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- **Life in the extreme**
  Studies of cold seeps and mud volcanoes in EUROMARGINS
- **The stormy Sun affecting the human life and the technology**

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EGU Topical Conference Series

2nd EGU Humboldt Conference, Lima, Peru, 5-9 March, 2007, The Role of Geophysics in Natural Disaster Prevention

Friday, 9 February 2007.- From 5 to 9 March, several hundred geoscientists will meet in Lima to discuss how they can help to protect society from major disasters like tsunamis, hurricanes, landslides, earthquakes and volcanic eruptions. They will present lessons learnt from the 2004 Indian Ocean tsunami, the 2005 Hurricane Katrina and recent volcanic and earthquake events, both in South America and elsewhere. The ongoing global climate change poses an additional threat by increasing the effects of naturally occurring extreme events. This has great relevance to countries in South America since, in this region, many populated areas are threatened by a whole range of natural disasters.

The 2nd Alexander von Humboldt Conference is jointly organised by the Instituto Geofísico del Perú and the European Geosciences Union. This conference will bring together leading experts from the Americas, Europe and Asia to discuss the latest results of and ideas on the prevention of natural disasters.

Objectives of the Conference

The conference aims at improving geophysical methods to evaluate natural hazards. It also aims to improve communication between the scientific and the decisionmaking communities. This is part of a more general effort to reduce the risks of natural hazards. Casualties and property losses due to natural disasters can significantly be mitigated when the risks involved for different scenarios are available in due time.

In most cases, however, scientists evaluate these hazards in probabilistic terms only. This is to be contrasted with precise forecasts expected by decision makers. Nevertheless, in most cases, science can provide decision makers with the best information for their mitigating decisions. This dilemma will be borne in mind when progress in natural disaster “prediction” is discussed during this interdisciplinary conference.

Topics (to be introduced by invited Keynote Speakers)

Volcanic Eruptions
Earthquakes
Tsunamis
Landslides
Avalanches
Extreme climate and/or meteorological disastrous events - El Niño related - Global Change related - Hurricanes

Media registration

Journalists, science writers and public information officers of all nations are welcome to attend this conference and to register in advance by sending an email to the EGU Press Office. A special press facility will be arranged for the written media, radio and TV, and public information officers.

The Press Officers speak Spanish as well as English. The official language for the conference is English. Simultaneous Spanish translation will be available for Keynote and other Invited Talks.

EGU Humboldt Conferences

This is the second of a series of Alexander von Humboldt International Conferences organised by the European Geosciences Union. The first Alexander von Humboldt International Conference on “The El Niño phenomenon and its global impact” was held May 16-20,2005 in Guayaquil, Ecuador.

The third EGU Humboldt Conference will be in Beijing, 24-29 September 2007.

Meeting website:
http://meetings.copernicus.org/avh2/

The Crafoord Prize in Geosciences for 2006

is awarded to Wallace Broecker

18 January 2007.- The Royal Swedish Academy of Sciences has decided to award the Crafoord Prize in Geosciences for 2006 to Wallace Broecker, Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY, USA, "for his innovative and pioneering research on the operation of the global carbon cycle within the ocean – atmosphere – biosphere system, and its interaction with climate". With his innovative research on the interaction between atmosphere, oceans, ice and living organisms, he has contributed greatly to our knowledge of climate change and its mechanisms.

Citation:

Will today's growing greenhouse effect lead to major climate changes and how cautious do we have to be? To answer these questions we have to understand the processes governing the interaction between the atmosphere, the oceans, ice and living organisms. Geochemist Wallace Broecker is the person who has contributed most to our knowledge of this complex interactive system.

His most pioneering contribution was his study of the global carbon cycle. Previously the composition of seawater was explained, for example, in terms of chemical equilibrium. A good 35 years ago Broecker launched instead a flow model based on the interaction of land, atmosphere and the oceans. In doing so he has made a decisive contribution to our understanding of the link between carbon dioxide levels in the atmosphere and the chemistry of the oceans, for example how much carbon dioxide they can receive and store.

The laureate has also played a crucial role in developing the theory of large-scale ocean currents and matching it with the interactive Earth System. He was 20-30 years ahead of his time when, in the 1960s, he suggested that rapid climate changes during the last glacial cycle were related to alterations in global ocean circulation patterns.

Ocean currents distribute heat between latitudes and, when they change, it has major effects on the climate, both locally and globally. For example if warm surface water failed to reach as far north in the North Atlantic as it does today, the climate in Scandinavia could be similar to Alaska's. Applied to the current climate debate, paradoxically, rapid global warming and increased rainfall could lead to a colder climate around the North Atlantic.

Broecker participates actively in the on-going debate, providing information about the interactive Earth System to the general public, politicians and other decision makers. He does not prophesy doom but urges caution: one of his similes is a comparison of the complex climate system with a sleeping dragon that we should not disturb.

Wallace S. Broecker, US citizen, was born 1931 (75) in Chicago and has obtained his PhD in Geology (1958) from Columbia University. He is Newberry Professor of Earth and Environmental Sciences at Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY, USA.

The Prize-awarding ceremony will take place in Lund on 26 april 2007 in the presence of Her Majesty the Queen of Sweden.

Press Release, Royal Swedish Academy of Sciences

12th IOCCG Committee Meeting

The IOCCG Committee met for the 12th time in Swakopmund, Namibia from 16-18 January 2007.

The meeting was hosted by the BENEFIT Programme (Benguela Environment Fisheries Interaction and Training Programme) and was chaired by Prof. James Yoder (Woods Hole Oceanographic Institution, USA).

The status of the various IOCCG working groups was reviewed. Two new IOCCG monographs should be published this year: Report Number 6 on "Ocean Colour Data Merging", edited by Dr. Watson Gregg (NASA), has already been sent to press, and the report from the working group on "Global Ecological Provinces", chaired by Drs. Mark Dowell and Trevor Platt, should be ready for printing later this year. Furthermore, the formation of a new IOCCG working group to implement Argo floats with optical and bio-optical sensors, was approved by the Committee.

Plans are underway for two new IOCCG capacity building initiatives: an advanced ocean-colour training course to be held in Newfoundland, Canada from 7-11 May 2007 (sponsored by the Canadian Space Agency), and a training course to be held in Africa (24 September-5 October 2007), organised by the Joint Research Centre (Italy) and co-sponsored by the IOCCG.

In other developments, the IOCCG Committee proposed the term "Ocean-Colour Radiometry" (OCR) for the general area of ocean-colour research, and urged the scientific research community to adopt this term in future publications. The full minutes of the meeting should be available on the IOCCG website within the next few weeks.

IOCCG

Mud volcano in Java may continue to erupt for months and possibly years

The mud volcano, known locally as 'Lusi', has been erupting for 239 days.

23 January 2007.- The first scientific report into the causes and impact of Lusi, the Indonesian mud volcano, reveals that the 2006 eruption will continue to erupt and spew out between 7,000 and 150,000 cubic metres of mud a day for months, if not years to come, leaving at least 10 km2 around the volcano vent uninhabitable for years and over 11,000 people permanently displaced.

The paper by a Durham University-led team and published in the February issue of US journal, GSA Today, reveals that the eruption was almost certainly manmade and caused by the drilling of a nearby exploratory borehole looking for gas, reinforcing the possible explanation in a UN report from July last year.

