N.P. Gillett and M. Eby, 2004: Natural and anthropogenic climate change: incorporating historical land cover change, vegetation dynamics and the global carbon cycle. Clim. Dyn. 22, 461-479.

Nakicenovic, N. and 27 coauthors, 2000: IPCC special report on emissions scenarios. Cambridge University Press, Cambridge, UK and New York, NY, USA, 599 pp.

Oberhuber, J.M., 1993: Simulation of the Atlantic circulation with a coupled sea ice-mixed layer-isopycnal general circulation model. Part I: Model description. J. Phys. Oceanogr. 22, 808-829.

Rahmstorf, S. and A. Ganopolsky, 1999: Long-term global warming scenarios computed with an efficient coupled climate model. Clim. Change 43, 353-367.

Robertson, A., J. Overpeck, D. Rind, E. Mosley-Thompson, G. Zielinski, J. lean, D. Koch, J. Penner, I. Tegen and R. Healy, 2001: Hypothesized climate forcing time series for the last 500 years. J. Geophys. Res. 106, 14783-14803.

Robock, A., 1994: Review of the year without a summer. World climate in 1816. Clim. Change 26, 105-108.

Robock, A. and M.P. Free, 1995: Ice cores as an index of global volcanism from 1850 to the present. J. Geophys. Res. 100, 11549-11567.

Robock, A. and J. Mao, 1995: The volcanic signal in surface temperature observations. J. Climate 8, 1086-1103.

Roeckner E., L. Bengtsson, J. Feichter, J. Lelieveld and H. Rodhe, 1999: Transient climate change simulations with a coupled atmosphere-ocean GCM including the tropospheric sulfur cycle. J. Climate 12, 3004-3032.

Roelofs, G.-J., and J. Lelieveld, 1995: Distribution and budget of O3 in the troposphere calculated with a chemistry-general circulation model. J. Geophys. Res. 100, 20983–20998.

Shindell, D.T., G.A. Schmidt, M.E. Mann, D. Rind and A.

Waple, 2001a: Solar forcing of regional climate change during the Maunder Minimum. Science 294, 2149-2152.

Shindell, D.T. G.A. Schmidt, R.L. Miller and D. Rind, 2001b: Northern Hemisphere winter climate response to greenhouse gas, ozone, solar and volcanic forcing. J. Geophys. Res. 106, 7193-7210.

Stendel, M., T. Schmith, E. Roeckner and U. Cubasch, 2000: The climate of the 21st century: Transient simulations with a coupled atmosphere-ocean general circulation model. Danish Meteorological Institute Report 02-1, 51 pp.

Stendel, M., I.A. Mogensen and J.H. Christensen, 2004: Influence of various forcings on global climate in historical times using a coupled AOGCM. Submitted to Clim. Dyn.

von Storch, H., E. Zorita, J.M. Jones, Y. Dimitriev, F. González-Rouco and S.F.B. Tett, 2004: Reconstructing past climate from noisy data. Science 306, 679-682.

Stothers, R.B., 1984: The great Tambora eruption in 1815 and its aftermath. Science 224, 1191-1198.

Zorita, E. H. v. Storch, F.J. Gonzalez-Rouco, U. Cubasch, J. Luterbacher, S. Legutke, I. Fischer-Bruns and U. Schlese, 2004: Simulation of the climate of the last five centuries. Met. Z. 13, 271-289.

Dr. Martin Stendel
Danish Meteorological Institute
Lyngbyvej 100
2100 Copenhagen, Denmark
mas@dmi.dk

The NOAH's ARK Project

The Impact of Future Climate Change on Cultural Heritage

by Peter Brimblecombe

Since the poet Horace wrote of the blackening of temples in Roman times it has been clear, that air pollution damages our monumental heritage. The adoption of coal as a fuel led to increased concentrations of sulfur dioxide in urban atmospheres and from the 17th century there were complaints of the way this damaged stone buildings. The architect, Sir Christopher Wren claimed that the sulfate encrustations on London buildings were inches thick in places. By the 20th century there was a move away from coal towards liquid fuels in many cities. The attendant reduction in sulfur dioxide concentrations in urban air had the potential to reduce pollution damage from acid gases (Brimblecombe 2000), although the increasing carbon load in the atmosphere as a result of diesel soot now causes considerable damage (Fig. 1). Concern over the damage caused by elemental carbon was of prime interest to the European Commission supported project CARAMEL http://www.caramel.cnrs-gif.fr/ (see within Saiz-Jimenez 2004).

Current regulations such as the European Union's Air Quality Monitoring and Management Directive aim to reduce air pollution. Although this is done largely from a health perspective, there are doubtless benefits for building materials from the reduced pollution loads. Reduction in the damage from air pollutants and a decrease in some components within acid rain have meant that climate factors, which have hitherto been largely ignored may become more important determinants of building damage. This is not to say that the potential impacts of frost, rain or wind have not been appreciated, but the changing balance of these factors as a result of climate change have largely been ignored. Buildings have to survive centuries such that they will confront increasing changes in climate. Historic buildings were designed to confront climate very different from those in the future. Some of these problems have been of interest to the project Engineering Historic Futures (http://www.ucl.ac.uk/sustainableheritage/research/projects.htm#EHF) coordinated by the University College London's Centre for Sustainable Heritage. In this work, the difficulties in drying out historic fabric have been shown to be far more complex than modern buildings, which hints at the problems we could face in a world with increased risk of heavy rain and flooding.

Fig. 1 The Cathedral of St John in Norwich, typifies the blackening now characteristic of cities with high loads of particulate elemental carbon.

The European project NOAH's ARK (http://noahsark.isac.cnr.it/) aims to assess the overall risk posed to monumental heritage by climate change. The project title alludes to the biblical story regarding the protection of what we value in times of great climatic stress. The partnership engaged in this work is very broad, going beyond academic researchers to include practitioners and additionally the insurance industry, which has to confront the costs of climate in a very direct way. The research groups and their leaders have particular expertise in physical, chemical and biological impacts on cultural materials as seen from the list of partners below:

--Institute of Atmospheric Sciences and Climate National Research Council (ISAC-CNR), Cristina Sabbioni

--Centre for Sustainable Heritage University College London (UCL), May Cassar

--School Of Environmental Sciences University of East Anglia (UEA), Peter Brimblecombe

--Swedish Corrosion Institute (SCI), Johan Tidblad

--Institute of Catalysis and Surface Chemistry Polish Academy of Sciences (ICSC), Roman Kozlowski

--Institute of Theoretical and Applied Mechanics Academy of Sciences (ITAM), Milos F. Drdacky

--Institute of Natural Resources and AgrobiologyCouncil for Scienfic Research (IRNAS-CSIC), Cesareo Saiz-Jimenez

--Norwegian Institute for Air Research (NILU), Terje Grontoft

--Ecclesiastical Insurance Group (EIG), Ian Wainwright
--Biologia y Medio Ambiente (BMA), Xavier Arino Vila

Climate Parameters

The Intergovernmental Panel on Climate Change (ICPP) emissions scenarios, project the Earth's mean surface temperature to increase 1.4 to 5.8°C by the end of the 21st century, with land areas warming more than the oceans, and the high latitudes warming more than the tropics. In general, precipitation is projected to increase in high-latitude and equatorial areas. Regional climate models in their basic form give climate data such as temperature, wind and precipitation. Thus these conventional analyses do not focus on the particular meteorological parameters most relevant to damaging to cultural heritage. NOAH's ARK will address this gap in our understanding, by producing climate parameters with special relevance to built heritage. In the early months of the project we identified the following factors as important:

Increase of temperature. The influence of temperature on the deterioration process might be seen as relatively slight because it is hard to imagine just few degrees would lead to a significant change in the rate of deterioration of heritage. However, there are factors which serve to enhance the impact of slight changes. In the some metals a maximum followed by a decrease of the corrosion rate has been observed at about 9-11oC, where interactions with liquid water are important. The number of freeze-thaw cycles is especially sensitive to temperature and the likely reduction in freezing across much of Europe in the future will lower the potential for frost shattering of porous building stone.

Change of relative humidity/mositure. For most materials increases in relative humidity cause an increase in deterioration rate. This often comes about through prolonged times of wetness (especially for metals), higher deposition rates of pollutants and more favourable conditions for microbiological activities. Our early analysis hints at much drier mid-summers in central Europe in the future (Fig. 2), which may reduce damage to buildings. However, this may also be a problem because soils or unfired clay used in traditional construction techniques could dry out and crack. Furthermore, stone is especially vulnerable to damage from hygroscopic salts, when the humidity oscillates between high and low values. The stability of the historic buildings is closely tied to their interactions with the ground and the atmosphere. Historic buildings have a greater intimacy with the ground than modern ones. They are more porous and draw water from the ground into their structure and lose it to the environment by surface evaporation. Their wall surfaces and floors are points of exchange for these processes. Changes in soil moisture might result in greater salt mobilisation and consequent damaging crystallisation on decorated surfaces.

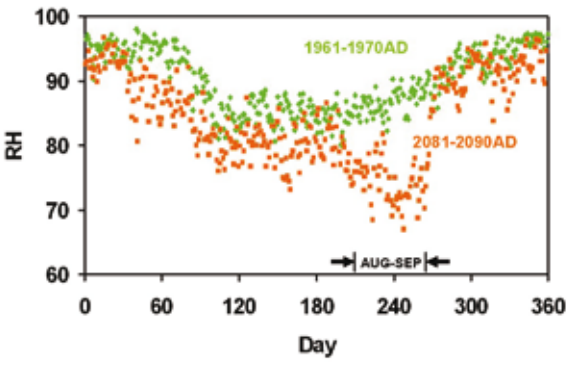


Fig. 2 Predicted seasonal humidity cycles for two different decades in Central Europe using the HadCM3a2 output. The figure illustrates the drier summers that may confront heritage at the end of the 21st century.

Change in wind velocity. An increase in wind velocity affects the deterioration of materials in several ways. Increased eddies and flows around historical buildings can alter the deposition rates of both gaseous and particulates pollutants and strengthen the effect of driving rain. A very serious effect may be the increased transport of sea salt inland which can substantially enlarge the areas along sea coasts affected by marine aerosols (Fig. 3). Changes in the intensity and direction of wind driven rain can alter the patterns of disfiguring soot deposits and make buildings less appealing because of rain streaking (Grossi and Brimblecombe 2004).

Fig. 3 The Cathedral of Oviedo, Spain in a clean near-coastal environment that may be at risk from wind-driven salt and rain in the future.

Change of precipitation. Increased precipitation can increase the damage caused by wet deposition by dissolution of surface layers of materials. Changes in the chemical composition, especially pH, can affect the deterioration rate of several materials. Many processes affecting the conservation of historic sites do not occur at regular intervals, but are concentrated in episodic outbursts related to the presence of extreme events, such as severe storms, carrying both water and dust. There are fears that the frequency of flooding events will increase in many areas of Europe. However, this has to be addressed on a river-by-river basis because of the considerable spatial variability of rainfall. Increased winter rainfall and storminess, particularly in exposed areas, is resulting in water-saturated building fabric. The problems are serious enough to worry the European Insurance Industry. Predicted future climate will be used to understand the pressures imposed by future flood risk. In particular the predicted rainfall can be used as an input to flood forecast models to understand the way in which the threat from floods will change in the future. This information gathered by NOAH's ARK will be useful for flood risk prediction at the sites during the 21st century, although such predictions will be beyond the scope of the present project.

Change of gaseous and particulate pollutants. Changes in levels of SO_2, NO_2, O_3, HNO_3, CO_2, VOC and both primary and secondary particulates can be of crucial importance for degradation of cultural heritage materials. Increased precipitation can exacerbate damage due to wet deposition through the

dissolution of surface layers. Changes in chemical composition of rain, especially pH, a function of long range pollutant transport, can affect the deterioration rates of external materials. The project will assess the changing balance of these processes across Europe.