The mud volcano, known locally as 'Lusi', has been erupting for 239 days and has continued to spew between 7,000 and 150,000 cubic metres of mud out every day, destroying infrastructure, razing four villages and 25 factories. Thirteen people have also died as a result of a rupture in a natural gas pipeline that lay underneath one of the holding dams built to retain the mud. It first erupted on 29 May 2006 in the Porong subdistrict of Sidoarjo in Eastern Java, close to Indonesia's second city of Surabaya.

The team of mud volcano and pressure experts, who analysed satellite images of the area for their study, propose that a local region around the central volcano vent will collapse to form a crater. In addition an area of at least the dimensions of the flow (10km2) will probably sag over the next few months and years.

Mud volcano expert, Professor Richard Davies of Durham University's Centre for Research into Earth Energy Systems (CeREES) comments: "It is standard industry procedure that this kind of drilling requires the use of steel casing to support the borehole, to protect against the pressure of fluids such as water, oil or gas. In the case of Lusi a pressured limestone rock containing water (a water aquifer) was drilled while the lower part of the borehole was exposed and not protected by casing. As a result rocks fractured and a mix of mud and water worked its way to the surface. Our research brings us to the conclusion that the incident was most probably the result of drilling."

"Lusi is similar to a 'blow-out' (eruption of water at the surface) that happened offshore of Brunei in 1979. Just as is most probably the case with Lusi, the Brunei event was caused by drilling and it took an international oil company almost 30 years and 20 relief wells and monitoring before the eruption stopped."

The team from Durham, Cardiff and Aberdeen Universities and GeoPressure Technology Ltd, an Ikon Science company, has essentially discounted the effect of an earthquake which occurred in the region two days prior to the mud volcano as the cause of the eruption. This is based on the time-lapse between the earthquake and the eruption, the fact that there were no other mud volcanoes in the region following the earthquake and through comparison with other geological examples.

Durham Univ. Press Release
This news release is based on the findings published in the paper: Birth of a mud volcano: East Java (29 May 2006). Davies, R.J et al; GSA Today v. 17, no 2 (2007) 4-9 published by the Geological Society of America. Link to paper - http://www.gsajournals.org/perlserv/?request=get-toc&issn=1052-5173&volume=17&issue=2

International Heliophysical Year begins

(IHY) will begin with a ceremony held at the United Nations Science and Technology Subcommittee Session.

19 February 2007.- A year of scientific collaboration and public engagement events aimed at understanding space weather and the Sun's true effects throughout the Solar System starts today. The International Heliophysical Year (IHY) will begin with a ceremony held at the United Nations Science and Technology Subcommittee Session in Vienna on 19 February 2007.

IHY is just one, yearlong campaign within a decade-long initiative called International Living With a Star (ILWS). ESA and NASA are joint partners in ILWS (which consists of a total of 27 space agencies around the world).

ESF Exploratory Workshops

2007 Call for Proposals

Each year the European Science Foundation (ESF) supports approximately 50 Exploratory Workshops across all scientific domains. The focus of the scheme is on projects aiming to open up new directions in research or to explore emerging research fields with potential impact on new developments in science. Proposals should demonstrate the potential for initiating follow-up research activities and/or developing future collaborative actions. Interdisciplinary topics are encouraged.

ESF Exploratory Workshops awards are intended for small, interactive and output-oriented discussion meetings of maximum 30 participants and up to a maximum value of 15000 EUR. Awards are for workshops to be held in the calendar year 2008 (1 January - 31 December). Deadline for receipt of proposals: 27 April 2007 (16:00 CET). Full details are available at http://www.esf.org/workshops.

Céline Seewald
Life, Earth and Environmental Sciences
European Science Foundation

EU and US agree to cooperate on environmental research and ecoinformatics

The Environmental Protection Agency (EPA) of the United States and the European Commission, have agreed on an "Implementing Arrangement on Environmental Research and Ecoinformatics".

09 February 2007.- The Environ-mental Protection Agency (EPA) of the United States government and the European Commission, the executive arm of the European Union (EU), have agreed on an "Implementing Arrangement on Environmental Research and Ecoinformatics" (the science of information in ecology and environmental science) which was negotiated under the auspices of the bilateral Science and Technology Agreement between the United States and the European Union.

Following EPA Administrator Stephen L. Johnson's signature in Washington, Director-General José Manuel Silva Rodríguez signed the implementing arrangement on the margins of the EU-US Joint Consultative Group meeting on 9 February in Brussels. The Joint Consultative Group monitors the bilateral science and technology cooperation and discussed new transatlantic initiatives.

Among the collaborative research topics included in the Implementing Arrangement are:

·environmental information systems;
·development of environmental and sustainability indicators;
·environmental modelling;
·decision support tools;
·environment and health;
·sustainable chemistry and materials;
·uses and impacts of nanotechnology;
·environmental technologies and
·air quality management.

Cooperation under the EPA-EC Implementing Arrangement is expected to take many forms, including direct collaboration between US and European researchers and consortia; joint sponsorship of conferences, workshops and meetings; coordinated calls for proposals and mutual participation in peer reviews and exchanges of information, methodologies and data.

An opportunity to turn this arrangement into practice is cooperation under the newly launched 7th EU Research Framework Programme (FP7, 2007-2013). Certain relevant topics are included already in the first calls for proposals which were launched a few weeks ago with deadline for proposal submission in May 2007. The calls are published on www.cordis.europa.eu/fp7.

EC

New group of algae discovered

The newly discovered algae are found among the smallest members of photosynthetic plankton. Approximately 50 percent of global photosynthesis is conducted in the world's oceans where it is dominated by microscopic algae, the so-called phytoplankton. Scientists estimate that up to 90 percent of phytoplanktonic species are currently unidentified.

11 January 2007.- An international group of researchers has succeeded in identifying a previously unknown group of algae. As currently reported in the scientific journal Science, the newly discovered algae are found among the smallest members of photosynthetic plankton - the picoplankton ('Picobiliphytes: A marine picoplanktonic algal group with unknown affinities to other Eukaroytes" Science, Vol. 316'). On account of the minute size of the organisms (no more than a few thousandth of a millimetre) and the appearance of phycobili-proteins, researchers have termed the new group Picobiliphyta.

Approximately 50 percent of global photosynthesis is conducted in the world's oceans where it is dominated by microscopic algae, the so-called phytoplankton. Scientists estimate that up to 90 percent of phytoplanktonic species are currently unidentified. In the present study, scientists used molecular techniques to investigate the smallest members of the plankton, the picoplankton. Because picoplankton algae are so extremely small, they are almost impossible to study by means of microscopy.

Researchers investigated gene sequences of the 18S gene, common to all cells. The identity of new organisms can be deduced from a comparison of familiar and unfamiliar gene sequences. "The gene sequences found in these algae could not be associated with any previously known group of organisms", explain Dr Klaus Valentin and Dr. Linda Medlin, co-authors of the study and molecularbiologists at the Alfred Wegener Institute in Bremerhaven. The algae in this study were found in plankton samples originating from various regions of the North Atlantic and the Mediterranean.

AWI

New observatory is opened to monitor interactions between the atmosphere and the tropical oceans

Located on the Cape Verde island of São Vicente in the tropical east Atlantic Ocean.

The international observatory, located on the Cape Verde island of São Vicente in the tropical east Atlantic Ocean, began its working life in October 2006 and has already produced three months of atmospheric data. It is being formally opened on 9 January by Madalena Brito Neves, the Cape Verdean Minister of Environment and Agriculture.

The new observatory will monitor and measure changes in the chemical, biological and physical composition of the tropical ocean and the air immediately above it, the marine boundary layer.