Effects on biodeterioration. Climate change is also projected to affect individual organisms, populations, species distributions, and ecosystem composition and function both directly (e.g., through increases in temperature and changes in precipitation) and indirectly (e.g. through climate changing the intensity and frequency of disturbances such as wildfires). Time of wetness is a possible indicator of biological attack on organic materials. However, in the case of wood a pre-existing index, the Schefer index has been widely applied. This index represents the potential of fungal attack on wood. It relies on the need for monthly temperature to be greater than 2oC and that there should be more than three rain days per month. It suggests that temperature increases may enhance the rate of fungal attack in some parts of Europe.

Output

The project has excited considerable interest in the media. This has ranged from worries about the effect of increased rainfall on the traditional English pub with its thatching and wattle and daub walls, through to concerns on the impact on icons such as the Eiffel Tower or the Torre del Oro in Seville. However, these broader interests have presented us with some difficulties because this audience is confused that our work does not study individual monuments, but rather the pressures on European monumental heritage as a whole. Individual monuments are of course, exemplars of the processes that may be underway in the future, but these sites are not the focus of our study. The work within NOAH's ARK is more often couched in terms of materials and we are currently giving special emphasis to stone, brick and unfired materials, metals and wood.

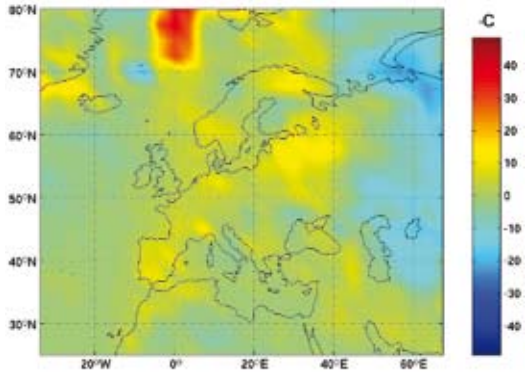


Fig. 4 A map of the changes in the spring temperature range between 1963 and 2012 from HadCM3a2 output. Buildings have to respond to temperature extremes and this is illustrated in terms of the range of spring temperatures (here the maximum and minimum experienced in the spring months). This output suggests that areas of the eastern Baltic and Spain show an increase in the spring temperature range. Difference maps for the planned Atlas will reflect changes in 30-year means, reducing the impact of year-to-year variation.

The project will produce European-wide scenario maps (Fig. 4) showing changes in relevant climate parameters into the 21st century. Ultimately we will be most interested in the climate in the near (2011-2030) and distant future (2070-2099) with respect to recent climate (1961-1990) as derived from model output (most typically HadCM3). We will use this climate information to estimate the potential for damage over these periods and provide this as electronic information sources and tools. Much of the output will be presented as web-based Climate Risk Maps and a Vulnerability Atlas. The Atlas will allow heritage managers to assess the threats of climate change to the built heritage and cultural landscapes under future climate scenarios and plan appropriate adaptation strategies. We also see the potential for our work to influence standards applied in construction and restoration work. On the simplest level one can imagine, for example, that conditions of greater rainfall intensity may necessitate increased size of pipes and guttering.

NOAH's ARK is in its first year so the most effort has focused on the relevant climate parameters and generating maps. This part of the work is almost complete, so the project will move to a more detailed analysis of the impact on climate change on materials in the summer of 2005.

References

Brimblecombe, P. (2000). "Air pollution and architecture: past, present and future." Journal of Architectural Conservation 5(2): 30-46.

Grossi, C. M. and P. Brimblecombe (2004). "Aesthetics of simulated soiling patterns on architecture." Environmental Science and Technology 38: 3971-3976.

Saiz-Jimenez, C., Ed. (2004). Air Pollution and Cultural Heritage. Leiden, Balkema.

Peter Brimblecombe
School of Environmental Sciences
University of East Anglia
Norwich NR4 7TJ, UK

GA²LEN

The European Community's network on allergies and asthma

by Anne Wilmes

GA²LEN, a major "Network of Excellence", has been selected for funding by the European Commission through the Sixth Framework Programme for Research. Its objectives are to establish an internationally competitive network, enhance the quality and relevance of research, and address all aspects of the disease with a view to reducing the burden of allergy and asthma throughout Europe.

WHY A NETWORK OF EXCELLENCE ON ALLERGY AND ASTHMA?

The health problem: Allergy, such as allergic rhinitis (hay fever), asthma and eczema, is already the most common chronic disease in Europe and its prevalence is growing. Up to one child in four is affected, and one in third in some parts of Europe. The prevalence is higher in Western Europe. Among 13-14 year-olds, rates vary between 32.2% in the UK and 2.6% in Albania, according to the International Study of Asthma and Allergies in Childhood, 1998 (see chart).

By 2015, half of all Europeans may be suffering from an allergy. Some food allergies, bee and wasp stings and asthma may be fatal; others seriously compromise the quality of life. More than 35% of sufferers are unable to go to restaurants or into an environment containing allergens, such as perfumes, animal fur, fumes from cleaning products or cigarette smoke. Over 70% of allergy patients say they feel limited in their daily activities.

Costs to society: Asthma is the main reason why children miss school and the leading cause of hospitalisation of children worldwide. Eighty million adults in Europe are affected by allergies, including asthma. Of these, 80% use medication. Asthma alone is responsible for an estimated nine billion work days lost in the European Union, according to the European Federation of Allergy and Airways Diseases Associations (EFA), a patients' organization and one of the GA²LEN partners.

The research challenge: Scientists are convinced that the number of people with atopy, that is persons who have a tendency to produce IgE antibodies in response to various environmental antigens and who exhibit strong immediate hypersensitivity response, is increasing but they do not know why. Most believe that aspects of the "western lifestyle", such as diet or hygiene, may be to blame. The theory gained credence during the period of Germany reunification when a huge change towards the western style of living in the former East Germany was associated with a significant increase in the prevalence of allergy sensitivity.

As well as identifying the cause of the increasing prevalence, another challenge is to define the exact mechanisms causing allergic symptoms. Only two-thirds of subjects with allergen specific IgE develop symptoms. Another question is why do some allergies worsen while others disappear. About 30% of patients with allergic rhinitis (hay fever) also develop asthma. Too little is known about this progression, known as the allergy "march".

During the past 10 years, some former assumptions about allergy have been refuted. For example, until very recently it was thought that those with a predisposition to cat allergy should avoid any contact. However, a recent study in Virginia, US, has shown that children born into homes with a cat have fewer allergies than those born into a home with no cat. Another assumption that has been contested is the significance of the role of outdoor pollution, including from diesel fumes and industrial emissions. For a while, it was believed to be crucial in the increasing prevalence of asthma and allergy in Western Europe. Although it is still considered important, recent Europe-wide studies show that allergic diseases are less frequent in eastern parts of Europe, where levels of outdoor air pollution are often higher. This has cast doubts on the extent of the contribution of outdoor pollution.

The network approach: Europe has produced some of the most important recent findings on allergy and asthma, but research tends to be fragmented in different institutes, and even departments of the same institution. Findings are not always shared nor rapidly translated into changes in practice. A "network of excellence" can help strengthen the impact of Europe's research by stimulating interaction between different teams and by communicating information beyond the research community to doctors, patients, policy makers and industry.

WHAT THE NETWORK AIMS TO DO

GA²LEN brings together 25 research institutes, university departments and hospitals in 16 European Union countries plus Switzerland, Norway, and Poland. A further two partners are the European Academy of Allergology and Clinical Immunology (EAACI), a scientific organisation, and the European Federation of Allergy and Asthma Associations (EFA), a patients' organisation. A communication consultancy and an elec-

tronic communications company are included in the network. (A full list is available at the end of this paper.) The project is co-ordinated by Professor Paul van Cauwenberge, Dean of the Medical Faculty, University of Ghent, Belgium.

Activities comprise three main strands. An internal communication programme, a series of joint research projects on issues identified as being of major importance to the prevention and management of allergies and asthma, and an external communication to share important findings with professionals, the public, policy makers and industry.

The internal communication programme will bring together all useful existing knowledge and information held by the different partners and make it available to the entire network. Planned activities include the development of a "GA²LEN yellow pages", electronic systems to help co-ordinate the research teams working on different themes, assistance in relation to research tools, databases, advice on gender issues, ethics or intellectual property rights, and support for quality management and exchanges of researchers and other personnel.

The joint research projects will address nine key themes outlined below. Each research team will be co-ordinated by one of the 25 research partners.

Every team will specifically address two different periods of early life: foetal exposure during pregnancy, and early exposure to environmental factors; and, two different stages in the development of allergic diseases and asthma: the development of symptoms from allergen sensitivity, and the persistence or worsening of allergy problems in childhood and later life.

The different research teams will benefit from databases of birth cohorts and population-based studies, gene banks and clinical networks.

The nine research programmes are as follows:

Nutrition

Co-ordination centre: University of Southampton, UK

Some foods, such as peanuts and seafood, cause serious and sometimes fatal allergic reactions. The European Community has made good progress in standardising the labelling of foods containing peanuts and other allergens. But more scientific information is needed on the relationship between diet and the prevention and treatment of allergies.

One of the priorities of the research programme is to assess the significance of food in the incidence and prevalence of asthma and allergy. Representatives of the nutrition work group are specialists in food safety, food allergy, and nutrition. Team members located in different centres will review existing research, explore epidemiological patterns of allergy among the diverse diets of different areas of Europe, and investigate whether changes in the diet could be effective in preventing the development of allergic diseases.

The role of infections

Co-ordination centre: Ludwig Maximilians Universitat Munchen, Germany

European researchers were the first to demonstrate the link between exposure to infections and a reduced risk of allergy. Since then, studies have consistently confirmed that children raised on farms or who are infected with parasitic worms (helminths) are less likely to suffer from hay fever, asthma and eczema than other children. The findings provide support for the so-called "hygiene hypothesis" in which the contemporary life style is blamed for rapidly rising prevalence of allergy in Western Europe. Most scientists believe that modern living with its diet of semi-sterile food encourages the human immune system to become lazy; instead of fighting against infections, it deviates towards the unwelcome production of allergies.

The infections research group will focus on the interaction of susceptible genes and the environment in the development of allergy and asthma. The aim is to identify genes that have an innate immune response to allergens. The information could lead to new treatments, and to recommendations on dietary changes to reduce the burden of these conditions in different parts of Europe.

Air pollution

Co-ordination centre: University of Utrecht, The Netherlands

The investigation by this research group will mainly focus on indoor air pollution. Outdoor air pollution is relatively well documented and its role alone is not enough to fully explain the increased prevalence in allergy and asthma that has occurred over the last few decades in Western Europe.

Sources of indoor air pollution include tobacco smoke, dust mites, animal "dander" (the skin shed from furry pets), and moulds and fungi associated with damp indoor walls. The research team will apply newly developed estimation methods to assess interactions between different indoor factors and between indoor and outdoor pollutants. Valuable comparisons should be made possible, particularly given the diverse geographical and climatic coverage of the network. The ultimate objectives include the production of recommendations on reducing the adverse effects of indoor pollution.

Occupation

Co-ordination centre: Institut Municipal Investigacio Medica (IMAS), Barcelona, Spain

Recent studies in Europe have identified relatively high rates of asthma, or asthma-like symptoms, in office workers. The European Community Respiratory Health Survey (ECRHS) identified moulds, passive smoking, use of self-copying paper, and newly painted surfaces as contributory causes for symptoms among white collar employees. Cleaning workers are at even greater risk of occupational asthma. A study in Spain suggested that degreasing sprays and household bleach may be important contributors. However, evidence on occupational causes is limited and is not well documented.

The risk associated with office work is of particular concern because it is likely to present a particular problem for the next generation, who have a high prevalence of allergies. The research group addressing occupational factors in allergies and asthma will measure the effects of occupational exposures in non-industrial indoor environments associated with asthma, including cleaning activities and products.

Gender

Co-ordination centre: INSERM, Paris, France

Although boys are more likely to suffer from asthma than girls in infancy, by adolescence asthma is more common in young women than young men. Current research suggests that women's breathing is relatively more adversely affected by smoking and air pollution, though it is unclear why.

Gender differences also exist in relation to medical care. Women are more likely to report symptoms than men, and health professionals are likely to treat women differently from men even when they present with similar symptoms.

The network's gender research team will gather data on gender differences in the incidence and prevalence of allergies and asthma and identify differences in exposure and vulnerability. The group will analyse hormonal and biological factors that may play a role in gender differences. It will also review the management of conditions across gender, different age groups and populations. On the basis of the findings, recommendations will be made to those involved in medical education on allergy and health promotion.

The GA²LEN project incorporates a "Gender Plan". Its objective is to stimulate gender issues in research and to encourage women to fully participate in project management, scientific teams, and the exchange programmes. New professorships will be created specifically for women.

IgE sensitisation

Co-ordination centre: INSERM, Paris, France

Allergy testing is helpful in identifying the cause of some reactions. Simple, skin prick tests can identify either the source or signs of a predisposition to allergic diseases in the form of allergen-specific IgE. But the tests cannot detect food allergies and are unable to predict whether the presence of antibodies will cause symptoms, or lead to the development of asthma.

Nor can the skin prick tests be used on babies. Protection in early in life rests on breastfeeding, which may delay the onset of allergy, and, when weaning begins, the introduction of new foods one by one to help identify allergies.

The "IgE sensitisation and allergic diseases" research team will investigate factors associated with the absence of symptoms in those testing positive for an allergy to dust mites, cat dander and grass pollens. To achieve this, the network as a whole will be involved in blood sampling followed by co-ordinated testing and analysis by the co-ordinating team. The ultimate aim is a better understanding of the protective, or "negative regulation", factors that prevent symptoms developing. The findings may be used to help develop new treatments, and tests that can predict whether symptoms will occur.

Airway remodelling

Co-ordination centre: University of Palermo, Italy

Childhood asthma causes inflammation that may be associated with "remodelling", or changes in the structure and function of the airways. Scientists believe that an analysis of the affected tissue may help identify significant cell characteristics as a basis for developing preventive treatments. The GA²LEN project makes this investigation possible because the network links doctors and surgeons, who have access to relevant tissue samples, with molecular and cell biologists and geneticists.

Clinical care and quality of life

Co-ordination centre: Karolinska Institute, Stockholm, Sweden

Very wide variations exist in allergy practice in different parts of Europe. For example, while specialist allergy care is widely available in Germany, similar services exist in only a handful of centres in the U.K. The differences may be primarily the result of countries' differing priorities and resources. However, a lack of guidelines about patient management and support, or poor implementation of existing guidelines, may also play a significant role in the qualitative differences in the services available.

The research team addressing clinical care and quality of life will review current practice, including variations in the recording of data, gaps in knowledge in relation to patient care, and so on. The information will be shared with network partners and with new partners. All partners will be encouraged to develop research programmes aimed at building evidence of excellence in patient management.

Genetics

Co-ordination centre: INSERM, Paris, France

The team working on genetics will look at interactions between the genes and the environment relevant to the research programmes on nutrition, infection and environment. This will involve genetics, studies addressing full DNA sequences (genomics), and investigations made possible following the completion of the human and other genomes (post-genomics). One of the first tasks is to establish the ground rules for building a gene bank, and the feasibility of a virtual DNA bank allowing immediate access to partners.

One of the hypotheses that will be tested by this group is whether "windows of exposure" exist that allow environmental influences to affect a particular genetic make-up differently at different life stages.

The external communication programme will disseminate knowledge and information to several groups beyond the network. They include the medical profession through education, training and evidence-based guidelines; scientists through publications; the public, patients and policy makers through articles and advice; and, industry through the development of partnerships.

The direct chain created between the research community and the community of medical professionals, patients and policy makers in Europe will help to harmonise research with the management of different conditions throughout the region. Partnerships with industry will hasten the translation of research into treatments and safer products. In particular, links between the network and companies will provide opportunities for the more rapid completion of clinical trials.

Communication beyond the network with be greatly assisted by two non-research partners.

The European Academy of Allergology and Clinical Immunology (EAACI) is a non-profit scientific society dedicated to the promotion of research and education in allergy and clinical immunology. It brings together 38 national societies and 4,000 active members who are academicians, researchers and clinicians. EAACI aims to promote research in allergy, disseminate relevant scientific information and support training and continuous education.

The European Federation of Allergy and Asthma Associations (EFA) is an alliance of 35 allergy, asthma and COPD (Chronic Obstructive Pulmonary Disease) associations in 19 European countries. It provides "the patients' voice" by calling for awareness and prevention and providing handbooks for policy makers at all levels. EFA works closely with the World Health Organization, the European Union and national govern-

ments. Following a European Commission-funded project on indoor air pollution in schools, EFA provided European recommendations on clean air in schools, an environment in which children spend a large proportion of their time.

WHAT MIGHT BE ACHIEVED?

Understanding the causes

A better understanding of the causes, or combinations of causes, of allergy and asthma will allow valuable and honest advice to policy makers. Although the basic mechanism may turn out to be the lack of exposure to infections in modern life, other specific substances that are highly allergic will be identified as additional important factors.

Environmental factors

Information about environmental exposures may be decisive in preventing prevalence from increasing in Western Europe, and in dampening the emergence of allergies in other areas of Europe and the rest of the world. For example, diesel particles are already known to facilitate sensitisation to allergens. The network may provide policy makers with more accurate information on significant combinations of outdoor and indoor exposure, including indoor allergens, such as humidifiers, cleaning products and passive smoking.

Age-related vulnerabilities

The research is likely to improve understanding of special human vulnerabilities at different stages in life. For example, it may contribute to more concrete advice on how expectant mothers can help protect their unborn child from developing allergies. It may refine guidelines for schools and office managers on what constitutes a healthy indoor environment.

"Tear drop" diagnostic tests

A very important technological breakthrough is likely to be a cheap, easy-to-use screening technique, appropriate for use in young children. A reliable test for food allergies would be particularly significant for all age groups. At the moment, it can take six months to get a good diagnosis with the help of elimination diets and then adding foods again to see if symptoms reappear.

GA²LEN co-ordinator, Professor Paul van Cauwenberge says: "I am pretty confident that a simple test – perhaps on a single tear drop or some saliva – will be developed in the five year project period. With it, we will be able to say to what we are allergic and to what extent."

Better treatments

A highly trustworthy diagnosis will lead to marked improvements in treatment. Currently, there is no way of knowing which of the array of treatments are likely to work in any given patient. Tests that can identify biomarkers for certain receptors or cells can be linked to the prognosis of treatment.

Understanding more about protective factors, such as infections or particular genes, will stimulate the development of new treatments. For example, vaccines may be developed that artificially stimulate the natural immunity created by some infections.

Changing attitudes and quality of care

Finally, GA²LEN's work will lead to a change in attitudes towards allergies, and more and better quality services. Allergy knowledge will increase with more doctors will be trained in allergy as a result of the network's activities. More information will be published in the mass and specialist media.

More knowledge will ensure that no one continues to believe that the perception of an increase in allergies is merely a matter of better reporting. The number of positives in skin prick tests today compared with the same allergens in blood tested 30 years ago has increased dramatically. While it is true that better awareness of allergy has occurred, there is also a real increase in allergy.

NOTES AND REFERENCES

1. GA²LEN is an acronym for Global Allergy and Asthma European Network. The name commemorates Galenus, a Roman physician who was the first to provide a written description of the relationship between the nose and the lungs.

2. An allergy is a disorder in which the body becomes hypersensitive to particular substances, called allergens. The allergens provoke characteristic symptoms whenever they are subsequently inhaled, ingested, injected or otherwise contacted.

3. The European Commission has short listed GA²LEN for funding through the Sixth Framework Programme for Research (2002-2006), Priority 5, Food Quality and Safety, to cover a period of five years. The total project budget is 14.4 million Euros.

4. Figures on incidence, prevalence and costs of allergies and asthma are taken from the "EFA fact sheet on allergy, asthma and COPD", April 2003.

Prevalence of wheezing in children aged 13-14 years: Figures are based on the self-reported asthma symptoms during a 12-month period of children responding to written questionnaires in the ISAAC study,1995-96.

	Percentage
United Kingdom	32.2
Ireland	29.1
Malta	16.0
Finland	16.0
Germany	13.8
France	13.5
Sweden	12.9
Belgium	12.0
Austria	11.6
Estonia	10.8
Spain	10.3
Portugal	9.5
Uzbekistan	9.2
Italy	8.9
Latvia	8.4
Poland	8.1
Russian Federation	4.4
Greece	3.7
Georgia	3.6
Romania	3.0
Albania	2.6

Source: Children's health and environment: A review of evi*dence, WHO Regional Office for Europe and European Environment Agency, in a chart based on figures from ISAAC Steering Committee, 1998.*

GA²LEN's first annual conference

The Conference of the flagship European Network on Allergy and Asthma, GA²LEN, will take place on Tuesday 19 April at 10.00 am at Holiday Inn, Ghent Expo, Belgium. Press lunch at 12H30.

Allergy increases blamed on environmental changes

Research into why half of all Europeans will have developed allergies by 2020 is focussing on environmental factors, such as air pollution and food quality.

"The reasons for the rise in allergies and asthma remain unclear but epidemiological evidence indicates that this rise has been driven by changes in the social and physical environment," according to Professor Paul van Cauwenberge, Coordinator of GA²LEN (Global Allergy and Asthma European Network), an EU-funded initiative aimed at mobilising the entire European research community to work together on this growing public health problem.

Speaking at GA²LEN's first annual meeting (18-19 April 2005), he reminds the audience that the past 40 years have witnessed a dramatic increase in the prevalence of allergic diseases and asthma. "Over 50% of the population of Europe is likely to be allergic within the next 10-15 years," he says. The increases will not only take place in Western Europe but also in poorer countries. "Environmental factors play an important role in altering host resistance to respiratory diseases in childhood. It is likely that the accession of a number of former Soviet Union countries to the European Union will be accompanied by changes in the patterns of disease among children in those countries."

Professor van Cauwenberge believes that at the end of its first year the GA²LEN "network of excellence" is already on track to create a structure that will maximise Europe's scientific contribution to controlling allergy and asthma. European Commissioner for Science and Research, Janez Potocnik is demonstrating his interest in GA²LEN's work through his participation in the meeting in Ghent. He explains that allergy and asthma are an important part of European Research on health-related research in his presentation entitled: "Allergy within the European Research Programme."

Professor Peter Burney from King's College London, one of the centres involved in GA²LEN, describes three areas of environmental research being undertaken by the network. One is the influence of indoor and outdoor air pollution on allergic and asthmatic patients. He says that this is "already an area of excellence in European research." He believes that new findings will provide an important basis for developments in "evidence-based" policy.

A second important area of research to be highlighted is occupational hazards, including the exposure of office workers and health care personnel to cleaning agents. A review of the effects of cleaning products on the development of asthma has just been completed and will be published shortly.

A third subject of environmental research is the quality and safety of food. The quality of European food is recognised to be deteriorating. "This is a known contributor to asthma," Professor Burney says. GA²LEN research is concentrating on which aspects of the changing diet is associated with the observed increases in allergies.