The observatory is funded through the Natural Environment Research Council's (NERC) Surface Ocean–Lower Atmosphere Study programme (UK SOLAS). Partner organisation Leibniz Institute of Marine Sciences, (also known as IFM-GEOMAR), Kiel, in Germany, is providing additional funding and support through the EU Tropical Eastern North Atlantic Time-Series Observatory (TENATSO) project.

New ocean-based activities will start in the summer of 2007 with the installation of an 'ocean station' – a network of buoys and moored instruments – about 70 kilometres offshore. The station will monitor the temperature, salinity and nutrient content of the sea-water, as well as levels of carbon and oxygen and the productivity of marine organisms such as phytoplankton (tiny floating plants). The tropical sea is one of the places where sea-surface temperatures are rapidly changing, lowering amounts of phytoplankton (which soak up large amounts of carbon dioxide), directly resulting in differing levels of trace gases present in the atmosphere.

Leibniz Prize Winners 2007 announced

Two geophysicists among the winners

13 December 2006.-The Deutsche Forschungsgemeinschaft (German Research Foundation, DFG) has announced the winners of its 2007 Gottfried Wilhelm Leibniz Prize. At its meeting on 7 December 2006, the DFG Joint Committee named ten scientists and academics — eight men and two women — as recipients of Germany's most highly endowed research award. For the first time, the prize winners for 2007 will receive up to 2.5 million euros (previously: 1.55 million euros) and be able to use these funds flexibly over a period of seven years (previously: five years) to finance their research.

Two geophysicists were among the winners:

Prof. Dr. Gerald Haug (38), Paleoclimatology, Department of Geodynamics, GeoForschungsZentrum (GFZ) Potsdam, and Department of Geosciences, University of Potsdam (2.5 million euros)

Gerald Haug investigates climate developments over the last several thousand to several million years. On the basis of seabed and lake sediments, he has successfully used innovative methods to reconstruct climate changes in recent Earth history in a number of key regions on our planet. Among other topics, he has examined the causes of climate thresholds and major climate shifts in recent Earth and climate history. He has been able to provide a plausible explanation for one of the oldest mysteries of paleoclimate research — the onset of the major ice ages on the northern hemisphere over 2.7 million years ago — and to demonstrate that the North Pacific is the key source of humidity for the American ice shield and the entire northern hemisphere. He also proved that changes in the physical stratification of polar and subpolar oceans are closely related to alterations in the exchange of the greenhouse gas CO2 between the ocean and the atmosphere.

Gerald Haug studied geology at the University of Karlsruhe and earned his PhD at the University of Kiel in 1995. After four years as a postdoc in Kiel, Vancouver, Woods Hole, and Los Angeles, he became an assistant professor at the Swiss Federal Institute of Technology (ETH) in Zurich, where he habilitated in 2002. Since 2003 he has headed the "Climate Dynamics and Sediments" section at the GeoForschungsZentrum (GFZ) in Potsdam and taught at the University of Potsdam.

Prof. Dr. Falko Langenhorst (42), Mineralogy and Petrology, Institute of Geosciences, University of Jena (2.5 million euros)

Falko Langenhorst looks at the impacts of celestial bodies colliding with Earth, as well as with other planets and moons, which have played a major role in the evolution of our planet and the solar system. He focuses especially on the basic physics and chemistry of impact processes and their effects on the biosphere ("astromineralogy"). Falko Langenhorst was the first to detect high-pressure minerals in the Martian meteorite Zagami, which itself had been ejected from the surface of Mars by a meteorite and flung all the way to Earth. For the impact event that produced this Martian meteorite, Langenhorst has been able to determine pressures of about 300,000 bars and temperatures of 2,400 to 2,500 degrees Celsius. He also received great international attention for his research on the crystal chemistry of perovskite, a main component of Earth's lower mantle.

Falko Langenhorst studied mineralogy in Gießen and Münster, where he got his PhD in 1993 before he went to Lille as a postdoc. Since 2004 he has held the chair for general and applied mineralogy in Jena. His high international reputation is reflected in numerous honours, such as his membership in the Academia Europaea and a fellowship from the Japanese Society for the Promotion of Science.

The award ceremony for the Gottfried Wilhelm Leibniz Programme 2007 will take place on 13 March 2006, 3:00 PM, at the Berlin-Brandenburg Academy of Sciences and Humanities in Berlin. The prizes will be awarded by the new President of the DFG, Professor Matthias Kleiner.

DFG
http://www.dfg.de/en

HY-1B to be launched in April

The launch of the Chinese HY-1B satellite has been postponed to April this year.

The satellite, designed and developed by Chinese Academy of Space Technology (CAST) and sponsored by the State Ocean Administration (SOA) will carry a payload of two ocean-colour sensors: the Chinese Ocean Color and Temperature Scanner (COCTS), with 10 wavebands and a spatial resolution of 1.1 km, and the Coastal Zone Imager (CZI) with 4 wavebands and a spatial resolution of 250 m. The satellite will be used to monitor the ocean environment (ocean colour and sea surface temperature) and survey ocean resources. SOA will carry out an extensive bio-optical sampling programme over the next three years for algorithm development and validation in the coastal zone.

The launch of the satellite, the second in a series of four HY-1 oceanic satellites, has been postponed to April this year.

Climate changes brings trouble for marine life in European Seas, Marine Board-ESF report says

The latest European Science Foundation-Marine Board study report, Impact of climate change on European marine and coastal environment - Ecosystem approach, shows how even moderate climate scenarios have caused marked consequences on the European marine environment.

05 March 2007.- The study has detailed the impact of climate change at a European Seas level – in the Arctic, the Barents Sea, the Nordic Seas, the Baltic, the North Sea, the Northeast Atlantic, in the Celtic-Biscay Shelf, the Iberia upwelling margin, the Mediterranean and the Black Sea.

Take the northern Arctic and Barents Seas for example; the decline in sea ice cover there has triggered the most obvious temperature-related changes for marine life. The open systems structure of these seas has demonstrated how climate changes are causing further northward movement of marine organisms – Atlantic species are beginning to inhabit the more northern seas, the traditional preserve of Arctic species, and subtropical species are moving into southern waters where previously mainly temperate species existed.

In addition, the increased river runoff and subsequent freshening of the Baltic Sea have also led to shifts from marine to more brackish and even freshwater species while the temperature-induced loss of native species from enclosed systems, such as the Mediterranean and Black Sea, will enhance the introduction of non-native organisms, according to the study-report which is led by Dr. Katja Philippart from the Royal Netherlands Institute for Sea Research.

After taking in all of the recorded impacts on the European Seas for consideration, the ESF-Marine working group has identified other possible future challenges in terms of climate change monitoring, modelling, indicators and research and development. It has made several recommendations based on these challenges.

They are:

1. A concerted effort to gather, store and analyse previously and presently collected marine environmental data (e.g. common open access database and annual Pan-European reporting based on national contributions);

2. Identifying the nature and rate of consequences of climate change in European marine and coastal waters; this will require the maintainance of sustained monitoring efforts and use of new technologies to increase their spatial and temporal resolution;

3. Predicting the consequences of climate change for our marine environment; this will require the development and measurement of parameters.

4. Predicting the response and feedback of marine environments and ecosystems to climate change which would require the improvement of regional climate models and the development of biophysical models;

5. Predicting the impact on climate change on the distribution of marine organisms and on marine food webs; this will require the inclusion of knowledge on species' physiology, bioenergetics and behaviour in biophysical and ecosystem models.

The study report, which started in 2005, was disclosed today at the annual Young Marine Scientist's Day event taking place at the Boeverbos venue in Bruges, Belgium, organised by the Flanders Marine Institute (VLIZ).

ESF

http://www.esf.org/

Variability of return periods of European winter precipitation extremes

Changes of extreme European December-February precipitation back to 1700 for various European regions is investigated

The authors investigated the changes of the return periods of seasonal winter precipitation extremes over the last 300 years for various European regions. It was shown that the recurrence of both wet and dry winter precipitation extremes over Europe were subject to significant changes both before and after the onset of human influences on climate.

Generally, winter precipitationhas become more extreme. Over central Europe dry winters occurred more often during the past 300 years (except 1801–1850) with respect to 1951–2000. On the other hand, wet winters were less frequent (except 1701–1750). Over many other parts of Europe, extremes happened less frequently over the last 300 years compared to 1951–2000.

The article is available free of charge at
http://www.clim-past.net/3/65/2007/cp-3-65-2007.pdf

A. Pauling, and H. Paeth, On the variability of return periods of European winter precipitation extremes over the last three centuries, Clim. Past, 3, 65–76, 2007.

Multidecadal variations in the North Atlantic

The analyses of SLP reconstruction and proxy data depict a persistent atmospheric mode at least over the last 300 years

The authors investigate the spatial and temporal characteristics of multidecadal climate variability in the North Atlantic realm, using observational data, proxy data and model results. The dominant pattern of multidecadal variability of SST depicts a monopolar structure in the North

Atlantic during the instrumental period with cold (warm) phases during 1900–1925 and 1970–1990 (1870–1890 and 1940–1960). Two atmospheric general circulation models of different complexity forced with global SST over the last century show SLP anomaly patterns from the warm and cold phases of the North Atlantic similar to the corresponding observed patterns. The analysis of a sediment core from Cariaco Basin, a coral record from the northern Red Sea, and a long-term sea level pressure (SLP) reconstruction reveals that the multidecadal mode of the atmospheric circulation characterizes climate variability also in the pre-industrial era. The analyses of SLP reconstruction and proxy data depict a persistent atmospheric mode at least over the last 300 years, where SLP shows a dipolar structure in response to monopolar North Atlantic SST, in a similar way as the models' responses do.

The article is available free of charge at
http://www.clim-past.net/3/39/2007/cp-3-39-2007.pdf

K. Grosfeld, G. Lohmann, N. Rimbu, K. Fraedrich, and F. Lunkeit, Atmospheric multidecadal variations in the North Atlantic realm: proxy data, observations, and atmospheric circulation model studies, Clim. Past, 3, 39-50, 2007.

The extreme dryness of the stratosphere

Cirrus in the cold air above cumulonimbus clouds and the associated sedimentation of ice particles reduces water mass fluxes by nearly two orders of magnitude

The mechanisms responsible for the extreme dryness of the stratosphere have been debated for decades. A key difficulty has been the lack of comprehensive models which are able to reproduce the observations. The authors examine results from the coupled lower-middle atmosphere chemistry general circulation model ECHAM5/MESSy1 together with satellite observations. Model results match observed temperatures in the tropical lower stratosphere and realistically represent the seasonal and inter-annual variability of water vapor. The model reproduces the very low water vapor mixing ratios (below 2 ppmv) periodically observed at the tropical tropopause near 100 hPa, as well as the characteristic tape recorder signal up to about 10 hPa, providing evidence that the dehydration mechanism is well-captured. The results confirm that the entry of tropospheric air into the tropical stratosphere is forced by large-scale wave dynamics, whereas radiative cooling regionally decelerates upwelling and can even cause downwelling. Thin cirrus forms in the cold air above cumulonimbus clouds, and the associated sedimentation of ice particles between 100 and 200 hPa reduces water mass fluxes by nearly two orders of magnitude compared to air mass fluxes. Transport into the stratosphere is supported by regional net radiative heating, to a large extent in the outer tropics. During summer very deep monsoon convection over Southeast Asia, centered over Tibet, moistens the stratosphere.

The article is available free of charge at
http://www.atmos-chem-phys.net/7/1313/2007/acp-7-1313-2007.pdf

J. Lelieveld, C. Brühl, P. Jöckel, B. Steil, P. J. Crutzen, H. Fischer, M. A. Giorgetta, P. Hoor, M. G. Lawrence, R. Sausen, and H. Tost, Stratospheric dryness: model simulations and satellite observations, Atmos. Chem. Phys., 7, 1313-1332, 2007.

The global marine phosphorus cycle

New mass balance model for the coupled marine cycles of P and C used to examine relationships between oceanic circulation, primary productivity, and sedimentary burial of reactive P and particulate organic C on geological time scales

A new mass balance model for the coupled marine cycles of phosphorus (P) and carbon (C) is used to examine the relationships between oceanic circulation, primary productivity, and sedimentary burial of reactive P and particulate organic C (POC), on geological time scales. Steady state and transient simulations indicate that a slowing down of global ocean circulation decreases primary production in the open ocean, but increases that in the coastal ocean. The latter is due to increased transfer of soluble P from deep ocean water to the shelves, where it fuels primary production and causes increased reactive P burial. While authigenic calcium phosphate accounts for most reactive P burial ocean-wide, enhanced preservation of fish debris may become an important reactive P sink in deep-sea sediments during periods of ocean anoxia. Slower ocean circulation globally increases POC burial, because of enhanced POC preservation under anoxia in deep-sea depositional environments and higher primary productivity along the continental margins. In accordance with geological evidence, the model predicts increased accumulation of reactive P on the continental shelves during and following periods of ocean anoxia.

The article is available free of charge at
http://www.biogeosciences.net/4/155/2007/bg-4-155-2007.pdf

C. P. Slomp and P. Van Cappellen, The global marine phosphorus cycle: sensitivity to oceanic circulation, Biogeosciences, 4, 155-171, 2007.

Godwin Patrick Olu Obasi, 1933-2007

Former WMO Secretary-General Prof. Obasi Passed Away

Professor Godwin Patrick Olu Obasi, Secretary-General of the World Meteorological Organization from 1 January 1984 to 31 December 2003, passed away on 3 March 2007 in Abuja, Nigeria.

Geneva, 6 March 2007 (WMO).- Professor Obasi was born on 24 December 1933 in Ogori, Kogi State, Nigeria. He held a B.Sc. (Honours) degree in Mathematics and Physics (1959) from McGill University, Montreal (Canada);

a Master of Science degree (1960) and a Doctorate (1963) in meteorology from the Massachusetts Institute of Technology, U.S.A. He won the Carl Rossby Award for the best doctoral degree thesis.

Following his graduation, Professor Obasi joined the National Meteorological Service of Nigeria. Four years later, he joined the Faculty of the University of Nairobi, where he was later appointed Chairman of the Department of Meteorology and Dean of the Faculty of Science. In 1978, he moved to Geneva to join the WMO Secretariat as Director of the Education and Training Department.

In May 1983 he was elected Secretary-General of WMO by the World Meteorological Congress with a four years mandate beginning 1 January 1984. He was subsequently re-elected for four terms (in 1987, 1991, 1995 and 1999). Upon completion of his fifth term, he became Secretary-General Emeritus of WMO as decided by the 14th World Meteorological Congress.