The joint research programme to be implemented throughout the network will address issues in relation to their effect in different life stages and steps in disease progression. One of the most promising research areas to be described at the meeting is the work on the exposure to infections in early life. Professor Erika von Mutius from the University Children's Hospital Munich, Germany, describes how increased exposure to infections leads to protective effects on asthma and wheeze. Her paper reports that children growing up on dairy farms have a significantly lower prevalence of allergic diseases, with the exception of eczema and positive allergy tests. "Contact with stables and barns and the consumption of non-pasteurised milk was found to explain much of the relationship between farming and allergies." The timing of farm exposure is crucial to the protective effect. Children need to be exposed in the first year of life, and mothers should ideally have exposure to farm animals during pregnancy and lactation.

Pooling excellence

Professor Paul van Cauwenberge believes that GA²LEN affords the best way to tackle the growing menace of allergies and asthma. He says: "Despite many collaborative projects, such as the European Community Respiratory Health Survey (ECRHS) and the International Study of Asthma and Allergy in Childhood (ISAAC), significant weaknesses continue to exist in the European research community. GA²LEN, which is built on the European Commission's concept of a "Network of Excellence", brings together 25 leading European research centres to jointly address these shortcomings."

First, GA²LEN ensures that research teams can take advantage of epidemiological data from countries with different prevalence rates and different environmental conditions. "The variability of environmental exposure and the sharp contrast in prevalence make international cooperation vital and Europe an ideal community laboratory," Professor van Cauwenberge says. He points out that the prevalence of asthma and allergies among teenage children varies from 32% in the UK to just 2.6% in Albania. GA²LEN's first year of activity has provided partners with numerous opportunities to exchange during symposia and meetings, as well as via a regular newsletter and intranet communication within a new website, and during two summer schools.

A second way in which GA²LEN is helping to overcome the European research community's limitations is through the recent establishment of a research platform that will help standardise methods for epidemiological surveys, common basic research and clinical trials. Once fully established, the results of studies in different European countries will become more fully comparable. All new and ongoing research projects also benefit from the support of specialist sections within the network dealing with gender, ethics and the role of intellectual property rights in patent and product development.

Non-research partners

Another important contributor to the likely future success of GA²LEN is the membership of two key organisations outside the research community. These two bodies can help GA²LEN hasten the process of translating research findings into clinical practice. One is the professional association of allergy experts, known as European Academy of Allergology and Clinical Immunology (EAACI). Its president, Ulrich Wahn is keenly involved in disseminating recent research findings to his several thousand members throughout Europe. He describes some promising approaches on how to help patients avoid provoking allergy symptoms.

Patients as well as medical experts should be provided

with practical updates on research findings if rapid changes in clinical management are to be achieved. The network helps to ensure information is disseminated to patients via the membership of the European Federation of Allergy and Airways Diseases Patients Associations (EFA). EFA represents 35 patients' associations in 20 countries and a total of 400,000 patients. Susanna Palkonen of the EFA Brussels office tells the meeting that GA²LEN fits perfectly into the EFA's mission of "improving the health-related quality of life of patients with these diseases in Europe."

The first 12 months of GA²LEN's life has produced concrete developments, including a research platform, several opportunities for partners to meet, the launch of a website and intranet, and a summer school programme. Little wonder then that the first annual report concludes: "GA²LEN is on track to create a permanent and durable structure that will maximise Europe's scientific contribution in the area of allergy and asthma."

More info is available at www.ga2len.net

GA²LEN Partners

27 Partners are involved in GA2LEN, including Universities, Institutes, Medical centres, Hospitals, the European Academy of Allergology and Clinical Immunology (EAACI), the European Federation of Allergy and Asthma Patients Associations and the Italian CNR.

Anne Wilmes
GA²LEN Communication Centre
Avenue Louise, 327 BP6
B-1050 Brussels
Tel:+32 (0)2 640 77 80
Fax:+32 (0)2 647 89 29
Mobile:0475 48 89 85

Low temperatures
in the Arctic stratosphere have led to severe ozone loss during the spring of 2005

by the SCOUT project office

25 April 2005.- The chemical balance in the stratosphere has changed significantly due to the presence of PSC clouds, altering the breakdown products from man-made CFCs (chlorofluorocarbons) so that rapid chemical ozone destruction can occur in the presence of sunlight. The cold conditions affected the distribution of nitrogen oxides, allowing ozone loss to continue longer than usual.

A beautiful photo of mother-of-pearl stratospheric clouds. Photo: Geir Braathen, Norwegian Institute for Air Research.

The first signs of ozone loss were reported in a press release issued by the SCOUT-O3 project and the European Commission on 28 January 2005. As sunlight returned to northern latitudes the rate of ozone depletion increased and rapid destruction of ozone occurred throughout February and March. In the altitude range where the ozone layer usually reaches its maximum concentration, more than half of the ozone was lost. “Overall, about 30% of the ozone layer was destroyed” says Markus Rex, an ozone scientist from the Alfred Wegener Institute in Potsdam, Germany. “This largely prevented the normal seasonal increase of the thickness of the ozone layer during winter and led to a thinner ozone layer in Arctic spring compared to warmer years” continues Rex.

The overall degree of ozone loss this year was of similar magnitude as the record loss that was observed in the Arctic during the winter of 1999/2000. During late March the Arctic air masses drifted over central Europe, which, in combination with unrelated dynamical effects, led to individual days of significantly increased UV-B radiation and sunburn risk in parts of Europe. The affected region reached as far south as northern Italy.

Emissions of ozone depleting substances are now largely

banned worldwide by the Montreal protocol. As a first success of this milestone of international cooperation in environmental policies the atmospheric concentrations of CFCs started to decrease. But the atmospheric lifetime of these compounds is extremely long and the concentrations will remain at dangerously high levels for another half century.

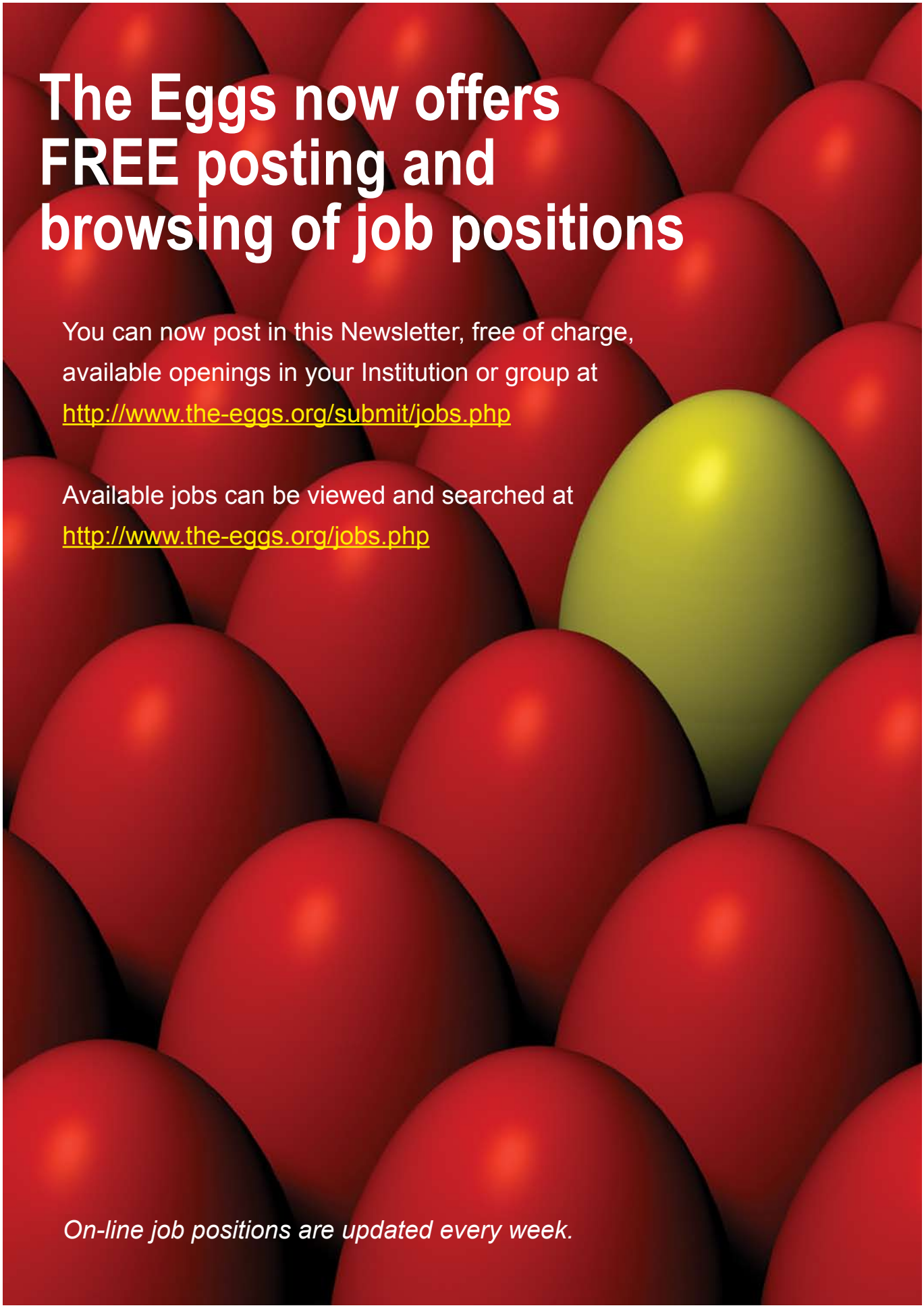
Over the next few decades the fate of the Arctic ozone layer will mainly depend on the evolution of atmospheric temperatures at the altitude of the ozone layer. Over the past forty years the conditions there have become significantly colder. "The cooling was particularly pronounced for the cold Arctic winters. Unfortunately these are the winters that result in large ozone losses. In 2005 the average extent of conditions cold enough for the existence of polar stratospheric clouds was four times larger than ever observed in the sixties or early seventies of the past century" says Georg Hansen, an ozone scientist from the Norwegian Institute for Air Research. This continuous cooling trend is qualitatively consistent with what would be expected as a result of increasing concentrations of greenhouse gases in the atmosphere. However, the coupling processes between climate change and temperatures in the polar ozone layer are complicated by feedback processes that are currently not sufficiently understood to make reliable predictions for the future.

Scientists from the EU SCOUT-O3 Integrated Project have been studying the links between stratospheric ozone and climate change in the Arctic since May 2004. The project is co-ordinated at the University of Cambridge's Department of Chemistry and has 59 partner institutions with over 200 scientists involved from 19 countries. "Our aim is to improve the predictions of future ozone and other stratospheric changes as well as the associated UV and climate impact" says Neil Harris from the University of Cambridge, one of the coordinators of the project.

"Within SCOUT-O3 we have followed the meteorological conditions in the Arctic closely and a suite of atmospheric observations and model calculations were triggered on a very short notice," says Florence Goutail, an ozone expert from CNRS.

The Arctic ozonesonde station network started a campaign of coordinated measurements to monitor the chemical ozone destruction. Groundbased instruments, belonging to the Network for the Detection of Stratospheric Change, deployed throughout the Arctic region, have followed the evolution of the ozone layer. ESA carried out additional measurements of the chemical composition of air in the Arctic ozone layer with the ENVISAT research satellite. The high flying research aircraft Geophysica made a deployment deep into Arctic air masses resulting in additional in-situ observations of key species. Preliminary results from all these studies have been presented at the European Geophysical Union meeting in Vienna this April.

Mother-of-pearl clouds represent a special type of polar stratospheric clouds. In this photo we see such clouds above southern Norway at sunrise on 5 January 2005. Mother-of-pearl clouds show up in the stratosphere, about 20-25 km above the ground, in lee-waves that form when strong westerly winds blow over a mountain range. The colours are caused by diffraction around the ice particles that these clouds consist of (the so-called halo effect). Despite their beauty they forebode ozone destruction through conversion of passive halogen compounds into active species that destroy ozone. Photo: Geir Braathen, Norwegian Institute for Air Research.



The Eggs now offers FREE posting and browsing of job positions

You can now post in this Newsletter, free of charge, available openings in your Institution or group at http://www.the-eggs.org/submit/jobs.php

Available jobs can be viewed and searched at http://www.the-eggs.org/jobs.php

On-line job positions are updated every week.

Journal of Geoscience Education

The Journal of Geoscience Education serves as the only international forum for the publication of research concerning the pedagogy, assessment, and philosophy of teaching and learning about the geosciences.

The Journal of Geoscience Education is the publication of record for NAGT (the National Association of Geoscience Teachers- U.S.A.), and serves as the only international forum for the publication of research concerning the pedagogy, assessment, and philosophy of teaching and learning about the geosciences.

The Journal is a source for innovations in geoscience teaching. Each volume of the Journal is published in five issues and runs to a total length of some 600 or 700 pages. The editorial review board consists of the editor and 11 associate editors. Each manuscript submitted to the Journal is subject to a standard review process consisting of two external peer reviews, a review by the associate editor assigned to the manuscript, and a review summary and editorial decision by the editor. Each issue typically consists of between six and 10 research papers as well as recurring columns on educational research, mathematical geology, precollege education, and common geological misconceptions.

All issues can be accessed at http://www.nagt.org/nagt/jge/index.html

Europe of Knowledge 2020: A Vision for University-Based Research and Innovation

The recently published proceedings of a very large conference on the future of University-based research in Europe draw a set of interesting conclusions and policy recommendations

June 16, 2005.- Close to 1000 policy-makers, researchers and academic leaders gathered in Liege, Belgium, 25-28 April 2004, to discuss the future of Europe's university-based research. The conference, organised by the European Commission, DG Research, Directorate for Science and Society, was inspired by the high response from stakeholders to the EC Communication on "The Role of Universities in the Europe of Knowledge" published in February 2003. The EC was eager to put the communication and responses in the broader perspective of the future of European research towards 2020, i.e. beyond the objectives of the Bologna and Lisbon/Barcelona agenda.

This large scale conference has yielded an amount of good ideas for potentially effective instruments and policy recommendations to be considered. These recommendations relate to the issues of knowledge production, the relation between higher education and research, funding, relations between universities and the regions, university governance, research training, achieving excellence and the inclusion of new Member States.

The main **CONCLUSIONS** of the conference, as outlined in the Proceedings follow:

"Excellence and competitiveness of research, the re-invigoration of basic research and its engagement with industry and society are crucial to the future vitality of Europe. Europe's universities are important engines in developing our research potential.

The variety of institutions in Europe needs to be maintained.

The universities of Europe, a total of some 3,800 higher education institutions, are marked by great variety. The character of our institutions depends primarily on the intensity at which these institutions carry out their main three functions in society, namely research, teaching and knowledge transfer in the form of innovation. Some 300 of these institutions are research-heavy with a significant research capacity. The largest part of Europe's higher education institutions are devoted to both research and teaching of university students. There is a third type of institutions that place great effort on innovation with strong ties to local and regional companies. The Conference recognised the importance of such a variety of institutions.

At the same time, participants underlined the need for specialisation. If Europe wants to be competitive on a worldwide scale, higher education institutions will need to achieve excellence in certain domains. At the same time, in order to make a fundamental difference, the majority of institutions would need to aim at improving the quality of their research and teaching performance. Not all institutions can be excellent at everything they do, which is why they need to make choices.

This is why Europe's universities are invited to use their margins for manoeuvre to redefine their missions, their institutional strategies as well as corresponding managerial instruments. It was concluded that they would have to make a decision on their aims for the future. One of the possible choices discussed at the conference was to "ride the wave" with the aim to gradually push an institution up to the top league of global players. Another scenario called "second renaissance" scenario would recognise the value of each institution at each step of the game, the global league players as much as the local league, or the first national or the European league.

However, it was clearly said that these choices are hard to make under the current circumstances. Too often are the hands of heads of higher education institutions tied by public funding constraints, restrictive national labour laws, and challenges arising from obtaining private financing at the cost of

academic freedom.

Clarity of objectives and sub goals

The objectives formulated in Lisbon and Barcelona as well as in the "Bologna Process" in the past years are generally clear. From these objectives it is also clear which sub goals should be achieved, although prioritisation of sub goals seems to be difficult. In fact, all the parallel sessions of this conference more or less reflect a set of sub goals:

* Improving the relationship between higher education and industry;

* Coping with new demands for research training;

* Structuring and maintaining the relationships with the region;

* Enhancing internationally competitive research.

As such the conference yielded much consensus. At the same time, most participants agreed that still many steps were needed to reach these objectives.

There was general consensus on a number of instruments.

Also on the positive side, important stakeholders seemed to endorse a number of actual instruments:

* The idea of the European Research Council, with specific tasks to increase competitiveness and promote excellence (although there were warnings not to see the ERC as the cure for all pains);

* The Marie Curie Programme, boosting mobility, training and career development of researchers;

* And, many initiatives at the national level. Without mentioning them specifically, many speakers have addressed adequate instruments that either potentially or in effect could contribute to achieving the above-mentioned goals.

Of course, and maybe needless to say, targeted policy evaluations should make clear whether European and national instruments indeed yield what they intend to achieve.

Some preconditions need to be fulfilled.

At the same time, general consensus stands out on some of the conditions necessary to achieve the objectives:

* Respecting the diversity of missions of universities (international, national, regional; research, teaching, research and teaching, service to the community). It should be stressed that during the conference we particularly focused on only a part of the landscape: those universities heavily involved in basic research. However, Europe possesses a great number of other higher education institutions fulfilling important other roles. In the context of this varied landscape, a general finding was also that rankings were not (yet) accepted throughout the community. It would be interesting however, to discuss whether developing classifications of higher education institutions would be a step forward to increase transparency across Europe;

* Related to this: a need for autonomous universities with strong management;

* It has been stressed time and again during the conference that it is impossible to reach the objectives (more, better, larger) if financial support is lacking or lagging. The focus not only should be on the 3% benchmark solely, but also on important facets of funding, such as the need to step away from matching and to move towards funding models based on covering both the full economic costs of research and taking into account the necessary financial support to build and maintain an adequate infrastructure. A second facet is to invest in people, particularly young researchers and to focus on career development. Maybe this is not so much an issue of financial investment, but of a necessary change in culture.

* In many cases it was clear which activities to pursue in the near future. For other case it was less clear. There was not yet consensus on the next steps, for the simple reason that we have not yet sufficient knowledge on these issues. Consensus could be reached on the conclusion that we need a (policy) research agenda on higher education and research.

The way ahead for non-controversial issues

For a number of issues the roadmap seems relatively obvious. With the risk of oversimplification, the main issue is to take care that good practices are communicated and disseminated. That does not imply that good examples should be copied without further ado, but carefully analysed and transposed into other context. With respect to the use of models, there was general consensus that Europe should find its way forward on the basis of its own strengths and should not copy the US model. Learning yes, blind imitation no. If there is a need to look for example, not only the US should be considered; there may be interesting examples from China, Southeast Asia and Latin America.

The available knowledge on the topics discussed at the conference, e.g. universityindustry relationships; the proper interrelationships between university and the region, certainly needs to be broadened, but there seem to be sufficient concrete models and experiences to continue the dissemination of good practices. In the meantime, researchers should continue to refine models.

Dilemmas, tensions, paradoxes

Throughout the conference and either implicitly or explicitly in the documents that have been prepared for the conference there are also a number of dilemmas, tensions and paradoxes. These are of such a nature that they cannot always easily be solved. It is important to be constantly aware of these dilemmas, for they will to a considerable extent determine the pace and direction of change. The following dilemmas serve as examples. For each of these dilemmas balanced solutions should be found:

* There is a call for more institutional autonomy and more strategic leeway for the universities and the management of the universities should be professionalized (e.g. universities should learn to market their strengths). At the same time it is stressed that governments should pick up challenges and that supranational agencies should develop policies and instruments to bring about change: the coexistence of national and a European Research Council not necessarily makes life easier for universities and, as important, academics;

* There are many advocates of a more competitive approach in higher education. But also cooperation, collaboration and collegial approaches are stressed. It will not be an easy task – both for national and supranational policy-makers, as well as for university administrators – to strike a balance. An example: a current concrete issue for the EU is to find a balance between on the one hand the efforts to create a kind of level-playing field through supporting "less-developed" regions through the Structural Funds, with on the other hand the attempts to apply targeted instruments (European Research Council) to selectively reward excellent universities increasing the differences between institutions and regions.

* Change is needed, but more reflection is needed on the actual actions to be taken. A number of changes will have an impact on core elements of the institutional fabric of higher education, e.g. the appropriateness of tenure was challenged in the context of fostering international mobility. The same goes for issues like selection of students and the introduction of (dif-

ferential) tuition fees. At the conference it was not clear what role the university could/should play for the service industry (session 8). Let us also not forget that competition means winners, but we have not considered sufficiently what should happen to the osers, whether we talk about full systems, individual universities or individual academics.

Given these dilemmas (and maybe controversies), the question is how soon we can bring about change and how soon do we want to change.

A policy strategy towards 2020

The objectives for 2020 are more or less clear and in five years time it will become clear to what extent the 2010 Bologna and Barcelona commitments have been reached. A number of instruments for the road ahead seem appropriate in terms of effectiveness and general endorsement. At the same time there are tensions, paradoxes and dilemmas. These relate to issues that have to be considered very cautiously and carefully. There is no one-size-fits-all solution, for this would harm the premise of valuing and respecting the diversity across Europe.

In order to continue the debate on these issues and to develop a policy strategy towards 2020, the Commissioner decided to establish a "Forum on University-Based Research." The activities of the Forum are twofold:

1. Help the Commission define an EU policy framework promoting the necessary changes and reforms for universities in building the ERA and achieving the Lisbon and Barcelona goals. In particular, clarify the aims and objectives as well as the corresponding tools and mechanisms taking into account the national or regional specificities. This expert contribution should also feed into the preparation of FP7.

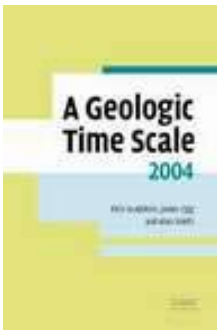
2. Identify and support the exchange of best practice across Europe and foster their dissemination.

The work of the Forum on University-Based Research will begin in September 2004. "

The full report can be downloaded at

http://europa.eu.int/comm/research/conferences/2004/univ/index_en.html

A Geologic Time Scale 2004



Authors: Felix M. Gradstein(ed.), James G. Ogg, Alan G. Smith
Publisher: Cambridge University Press
ISBN: 0521781426
YEAR : 2004
EDITION : 1st
PAGES : 610
PRICE : 117.30 €

An international team of over forty stratigraphic experts have helped to build the most up to date international stratigraphic framework for the Precambrian and Phanerozoic. This successor to A Geologic Time Scale 1989 by W. Brian Harland et al. (CUP 0521 387655) begins with an introduction to the theory and methodology behind the construction of the new time scale. The main part of the book is devoted to the scale itself, systematically presenting the standard subdivisions at all levels using a variety of correlation markers. Extensive use is made of isotope geochronology, geomathematics and orbital tuning to produce a standard geologic scale of unprecedented detail and accuracy with a full error analysis. A wallchart summarising the whole time scale, with paleogeographic reconstructions throughout the Phanerozoic, is included in the back of the book. The time scale will be an invaluable reference source for academic and professional researchers and students.