During his tenure, Prof. Obasi was active in promoting global solutions to environmental issues, with special attention to the atmosphere, fresh water and the oceans. He was at the forefront in drawing the world's attention to the issue of climate change, notably in convening the Second World Climate Conference, held in Geneva, Switzerland, in 1990. He played an important role in the negotiations leading to the establishment of the United Nations Framework Convention on Climate Change, the United Nations Convention to Combat Desertification, the Intergovernmental Panel on Climate Change, the World Climate Research Programme, the Global Climate Observing System and the Vienna Convention on the Protection of the Ozone Layer and its Montreal Protocol.

Professor Obasi's name is closely associated with scientific breakthroughs in his field of specialization, atmospheric dynamics, including experiments related to the West African Monsoon and to global atmopsheric research.

Prof. Obasi was honoured by many professional meteorological and hydrological societies, academies of sciences and universities throughout the world.

WMO PR-No. 772

www.wmo.int

The stormy Sun affecting the human life and the technology

by Panagiotis Marchavilas

INTRODUCTION

The origins and fate of life on Earth are intimately connected to the way the Earth responds to the Sun's variations. We live in the extended atmosphere of an active star, as we can realize from the simplified illustration of the Sun–Earth connection of Figure 1 (Marhavilas, 2004). While sunlight enables and sustains life, the Sun's variability produces streams of high-energy particles and radiation that can harm life or alter its evolution. Under the magnetosphere (a protective shield of a magnetic field) and atmosphere, the Earth is an island in the Universe where life has developed and flourished (http://sec.gsfc.nasa.gov/sec_science.htm).

As the sphere of the human environment and exploration continues to expand towards space, understanding the effects of our active Sun and "space weather" on astronaut safety, satellite operations, power and communications, and climate change, becomes day after day more important. We need to understand and be able to predict the effects of solar activity on Earth and society (more information on NASA's LWS initiative: http://ds9.ssl.berkely.edu). Critical questions, associated with the Sun-Earth connected system, which must be answered, are as follows: How and why does the Sun vary? How does the Earth respond? What are the impacts on humanity?

This paper reviews present understanding of the dynamics of the solar-terrestrial environment and its impacts on the human activity.

THE STORMY SUN

The closer we get to the Sun's secrets, the more we admire the luminous body. The ancient Greek philosophers Anaxagoras (500-428 B.C.) and Democritus (460-370 B.C.) thought that the Sun was a crag, getting hot by its fast rotation. Heraclitus (544-470 B.C.) estimated that the Sun was not bigger than a footstep. According to Aristotle the Sun and the other luminous

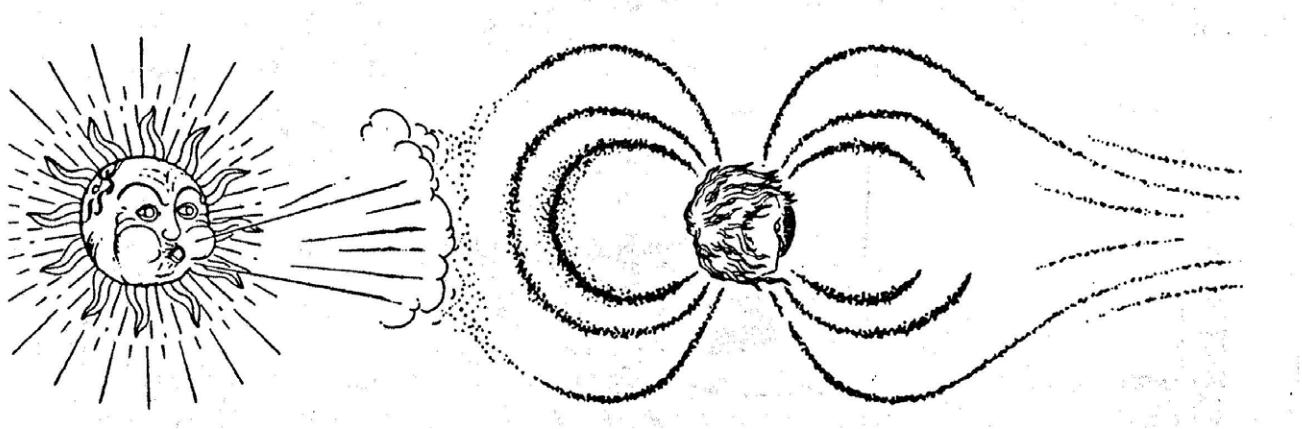

Figure 1. A simplified illustration of the Sun–Earth connection (see Marhavilas, 2004).

bodies consist of constant and everlasting matter-ether. Nowadays, we know that the Sun is a class G star (J.F. Graham, 1995) composed of ionized hydrogen and helium gas located ~150 million km from the Earth. Current calculations give its age at about of 5 billion years, i.e. about half its life span. It is a second generation star which means that it formed from the remains of some other stars which may have exploded between five and ten billion years ago. The Sun has a mass of 1.98 x 1030 kilograms about 333,000 times larger than the Earth's mass of 5.98 x 1024 kilograms. The Sun's radius is about 695,000 km compared to the Earth's radius of 6378 km.

Because the Sun is an enormous gaseous sphere it rotates faster around the equator than it does at the poles, 27 days versus about 35 days. Its surface temperature is about 5,770º Kelvin and its interior temperature is about 16 million degrees Kelvin. Its total radiated energy is equivalent to 100 billion tons of TNT exploding per second or the same as a significant portion of the Earth's entire nuclear arsenal exploding every second. This power is obviously important to us because it supports all life on the Earth. It causes seasonal changes, ocean current flows, and atmospheric circulation. It also is responsible for photosynthesis for plant life from which is derived all food and fossil fuels.

The Sun contains several major sections: the core along with the radiative and the convective layers. The Sun is a huge thermonuclear reactor. The process by which the Sun gives off energy is the fusion i.e. the conversion of hydrogen into helium by nuclear reactions, which release energy. Even though the nuclear burning occurs in the core, the heat and light generated from this process take about 10 million years to reach the Sun's surface. Once the photons depart the core, they must travel through the radiative layer to the convective zone where the temperatures go from 8 million to 7,000º Kelvin. After reaching the Sun's surface also known as the photosphere, the photons travel through the chromosphere and it eventually reach the corona. The last three regions with their different physical properties constitute the solar atmosphere. Most of the solar radiation comes from the photosphere (its name comes from the Greek word "φως" ("phos") that means "light"), which emits a continuous spectrum with superimposed dark absorption lines. The photosphere is the visible surface of the Sun. This is what we see in a clear day from the ground. Its temperature is ~5,800 ïK. The chromosphere lies above the photosphere up to a height of ~1,500 km with a temperature of ~10,000 to ~500,000 ïK. When the Sun is observed through filters of different wavelengths, pictures can be obtained of the Sun's structure at a variety of levels. The lower chromosphere is shown up by using an Ha filter. In the beginning of an eclipse we can see light that has emitted from the photosphere and is then scattered towards us at the chromospheric levels as well as the intrinsic chromospheric emission. This colourful effect (it appears bright red), led Young in 1870 (Priest, 1984) to give the chromosphere its name (from the Greek word "χρώμα" ("chroma") that means colour). The corona (from the Latin word for "crown") is the upper layer of the solar atmosphere. In this layer the temperature rises to more than ~1,000,000 ïK.

The Solar Wind

Near its surface, the Sun is like a pot of boiling water, with bubbles of hot, electrified gas – actually electrons and protons in the forth state of matter known as "plasma" – circulating up from the interior, rising to the surface, and bursting out into space. The steady stream of ionized plasma, which continuously escapes from the solar corona and pervades the whole interplanetary space (Hundhausen, 1972, 1995), is known as the solar wind. This gas, composed of electrons and protons with approximately 10% helium ions, also induces geomagnetic activity by variations of its pressure and magnetic field (N. Vilmer, 1998). At the orbit of Earth, this wind has a density of about 10 particles per cc, a temperature of about 1 keV (equivalent to about 10,000,000 oK) and an average speed of about 500 km/sec. The solar wind gas also has magnetic fields from the sun imbedded within it. At Earth's orbit, these fields have a strength of ~10 nT (about 3,000 times less than the Earth's magnetic field at its surface).

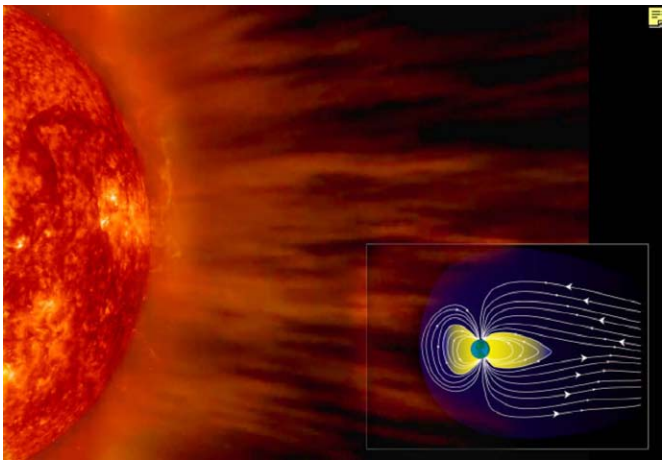

Figure 2. The solar wind streaming away from the Sun (NASA & ESA, 2002).

Blowing at ~400 to ~2,500 km per second, the solar wind (see Figure 2) carries a million tons of matter into space every second (NASA & ESA, 2002). Although the solar wind carries mass away from the Sun at rate of 1.6x1012 gr/sec and energy at a rate of 1.8x1027 erg/sec, it is negligible in the overall mass and energy balance of the sun. It's not the mass or speed, however, that makes the solar wind potent. In fact, the solar wind would not even ruffle the hair on the head because there are too few particles in the breeze (our air is millions of times denser than the solar wind). Instead, it is the energy stored in the plasma and the magnetic fields associated with that plasma that allow the wind to shape and impact Earth's protective magnetic shield in space (the magnetosphere). Though less than 1% of the solar wind penetrates the magnetosphere, that's enough to generate millions of amps of electric current in our atmosphere and to cause occasional storms in the space around Earth (see: NASA's brochure, 1998).

The Sun-Earth system is driven by the 11-year solar cycle. This means that every 11 year the Sun reaches a peak period of activity called "solar maximum", followed a few years later by a period of quiet called the "solar minimum". During solar maximum there are many sunspots, eruptive prominences, solar flares, and coronal mass ejections (CMEs), all of which can affect communications and other technology here on Earth. The last maximum occurred in 2000 during Cycle 23.

Sunspots

One way of tracking solar activity is by observing the number of sunspots. During solar maximum there are hundreds

of sunspots and during solar minimum only a dozen can be found. In the photosphere the sunspots are characterized by the most intense concentrations of magnetic flux that have been formed during the emergence of flux in one day or so. They are relatively cool areas that appear as dark patches like freckles on the solar surface formed when magnetic field lines just below the Sun's surface are twisted and poke through the solar surface (see Figure 3). They appear dark because they are not as hot or bright as the area surrounding them (4,000 º Kelvin vs. 6,000 º Kelvin). Sunspots can last from a few hours to several months, and a large sunspot can grow several times the size of Earth.

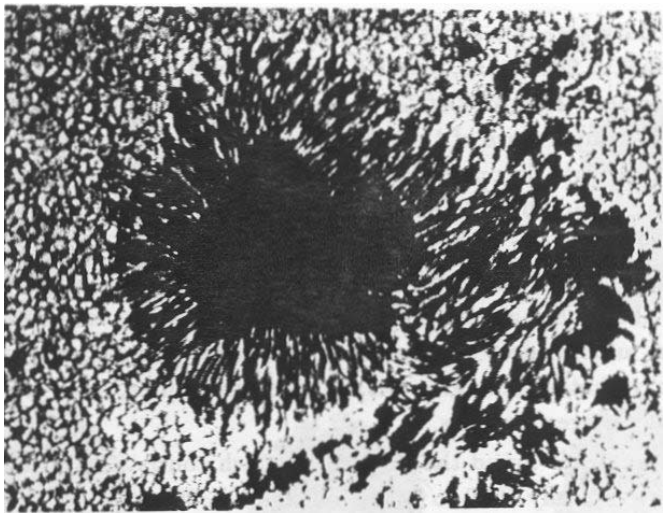

Figure 3. A large sunspot [Muller R., 1973]

Though the Chinese recorded some observations as early as 28 B.C., scientists have been observing and recording sunspots since the 17th Century. (Galileo, who first performed scientific observations in the early 1613, concluded that the Sun did indeed have spots.) The scientists care about sunspots because they are visible signs of the turmoil inside the Sun that lead to space weather effects on Earth (see: NASA's brochure, 2000).

However sunspots, which are surrounded by areas with enhanced brightness called active regions, are not the only element of solar activity. The Sun emits more energy when it is active. Increased solar activity also means stronger and more frequent eruptive prominences, and solar flares (a dramatic release of energy equivalent to a million hundred-megaton nuclear explosions).

Prominences

Prominences are the most impressive objects on the Sun because they are located in the corona but possess temperatures a hundred times lower and densities a hundred or a thousand times greater than the coronal values. They are structures in the corona, consisting of cool plasma supported by magnetic fields (see Figure 4). They are bright when seen at the Sun's edge. However, when seen against the bright solar disk they are dark and are called filaments. If they have broken away from the sun, they are called eruptive prominences.

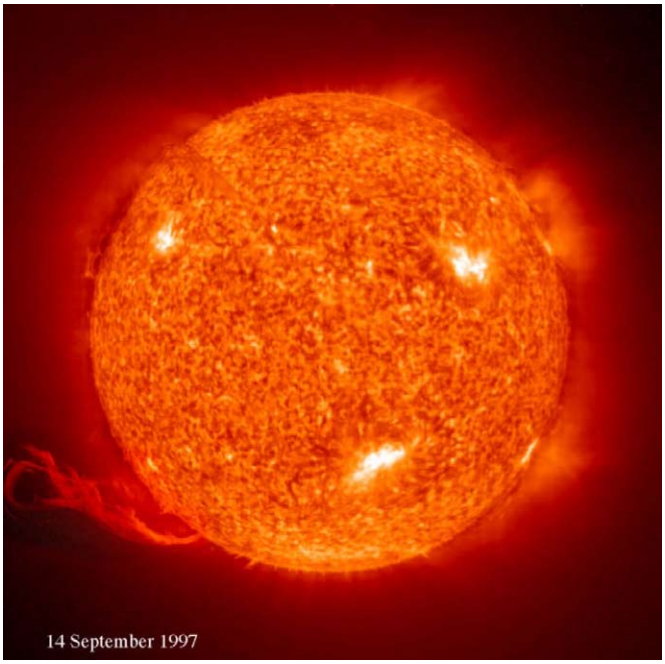

Figure 4. An image of a large eruptive prominence emerging from the solar surface that was taken on 14 September 1997 by the Extreme Ultraviolet Imaging Telescope onboard NASA's Solar and Heliospheric Observatory (SOHO) spacecraft, in an extreme ultraviolet wavelength of ionised helium heated to about 60,000 to 80,000 oK (http://sohowww.nasacom.nasa.gov, http://sohowww.estec.esa.nl).