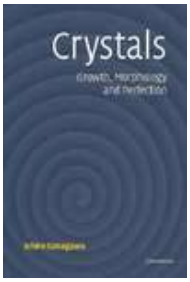
- Most detailed international geologic time scale
- Includes wallchart
- Compiled by international team of experts
- Ratified by International Commission on Stratigraphy
- Uses foremost methodologies

A Geologic Time Scale 2004

Authors: P. C. Gregory
Publisher: Cambridge University Press
ISBN: 052184150X
YEAR : 2005
EDITION : 1st
PAGES : 486
PRICE : 66.00 €

Increasingly, researchers in many branches of science are coming into contact with Bayesian statistics or Bayesian probability theory. By encompassing both inductive and deductive logic, Bayesian analysis can improve model parameter estimates by many orders of magnitude. It provides a simple and unified approach to all data analysis problems, allowing the experimenter to assign probabilities to competing hypotheses of interest, on the basis of the current state of knowledge. This book provides a clear exposition of the underlying concepts with large numbers of worked examples and problem sets. The book also discusses numerical techniques for implementing the Bayesian calculations, including an introduction to Markov Chain Monte-Carlo integration and linear and nonlinear least-squares analysis seen from a Bayesian perspective. In addition, background material is provided in appendices and supporting Mathematica notebooks are available, providing an easy learning route for upper-undergraduates, graduate students, or any serious researcher in physical sciences or engineering.

Crystals. Growth, Morphology, & Perfection

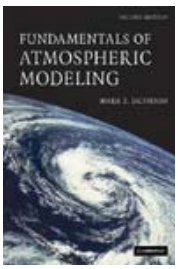


Authors: Ichiro Sunagawa
Publisher: Cambridge University Press
ISBN: 0521841895
YEAR : 2005
EDITION : 1st
PAGES : 308
PRICE : 80.70 €

How do crystals nucleate and grow? Why and how do crystals form such a wide variety of morphologies, from polyhedral to dendritic and spherulitic forms? These are questions that have been posed since the seventeenth century, and are still of vital importance today both for modern technology, and to understand the Earth's interior and the formation of minerals by living organisms. In this book, Ichiro Sunagawa sets out clearly the atomic processes behind crystal growth, and describes case studies of complex systems from diamond, calcite and pyrite, to crystals formed through biomineralization, such as the aragonite of shells, and apatite of teeth. Essential reading for advanced graduates and researchers in mineralogy and materials science.

• Excellent introduction to the principles of crystal growth, accessible to graduate students
• Discusses both inorganic and organic mineral formation

Fundamentals of Atmospheric Modeling



Authors: Mark Z. Jacobson
Publisher: Cambridge University Press
ISBN: 0521548659
YEAR : 2005
EDITION : 2nd
PAGES : 828
PRICE : 67.00 €

New edition of a successful and comprehensive textbook on the atmospheric processes, numerical methods, and computational techniques required for advanced students and scientists to successfully study air pollution and meteorology.

Natural Hazards

Authors: Edward Bryant
Publisher: Cambridge University Press
ISBN: 0521537436
YEAR : 2005
EDITION : 2nd
PAGES : 328
PRICE : 31.70 €

Natural hazards afflict all corners of the Earth; often unexpected, seemingly unavoidable and frequently catastrophic in their impact. This revised edition is a comprehensive, inter-disciplinary treatment of the full range of natural hazards. Accessible, readable and well supported by over 180 maps, diagrams and photographs, it is a standard text for students and an invaluable guide for professionals in the field. Clearly and concisely, the author describes and explains how hazards occur, examines prediction methods, considers recent and historical hazard events and explores the social impact of such disasters. This revised edition makes good use of the wealth of recent research into climate change and its effects.

Irrigation and Drainage Performance Assessment: Practical Guidelines

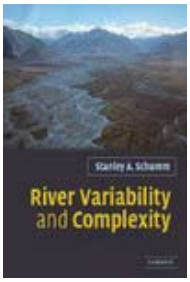
Authors: M. G. Bos, M. A. Burton, D. J. Molden
Publisher: CABI Publishing
ISBN: 0851999670
YEAR : 2005
EDITION : 1st
PAGES : 176
PRICE : 60.20 €

Effective irrigation and drainage systems are essential if growing demands for water resources are to be met. For the use of water for irrigation to be improved we must understand current levels of performance. This book draws together the growing body of knowledge on irrigation and drainage performance assessment that has been gained over the last twenty years. It provides guidelines for practitioners to enable them to design and carry out performance assessment and implement performance-based management. Developed by a working group of the International Commission on Irrigation and Drainage (ICID) it provides a generic framework for performance assessment with guidance on the theory and practice of how to audit and assess the performance of irrigation and drainage schemes.

Main Contents:

- Introduction
- Framework for performance assessment
- Performance indicators for irrigation and drainage
- Operational strategic performance assessment
- Diagnosing irrigation performance
- Data management for performance assessment

River Variability and Complexity



Authors: Stanley A. Schumm
Publisher: Cambridge University Press
ISBN: 0521846714
YEAR : 2005
EDITION : 1st
PAGES : 234
PRICE : 59.50 €

Rivers differ among themselves and through time. An individual river can vary significantly downstream, changing its dimensions and pattern dramatically over a short distance. If hydrology and hydraulics were the primary controls on the morphology and behavior of large rivers, we would expect long reaches of rivers to maintain characteristic and relatively uniform morphologies. In fact, this is not the case - the variability of large rivers indicates that other important factors are involved. River Variability and Complexity presents a new approach to the understanding of river variability. It provides examples of river variability and explains the reasons for them, including fluvial response to human activities. Understanding the mechanisms of variability is important for geomorphologists, geologists, river engineers and sedimentologists as they attempt to interpret ancient fluvial deposits or anticipate river behavior at different locations and through time. This book provides an excellent background for graduates, researchers and professionals.

• A concise new approach to the understanding of river variability, building on the author's 40 years experience of river geomorphology

• Includes helpful reference tables and charts for the study of river characteristics (type) and behaviour (dynamics)

• Includes a discussion of the unintended consequences of human actions and develops a hypothesis regarding the effect of river characteristics on human behaviour Contents

Irrigation and River Basin Management: Options for Governance and Institutions

Authors: M. Svendsen (ed.)
Publisher: CABI Pulishing
ISBN: 0851996728
YEAR : 2005
EDITION : 1st
PAGES : 272
PRICE : 82.80 €

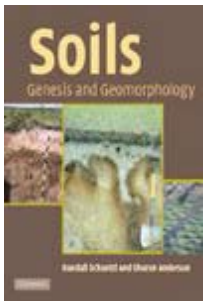
With increasing water scarcity, pressure to re-allocate water from agriculture to other uses mounts, along with a need to put in place institutional arrangements to promote 'higher value' uses of water. Many developing countries are now experimenting with establishing new institutional arrangements for managing water at the river basin level.

This book, based on research by IWMI and others, reviews basin management in six developed and developing countries. It describes and applies a functional theory of river basin management, based on the idea that there is a minimum set of functions required to manage basins effectively and a set of basic conditions that enable effective management institutions to emerge. The book examines the experiences of both developed and developing countries in order to see what lessons can be learned and to identify what constitutes the core of a 'theory of river basin management'. It concludes that although it is difficult for developing countries to adopt approaches and institutional designs directly from developed countries, basic principles and lessons are transferable.

Main Contents:

- Managing River Basins: An Institutional Perspective, M Svendsen, P Wester, Wageningen University, The Netherlands, and F Molle, Institut de Recherche pour le Développement, France
- Phases of River Basin Development: The Need for Adaptive Institutions, D Molden, IWMI, Sri Lanka, R Sakthivadivel, IWMI, India, M Samad, IWMI, Sri Lanka, M Burton, ITAD~Water Ltd, UK
- Limits to Leapfrogging: Issues in Transposing Successful River Basin Management Institutions in the Developing World, T Shah, IWMI, India, I Makin, IWMI, Sri Lanka, and R Sakthivadivel
- Making Sound Decisions: Information Needs for Basin Water Management, M Burton and D Molden
- Financing River-Basin Organisations, C L Abernethy, Consultant, Sri Lanka
- Water Management for Irrigation and Environment in a Water-stressed Basin in Southwest France, H Tardieu, Compagnie d'Aménagement des Coteaux de Gacogne, France
- Basin Management in a Mature Closed Basin: The Case of California's Central Valley, M Svendsen
- River Basin Closure and Institutional Change in Mexico's Lerma-Chapala Basin, P Wester, C A Scott, IWMI, India, and M Burton
- Water Resources Planning and Management in the Olifants Basin of South Africa: Past, Present and Future, M de Lange, South Africa, D J Merrey and H Levite, IWMI, Africa, and M Svendsen
- Water Resource Management in the Dong Nai Basin: Current Allocation Processes and Perspectives for the Future, M Svendsen, C Ringler, International Food Policy Research Institute in Washington, USA and N Duy Son, Sub-Institute for Water Resources Planning, Vietnam
- Governing Closing Basins: The Case of the Gediz River in Turkey, M Svendsen, H Murray-Rust, ARD Inc, USA, N Harmancioğlu, and N Alpaslan, Dokuz Eylul University, Turkey
- Managing River Basins: Lessons from Experience, M Svendsen and P Wester - Providing Irrigation Services in Water Scarce Basins: Representation and Support, P Wester, T Shah and D J Merrey

Soils. Genesis and Geomorphology

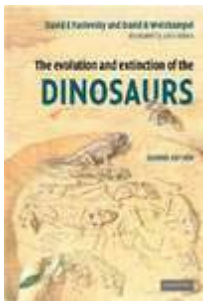


Authors: Randall J. Schaetzl, Sharon Anderson
Publisher: Cambridge University Press
ISBN: 0521812011
YEAR : 2005
EDITION : 1st
PAGES : 832
PRICE : 55.00 €

Soils: Genesis and Geomorphology is a comprehensive and accessible textbook on all aspects of soils. The book's introductory chapters on soil morphology, physics, mineralogy and organisms prepare the reader for the more advanced and thorough treatment that follows. Theory and processes of soil genesis and geomorphology form the backbone of the book, rather than the emphasis on soil classification that permeates other less imaginative soils textbooks. This refreshingly readable text takes a truly global perspective, with many examples from around the world sprinkled throughout. Replete with hundreds of high quality figures and a large glossary, this book will be invaluable for anyone studying soils, landforms and landscape change. Soils: Genesis and Geomorphology is an ideal textbook for mid- to upper-level undergraduate and graduate level courses in soils, pedology and geomorphology. It will also be an invaluable reference text for researchers.

• Thoroughly up-to-date
• Comprehensive, accessible, and well-written
• Global in scope; well-illustrated

The Evolution and Extinction of the Dinosaurs

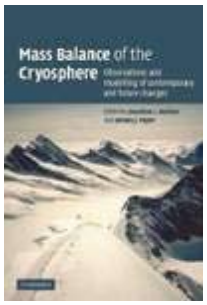


Authors: David E. Fastovsky, David B. Weishampel
Publisher: Cambridge University Press
ISBN: 0521811724
YEAR : 2005
EDITION : 2nd
PAGES : 500
PRICE : 51.40 €

This new edition of The Evolution and Extinction of the Dinosaurs is a unique, comprehensive treatment of this fascinating group of organisms. It is a detailed survey of dinosaur origins, their diversity, and their eventual extinction. The book can easily be used as a teaching textbook for a class, but it is also written as a series of readable, entertaining essays covering important and timely topics appealing to non-specialists and all dinosaur enthusiasts: birds as 'living dinosaurs', the new feathered dinosaurs from China, 'warm-bloodedness'. Along the way, the reader learns about dinosaur functional morphology, physiology, and systematics using cladistic methodology - in short, how professional paleontologists and dinosaur experts go about their work, and why they find it so rewarding. The book is spectacularly illustrated by John Sibbick, a world-famous illustrator of dinosaurs, commissioned exclusively for this book.