Solar Flares

Solar Flares are huge explosions in the Sun's atmosphere. They appear to our instruments as bright flashes in visible light, often followed by a burst of high-energy protons and radiation. Moreover their characteristics can include bursts of radiowaves, EUV and X-rays. A large solar flare can release a thousand million megatones of energy [more precisely 1028 to 1034 ergs (N. Vilmer, 1998)] in a single explosion. The released energy is transformed into: 1) thermal energy (localized heating leading to an increased brightness of e.g. the Ha and X-ray emission), 2) particle kinetic energy leading to the acceleration of electrons to energies of 10 keV to 1 GeV and ions to ener-

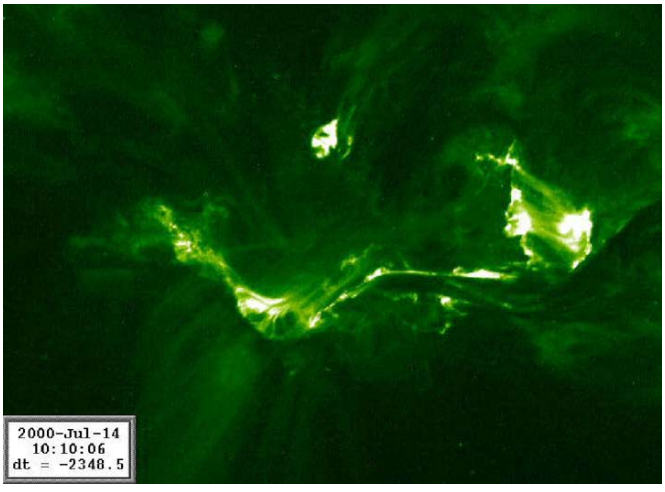

Figure 5. The unusually large flare, which took place on 14 July 2000. This event was so remarkable that it has become known as the "Bastille Day" event. (F. Jansen & R. Hippler, 2003).

gies from a few MeV/nuc to GeV/nuc, 3) mechanical energy leading to several kinds of plasma ejecta. Solar flares sometimes occur together with other signatures of solar activity e.g. prominence eruptions, CMEs and interplanetary shock waves. However the exact relationship between these phenomena is not yet completely understood. In fact the solar flares are one of the main challenges of space weather prediction. Figure 5 shows the unusually large flare, which took place on 14/7/2000 (F. Jansen & R. Hippler, 2003). This event was so remarkable that it has become known as the “Bastille Day” event.

Coronal Mass Ejections (CMEs)

One of the most important solar events from the Earth’s perspective is the coronal mass ejection, the solar equivalent of a hurricane (NASA’s brochure, 2000). A CME is the eruption of a huge bubble of plasma from the Sun’s outer atmosphere. It can occur with or without solar flares, and can threaten Earth’s atmosphere. Once it escapes the Sun’s gravity, a CME speeds at velocities approaching 400 km/sec (~1,000,000 miles/hr) up to 2,000 km/sec (~5,000,000 miles/hr). A typical CME can carry more than 10 billion tons of plasma into the solar system. Just hours after blowing into space, a CME cloud can grow to dimensions exceeding those of the Sun itself, often as wide as 20 million km across. As it ploughs into the solar wind, a CME can create a shock wave that accelerates particles to dangerously high energies and speeds. Behind that shock wave, the CME cloud flies through the solar system bombarding planets, asteroids, and other objects with radiation and plasma. If a CME erupts on the side of the Sun facing Earth, and if our orbit intersects the path of that cloud, the results can be spectacular and sometimes hazardous. Figure 6 shows a large CME erupting from the Sun on 2nd April 2001. The CME is seen as a bright cloud expanding towards the right hand side of the image taken using the LASCO coronograph onboard SOHO. In this case an EUV image of the Sun has been superimposed onto the LASCO image to show the size and location of active regions on that day.

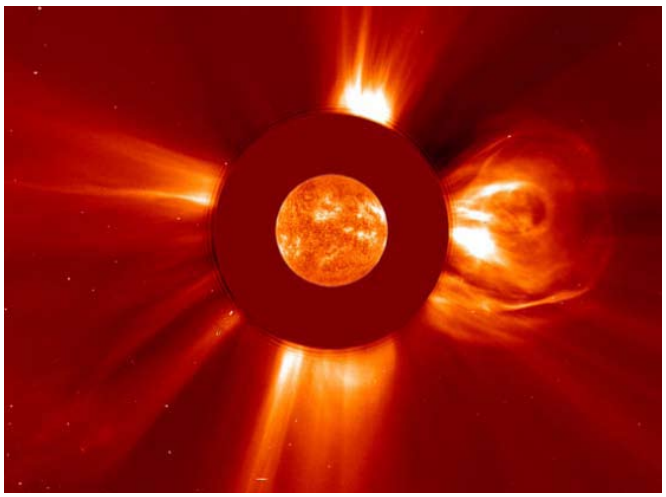

Figure 6. A large coronal mass ejection (CME) erupting from the Sun on 2nd April 2001. The CME is seen as a bright cloud expanding towards the right hand side of the image taken using the LASCO coronograph onboard SOHO. In this case an EUV image of the Sun has been superimposed onto the LASCO image to show the size and location of active regions on that day (http://sohowww.nasacom.nasa.gov, http://sohowww.estec.esa.nl).

Geomagnetic storms and substorms

The region near-Earth space, where the dynamics is governed by the internal geomagnetic field, is called magnetosphere. The solar wind flow past the Earth distorts the dipole field to compress it on the dayside and elongate it to a long geomagnetic tail on the nightside. The geomagnetic tail plays a key role in magnetospheric dynamics; for example, it acts as an energy reservoir for the dynamic processes (T.I. Pulkkinen, 1998). The magnetosphere (Figure 7) comprises distinct regions, which all have their characteristic plasma properties: The tail lobes at high latitudes are regions of low plasma density and energy, whereas the plasma sheet is characterized by denser and hotter ~keV plasma. The most hazardous region for technological systems is the inner magnetosphere, where trapped populations of high-energy (from hundreds of keV to multi-MeV) electrons and ions reside in the ring current and in the Van Allen radiation belts.

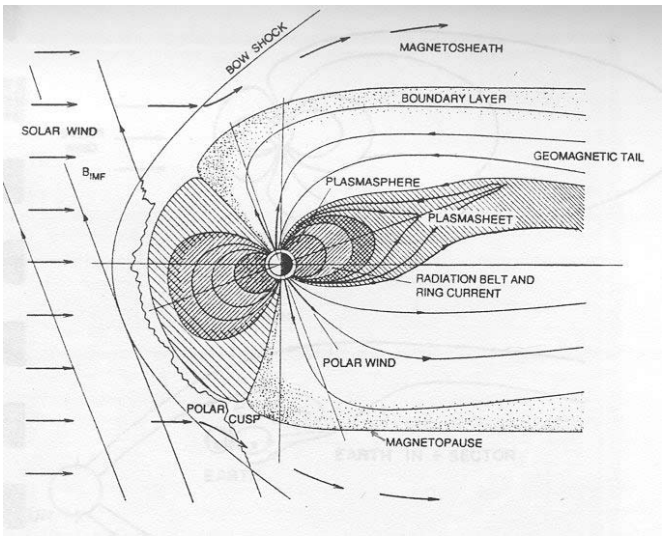

Figure 7. Schematic of the Earth’s proximate space environment, the magnetosphere.