• Covers all of the latest discoveries in dinosaur paleobiology written by two world experts
• Comprehensive and detailed, yet utterly readable and entertaining
• Beautifully illustrated by world-famous dinosaur artist, John Sibbick

The Geology of Australia



Authors: David Johnson
Publisher: Cambridge University Press
ISBN: 0521841216
YEAR : 2005
EDITION : 1st
PAGES : 288
PRICE : 95.45 €

The Geology of Australia provides a vivid and informative account of the evolution of the Australian continent over the past 4400 million years. Starting with the Precambrian rocks which hold clues to the origins of life and the development of an oxygenated atmosphere, it then covers the warms seas, volcanism and multiple orogenies of the Palaeozoic, which built the eastern third of the Australian continent. This illuminating history then details the breakup of Gondwana and the development of the continental shelves and coastlines. Separate chapters cover the origin of the Great Barrier Reef, the basalts in Eastern Australia and the geology of the Solar System. From Uluru to the Great Dividing Range, from sapphires to the stars, The Geology of Australia is a comprehensive exploration of the timeless forces that have shaped this continent and that continue to do so.

• Describes the origin of the Australian continent and landscapes in easy language

• Vividly illustrated with colour images throughout

• Many major subjects are explained: the supercontinent

Radiogenic Isotope Geology

Authors: Alan P. Dickin
Publisher: Cambridge University Press
ISBN: 0521530172
YEAR : 2005
EDITION : 2nd
PAGES : 510
PRICE : 119.26 €

Modern isotope geochemistry is a rapidly expanding field that has a part to play in a broad range of earth and planetary sciences - from extra-solar system processes to environmental geoscience. this new edition of a popular textbook is completely updated and places more emphasis on the uses of radiogenic isotopes in environmental earth science. The author reviews the field of radiogenic isotope geology in a concise and visual manner to provide a comprehensive introduction to the subject and its wide variety of applications. For each technique, current ideas are presented in their historical context to allow the reader to understand the development of the theory. The latest ideas and methods, classic papers and case studies all come under scrutiny within this book. An accessible introduction for scientists from other disciplines and an important reference for students and researchers working in isotope geology.

Science shops: Building partnerships for public access to research

http://www.scienceshops.org/

In addition to the demands made on research and development by commerce and industry, 'civil society' organisations have their own research needs. Diffusion of knowledge often focuses on communication from researchers to society, but increasingly there is a demand for communication from society to researchers. This is the concept of 'social demand' for knowledge . Different types of interfaces exist between researchers and society, one of which are the 'science shops'. Science shops are organisations created as mediators between citizen groups (trade unions, pressure groups, non-profit organisations, social groups, environmentalists, consumers, residents association etc.) and research institutions (universities, independent research facilities). Science shops are important actors in community-based research (CBR). There are many differences in the way science shops are organised and operate, as well as some important parallels.

A science shop provides independent, participatory research support in response to concerns experienced by civil society.

In practice, contact is established between a civil society organisation and a science shop or CBR centre on a problem in which the civil society organisation is seeking research support. In this collective search for a solution new knowledge is generated, or at least existing knowledge is combined and adapted - again, in a true partnership without 'science' prevailing in any way. Through their contacts, science shops provide a unique antenna function for society's current and future demands on science.

There is not one dominant organisational structure defining a science shop. How science shops are organised and operate is highly dependent on their context. The above definition of a science shop might also include organisations that do not self-define as a science shop. Organisations that meet the definition of a science shop and do provide civil society with knowledge and skills through research and education on an affordable basis will be taken into account. The term 'science' is used in its broadest sense, incorporating social and human sciences, as well as natural, physical, engineering and technical sciences.

This site, sponsored by the EU science and society programme, provides information in the concept of science shops, links, documentation, examples, and offers the opportunity to join the netwrk of "science shops".

New Master Course on Earth Oriented Space Science and technology (Course)

01/10/2005 - 01/10/2010 - Munich, Germany

Master\'s course:

The new Master of Science program ESPACE has succefully passed all university bodies - aprobation by the state ministry of education is expected soon. Start of the program is planned for October 2005 (winter term 2005/06).

ESPACE Application:

Deadline for application for the new master\'s course is July 15th, 2005.

Application guidelines and forms can be found in the web page.

Contact details:

ESPACE is a collaboration of different institutes.

ESPACE is coordinated at the faculty of civil and geodetic engineering of Technische Universität München, Munich, Germany.

Postal address:

ESPACE
Technische Universität München
Institut für Astronomische und Physikalische Geodäsie
Arcisstrasse 21
80290 München
Germany

e-mail, fax and phone:
e-mail: info@espace-tum.de
fax: ++49 (0)89 289 231 78
phone: ++49 (0)89 289 231 90 (Secretariat, Mrs. Rechel)

Objectives of the Master\'s course:

Satellite techniques gain more and more in importance for Earth sciences and engineering. Design, development and data analysis of respective satellite missions require knowledge from a broad spectra of disciplines. Usually relevant university programs only cover parts of this spectra, respectively.

ESPACE connects know-how in spacecraft technology and orbit mechanics with applications in Earth System Science, Remote Sensing and Navigation. The programme is focused on methodologies.

ESPACE provides a unique center of education on the level of a master\'s and doctoral program.

It takes advantage of the Munich situation with its unique concentration of expertise in:

* 3 universities (Technische Universität München, Ludwig-Maximilian University, University of the Federal Armed Forces)

* research institutions (such as the German Aerospace Center, DLR)

* space industry (such as EADS or Kayser-Threde)

ESPACE offers a 2-years international Master of Science program.

Programme:

The first year of the programme covers foundations of space engineering and science as well as an introduction to remote sensing, geo-sciences and navigation.

The 3rd term allows the students to specialize in either Earth System Science or Remote Sensing or Navigation and Positioning.

The 4th and last term will be devoted to a master\'s thesis.

Application for the Master\'s course:

Requirements: Bachelor or Diploma degree or equivalent from an internationally recognized university in science or engineering (such as mathematics, physics, informatics, mechanical/electrical/aerospace engineering, geodesy, geophysics).

Certificate of English language ability (the whole course is given in english).

Application: Please download the application package from the web site of the course.

Deadline: Application deadline for winter term 2005/06 (starting October 2005) is July 15th, 2005.

Tuition fees: TUM is a German state university financed by taxes. Therefore there are no tuition fees, except for an enrolment fee of about 85 EUR per semester. As a consequence TUM does not provide financial support to the students.

Housing and living: The ESPACE program does not care for housing and living of the students. However, there is the Center of International Affairs of TUM and the Studentenwerk (Office of Students Services in Munich) who take care of you. Living in Munich is not cheap. You might need up to 600 EUR per month (depending on accomodation).

Organizer

Technical University of Munich
www.espace-tum.de

OCEAN TURBULENCE SUMMERCOURSE AT CUM (Course)

11/07/2005 - 16/07/2005 - Vilanova i la Geltru, Spain

A week long summer course on the subject of Ocean Turbulence will be held in Vilanova i la Geltru (medimu sized coastal village 40 Km south of Barcelona) in Spain during 11-16 July 2005.

This course is part of a series of courses that started in 1999 on the broad subject of Environmental and geophysical fluid dynamics under the auspices of the CUM (Campus Universitari de la Mediterrania). This year lecturers and support ~~come mainly from UPC, Toulon University, NASA and China~~ Ocean University. For inscription and assistance grants contact Prof. J.M. Redondo at cum@vig.es.

http://www.campusmed.net

New ocean colour training initiative (Course)

03/10/2005 - 14/10/2005 - Ispra, Italy

The Joint Research Centre of the European Commission is offering an ocean colour training course on “Methods and Applications of Ocean Colour Remote Sensing in Coastal and

Regional Seas", within the framework of the JRC Enlargement and Integration Action 2005. The course will take place at JRC in Ispra, Italy, and is endorsed and supported by the International Ocean Colour Coordinating Group (IOCCG).

To encourage participation by students from new EU member states and Candidate Countries (PECO countries), scholarships will be awarded to successful applicants to cover travel and accomodation expenses. IOCCG is also offering a limited number of scholarships for candidates from other developing countries. For further information on the course, please see the announcement on JRC's ECOMAR website (http://ecomar.jrc.cec.eu.int/). Application forms and a brochure of the training course can also be downloaded from the website.

Organizer

Joint Research Centre (JRC) of the European Commission

http://ecomar.jrc.cec.eu.int

INTERNATIONAL SEMINAR ON EUROPEAN PROJECT DEVELOPMENT - ENERGY AND ENVIRONMENT (Course)

22/09/2005 - 23/09/2005 - St. Julians, Malta

The first seminar that presents the EC Seventh Framework Programme (FP7), and the Competitiveness and Innovation Framework Programme (CIP) together with existing funding sources for energy and environment projects.

The European Commission will drastically change the funding schemes available for environmental and energy projects starting from 2006. These changes concern the introduction of completely new programmes and a significant increase in the budget of the existing ones. Leaning heavily on the experiences gained from years of successful project development under the current funding schemes the lecturers of the seminar will introduce these new programmes for the first time. Whereas official EU Information Days tend to concentrate on individual programmes with theoretical presentations, the Energy & Environment EC Seminar will discuss all relevant EU programmes in a common structure providing a unique basis for decision making and future business strategy development.

The new Energy & Environment EU Programmes that will be first introduced during the course:

Seventh Framework Programme for Research and Development (FP7)

Did you know that...

» New, different categories of actions and types of supported activities will be implemented through a much simpler set of funding scheme?

» The budget of the programme is more than four-times bigger than its predecessor's?

» Emphasis is put on research themes rather than instruments?

» Financial regulations are simplified (eligible costs, cost-reporting, etc.)?

Competitiveness and Innovation Framework Programme (CIP) 2007-2013

Did you know that...

» CIP will bring together all the activities that were previously dispersed over MAP, LIFE - Environment, e-TEN, e-Content and the Intelligent Energy for Europe Programme?

» Three specific programmes are defined: Entrepreneurship and Innovation Programme, ICT Policy Support Programme and Intelligent Energy Europe (IEE)

» IEE will take its emphasis on the mass replication of new and renewable energy sources and energy efficient technology

This seminar will discuss all the above new programmes and the existing ones, like LIFE-III Environment, LIFE-III Nature, LIFE-III Third countries, Intelligent Energy for Europe, INTERREG III, Structural Funds, the Cohesion Fund and the Pre-Accession Instruments (Phare, Sapard, Ispa, Cards, Meda) in a common structure, tailored to fit the needs of project leaders and CEOs.

TARGET GROUP

The program is recommended for both desicion makers and high-level project managers representing companies and other organisations planning to take an active part in the development of future energy and environmental projects in Europe. The training has been tailored to suit the needs of small and medium sized enterprises, NGOs, and universities although we also forsee the participation of municipalities and other organisations.

TOPICS

Day 1 - Session 1: Overview

Classification of present and future funding opportunities open for companies and other organisations from Member States and Candidate Countries.

» Pre-accession instruments (PHARE, ISPA, SAPARD)

» Structural Funds and the Cohesion Fund

» Community Programmes

» Relevant Community Initiatives (INTERREG III, LEADER+)

» General information sources about EC funding possibilities on the Internet

Day 1 - Session 2: Community Programmes

Introduction to relevant Community Programmes providing funds for energy and environmental projects

» The 6th Framework Programme (Sustainable Surface Transport, Sustainable Energy Systems, Global Change and Ecosystems priority and other relevant thematic areas),

» Intelligent Energy for Europe Framework Programme and its four sub-programmes (SAVE, ALTENER, COOPENER, STEER),

» LIFE III programme and its three sub-programmes (Environment, Nature and Third countries),

» Other Community Programmes with environmental thematic areas

» Special EC programme introduction: Forthcoming Community Programmes:

» FP7: Seventh Framework Programme on Research and Technological Development

» CIP: Competitiveness and Innovation Framework Programme

» LIFE+: Financial Instrument for Environment +

Day 2 - Practical advice for Project Developers

Preparation to the new programmes based on experiences gained during the previous programmmes, administrative and

financial conditions of participating in the Community Programmes, from the original idea till signing the contract - project examples

» Presentation of funded/successful projects - Why were they accepted?

» Practical guidance to prepare competitive proposals Successful strategy for proposal preparation

» Evaluation of proposals - Experiences of a Brussels evaluator expert

» Procedure of signing the contract and the implementation of projects

» Basic requirements for a project proposal: General principles, criteria - ideas and partners - selecting the most suitable call, setting up and managing the consortium In summary

All relevant EC programmes are comprehensively covered during first day which is followed by the practical sessions during Day2 on experiences and useful hints.

COSTS

Standard fee: 1149 EUR

Special early bird rate: 890 EUR, for applications before 15 July

All rates include taxes plus buffet lunch, coffee breaks and the official training material but do not include accommodation costs.

MORE INFORMATION

Europa Media PSC
Budapest, Hungary
Contact: Ms. Judit Gábosy
Phone: +36 1 453 3801; Fax: +36 1 436 9038
E-mail: info@europamedia.hu

Organizer

Europa Media PSC, www.eucenter.org
www.eucenter.org/training/training.php

PAGES 2nd Open Science Meeting - Paleoclimate, Environmental Sustainability and Our Future (Meeting)

10/08/2005 - 12/08/2005 - Beijing, China

The meeting will focus on understanding past processes and natural variability - within the topics of climate, environmental change and human impact - in order to develop predictive models of the future. By locating the 2nd Open Sceince Meeting in China, PAGES hopes to increase the visibility of paleoenvironmental research in Asia and provide opportunities for international collaboration. By linking paleoresearch, environmental history and modeling, the meeting also hopes to encourage interdisciplinary science.

The OSM is being held in conjunction with the 9th IAMAS Scientific Assembly. The OSM will consist of plenary lectures and poster sessions. The deadline for poster abstract submission is 30 April 2005.

Organizer

PAGES (Past Global Changes)
http://www.pages2005.org

22nd International Meeting on Organic Geochemistry -IMOG (Meeting)

12/09/2005 - 16/09/2005 - Seville, Spain

SCIENTIFIC PROGRAMME

The 22nd IMOG is intended to cover the full range of research activities in organic geochemistry, with a wide spectrum of subjects involving geology, biogeochemistry, environmental geochemistry, chemical oceanography and hydrology, petroleum geochemistry (including natural gas), organic-rich rocks and soils. To reflect our field's multidisciplinary nature, we warmly invite contributions from scientists working in oil and gas companies, research institutes, universities, consulting and contractor companies, and wherever else geochemists may be found. IMOG has a tradition of allowing the shape and scope of the technical programme to be determined by the abstracts submitted by the scientific community. Presentations will be in oral and poster formats. Plenary morning sessions and parallel afternoon sessions are planned. An even balance between bio- and petroleum- orientated topics will be maintained, as is customary at IMOG. While the final session topics will be based on the themes of the submitted abstracts, papers are sought in the following broad areas:

Petroleum and Coal Geochemistry

Contributions on all topics related to petroleum formation and systems are invited, with emphasis on geochemical controls on reservoir fluid properties, generation and migration of petroleum and gas, basin modelling, reservoir and production geochemistry, organic solids, kinetics, source rocks, fluid inclusions, and oil-rock interactions. Abstracts on all areas of coal geochemistry and petrology, and coal-bed gases are also welcome.

Biogeochemistry

All aspects of the field of biogeochemistry will be considered, including preservation and transformation of organic matter in the biosphere and geosphere, degradation of organic matter, biomarkers, paleoenvironment, stable isotopes, carbon and nitrogen cycles, marine chemistry.

Environmental Geochemistry

Abstracts on industrial pollution and natural pollution, their sources and their effects on the environment are invited, as will contributions on alteration of organic matter as a result of pollution of the air, water, soil, and sediments.

New trends in Organic Geochemistry

Work on the application of organic geochemistry expertise and tools to new disciplines and arising environmental problems (global change, carbon stabilization and sequestration, etc) will be most welcome. Interdisciplinary aspects of geochemistry (archaeology, biochemistry, DNA, oceanography…), integrated and ground-breaking studies will be very welcome.

The submission of abstracts has been extended to the 15th of July, 2005.

Organizer

European Association of Organic Geochemists (EAOG)
http://www.imog05.org/

4th Congress of the Balkan Geophysical Society (Meeting)

09/10/2005 - 12/10/2005 - Bucharest, Romania

Message of the Romanian presidency

"We cordially invite geophysicists and other members of the geoscientific community around the world to attend the 4th Congress of the Balkan Geophysical Society - "Bucharest 2005", organized and hosted by the Romanian Society of Geophysics. Here you will have excellent opportunities to work together with Romanian specialists on solving contemporary problems of the Earth Sciences and to establish or consolidate scientific and business contacts.

The most important international associations and societies of geophysics: European Association of Geoscientists and Engineers, Society of Exploration Geophysicists, European Geosciences Union and American Geophysical Union have decided to be partners of Balkan Geophysical Society and Romanian Society of Geophysics in organizing "Bucharest 2005", under the auspices of the International Union of Geodesy and Geophysics. This is a great honor for us and a sign that Romania has become an appreciated partner for the international geophysical community.

Your participation will represent a deeper involvement of the top specialists in Earth Sciences in the continuous enhancement of human life, the protection of environment and its connection with the Earth as a system, from atmosphere to its core.

On this occasion, we wish to express our pride that Romania has been represented in the international scientific community by distinguished scientists as Professors Sabba S. Stefanescu and Liviu Constantinescu, recognized worldwide for their outstanding contributions in the fields of Applied and Planetary Geophysics and as founders of the National School of Geophysics.

We would also like to emphasize that besides the traditional topics in Geophysical Prospecting and Earth's Physics, a great interest will be devoted to the newer but equally important Environmental Geophysics issues. Caring the complex environment that makes life possible on the Earth represents one of our main duties towards the next generations!

The gathering of expertise of those involved in both Applied Geophysics and Physics of the Earth in a coherent ensemble produces a synergistic effect to the enhancing of geological knowledge of this region at scales from local to continental. Also, highlighting results and challenges of geosciences on the Balkan Region under the logo "Geophysics without frontiers", the Conference brings a significant contribution towards recovering peace and friendship in this highly challenged region!"

Topics

The abstracts should describe state-of-the-art research in applied geophysics (for natural resources or environmental) or in tectonophysics. More specifically, the Technical Program will focus on the following:

Oil & Gas Exploration of both onshore and offshore environments (acquisition, processing, interpretation and visualization of 3-D and 4-D seismic reflection data, seismic monitoring of production, borehole geophysics, high-resolution potential field methods, petrophysics, and synergetic modeling and interpretation). This subject will be illustrated using examples from hydrocarbon exploration and development of the Eastern Alps, Carpathians, Dinarides and Rhodopes and their internal and marginal basins, with a special emphasis on the Black Sea system.

Mineral Exploration and Development will emphasize international and local application of new generation of mining geophysics; Water resources will be a focal point of the multidisciplinary approach. Engineering, environmental and archeogeophysics will offer the chance to present new investigation strategies and case studies.

Continental and regional geology and seismotectonic sessions will concentrate on the connections between deep, lithospheric processes and tectonic topography. A special focus on GPS and satellite imagery methods will provide a natural framework for discussions of all other types of geophysical investigations. Data management and GIS techniques for the entire area will also be a focal point.

The paleogeography and geodynamics of the Eastern Alps, Pannonian and Transylvanian basins, Carpathians, Dinarides, Rhodope, Anatolia, and the Aegean system will be topics of in-depth focus for the meeting. The orogenic relationships between continental blocks, platforms and marginal basins of the Balkans, as well as opening and evolution of the Black Sea area and Eastern Mediterranean will be integrated with the societal impact due to the highly active seismic regions around Vrancea, in the Carpathians, and in Anatolia.

Organizer

Balkan Geophysical Society
www.bgs-bucharest2005.ro

Living With a Star 1: A new era in understanding our space environment (Meeting)

26/03/2007 - 29/03/2007 - Boulder, Co., U.S.A.

Mark your calendars for LWS1/SOHO19, organized by the LWS/SDO science team, hosted by the High Altitude Observatory in Boulder, Colorado, U.S.A.

The launch of the first Living With a Star mission, the Solar Dynamics Observatory, is planned for 2008. That year also marks the 100th anniversary of the discovery of magnetic fields on the Sun, and the 50th anniversary of NASA. This new global solar observatory in space will mean a major change for solar and heliospheric physics, moving away from SOHO and TRACE towards a dramatically improved view of the Sun, from its deep interior to its high corona. The LWS1/SOHO19 science meeting, presents us with a unique opportunity to combine an overview of our understanding of solar magnetic activity with a vision for the future.

There will be a pre-cursor session to the LWS1/SOHO19 meeting during the SOHO17 meeting (the SOHO 10th anniversary) near Taormina, Sicily, 7 - 12 May, 2006. The SOHO17 web site will go live soon at http://www.soho17.org/ .

Organizer

LWS/SDO science team
http://www.lws1.org/

2005 AGU Fall Meeting (Meeting)

05/12/2005 - 09/12/2005 - San Francisco, California, USA

2005 AGU Fall Meeting

The Fall Meeting is expected to draw a crowd of over 11,000 geophysicists from around the world and provides an opportunity for researchers, teachers, students, and consultants to present and review the latest issues affecting the Earth, the planets, and their environments in space. Held in San Francisco, California, at the Moscone Center, the meeting will cover topics in all areas of Earth and space sciences. Abstract submissions welcome.

Organizer

AGU
http://www.agu.org/meetings/fm05/

36th COSPAR Scientific Assembly and Associated Events (Meeting)

16/07/2006 - 23/07/2006 - Beijing, China

Topics

Approximately 80 meetings covering the fields of COSPAR Scientific Commissions (SC) and Panels:

- SC A: The Earth's Surface, Meteorology and Climate
- SC B: The Earth-Moon System, Planets, and Small Bodies of the Solar System
- SC C: The Upper Atmospheres of the Earth and Planets Including Reference Atmospheres
- SC D: Space Plasmas in the Solar System, Including Planetary Magnetospheres
- SC E: Research in Astrophysics from Space
- SC F: Life Sciences as Related to Space
- SC G: Materials Sciences in Space
- SC H: Fundamental Physics in Space
- Panel on Satellite Dynamics (PSD)
- Panel on Scientific Ballooning (PSB)
- Panel on Potentially Environmentally Detrimental Activities in Space (PEDAS)
- Panel on Radiation Belt Environment Modelling (PRBEM)
- Panel on Space Weather (PSW)
- Panel on Planetary Protection (PPP)
- Panel on Capacity Building (PCB)
- The Public Understanding of Space Science
- Space Science Education and Outreach

Organizer

Committee on Space Research (COSPAR)

http://www.copernicus.org/COSPAR/COSPAR.html