The dynamic response of the magnetosphere to varying solar wind and interplanetary magnetic field conditions is the magnetospheric substorm (Rostoker et al. 1980). Energy input from the solar wind is largely controlled by the interplanetary magnetic field orientation: During periods of southward interplanetary field, the energy input is enhanced and the energy extracted from the solar wind is stored in the magnetosphere in the form of magnetic field energy in the magnetotail. This is the substorm growth phase. After typically 30-60 min, the magnetotail undergoes a change of state from stable to unstable, and the stored energy is dissipated via a highly dynamic process. This substorm expansion phase involves an injection of energetic (tens to hundreds of keV) electrons and ions to the vicinity of the geostationary orbit, strong electric currents in the auroral regions, and rapid fluctuations and configurational changes of the magnetospheric magnetic field. All these phenomena are potential space weather effects. The substorm process ends when the energy dissipation ceases and the magnetosphere recovers its initial state after about two to four hours from the beginning of the event (for recent reviews: McPherron, 1991; Baker et al. 1996; Pulkkinen, 1998).

Geomagnetic storms are large disturbances in the near-Earth environment caused by coherent solar wind and inter-

planetary field structures that originate from solar disturbances such as CMEs (Gonzalez et al. 1994). Storms are associated with major disturbances in the geomagnetic field and strong enhancement of the fluxes of energetic (tens to hundreds of keV) ions and high-energy (up to several MeV) electrons in the outer Van-Allen radiation belt (Baker et al. 1998).

IMPACTS ON HUMAN LIFE AND ACTIVITY

Space Weather

As A. Frank has written (A. Frank, 1999), humanity is maturing into a space-faring race. The response of the space environment, particularly around the Earth, to the stormy Sun, is known as Space Weather, which is a hot topic today, because of the increasing awareness that many modern technological systems are potentially vulnerable to the effects from solar storms. On the other side, the danger of some aspects of space weather has slowly been recognized, and is studied by the scientists in order to help protect space and ground systems (technical and biological) from space environment hazards. Space weather disturbances are generally caused by transient events in the solar atmosphere. There are two different types of events, which trigger disturbances in the Earth's environment (Brekke, 2001): a) solar flares and b) CMEs. However, not all solar flares result in geomagnetic storms, and even more significantly, not all geomagnetic storms can be associated with solar flares. CMEs are some of the most dramatic space weather effects. The emission from the two types of disturbances can be divided into two classes: a) particle radiation and b) electromagnetic radiation, which will have different effects on the Earth's environment.

Particle Radiation: A continuous flow of charged particles (protons and electrons), the solar wind, is streaming out from the Sun. Moreover, several types of solar events can cause particles with high velocities to be superimposed on this background solar wind. CMEs carry billion tons of matter at high speeds, considerably greater than the normal solar wind velocities. The cloud of charged particles (which also bring with them parts of the solar magnetic field) interacts with the Earth's magnetic field when it reaches the Earth's orbit. This results in a disturbance of the Earth's magnetic field, and the auroral particle precipitation into the atmosphere increases. The aurora (as discussed below) is a dynamic and delicate visual manifestation of solar-induced geomagnetic storms.

Electromagnetic Radiation: The energetic radiation bursts from flares, travel at the speed of light well ahead of any particles or coronal material associated with the flares, arrive at Earth just 8 minutes after leaving the flare site. Moreover, unlike the electrons and ions of the solar wind and the solar energetic particle populations, the passage of electromagnetic waves is not affected by the presence of Earth's magnetic field. The direct response of the upper atmosphere to a burst of solar flare ultraviolet and x-ray emissions is a temporary increase in ionisation (as well as temperature) in the sunlit hemisphere, lasting from minutes to hours and called a sudden ionospheric disturbance. This can cause disruption of short-wave radio communication at HF frequencies (3-30 MHz), which is still extensively used by the military and for overseas broadcasting.

Historical Notes

The earliest evidence for the impact of solar-terrestrial phenomena on technical systems appeared in the first half of the 19th century (Lanzerotti et al., 1999). Beginning with the invention of telegraphy in 1841, during solar storms, "earth currents" induced by the changing terrestrial magnetic field, were so powerful that telegraphers didn't need a battery to send their messages down the line. Any relationship of the sun to the appearances of the "spontaneous" currents that were measured on the telegraph wires was not clarified until the occurrence of the large white light solar flare of late August 1859 (Carrington, 1863; the first such flare ever recorded by astronomers). Within a day following this flare, large geomagnetic disturbances and wide-spread aurora were observed over the Earth, including at low geomagnetic latitudes in Hawaii and Rome. The advancement in communications provided by radio stimulated a significant need to better understand the medium that was critical in bending the radio waves around the curvature of Earth, the ionosphere. The same ionosphere currents that could produce "spontaneous" Earth currents could also affect the reception and the fidelity of the transmitted, long-distance wireless signals. Marconi in 1928 noted, with respect to wireless communications, that "… times of bad fading practically always coincide with the appearance of large sun-spots and intense aurora-boreali usually accompanied by magnetic storms …" He also wrote that these were "… same periods when cables and land lines experience difficulties or are thrown out of action". Such concerns have persisted throughout the twentieth century (e.g. Gassmann, 1963), with considerable present-day research on the ionosphere being motivated by engineering considerations similar to those encountered in the early days of trans-ocean wireless communications.

The March 24, 1940 storm caused a temporary disruption of electrical service in New England, New York, Pennsylvania, Minnesota, Quebec and Ontario. A storm on February 9-10, 1958 caused a power transformer failure at the British Columbia Hydro and Power Authority. On August 2, 1972, the Bureau of Reclamation power station in Watertown, South Dakota was subjected to large swings in power line voltages up to 25,000 volts. Similar voltage swings were reported by Wisconsin Power and Light, Madison Gas and Electric, and Wisconsin Public Service Corporation. A 230,000-volt transformer at the British Columbia Hydro and Power Authority exploded, and Manitoba Hydro in Canada recorded power drops from 164 to 44 megawatts in a matter of a few minutes, in the power it was supplying to Minnesota (St. Odenwald, 1998).

Aurora

The aurora is beautiful, spectacular, splendid, and appears quite frequently – almost nightly – in the polar sky (Daglis & Akasofu, 2004). Appearing in the form of majestic, colourful, irregular lights in the night sky, the aurora has a variety of shapes, colours, and structures (alike shimmering, colourful curtains), and continuously changing in the time (see Figure 8). Although many theories existed, it wasn't until a hundred years ago that scientists discovered that they were caused by interactions with the Sun. It is a large-scale electrical discharge phenomenon in the high-altitude atmosphere, resulting from quantum leaps in oxygen and nitrogen atoms. What exactly happens? In the highest reaches of the atmosphere, above about a hundred kilometres, oxygen and nitrogen atoms and molecules are energized and/or ionised by energetic electrons. In this transition region between the earth's atmosphere and near-earth space free electrons abound. Accelerated by elec-

tric fields in the magnetosphere, energetic electrons streaming geomagnetic field lines hit and excite atoms and molecules. The auroral light results from the de-excitation of these particles. The colour, shape, and intensity depend on the electromagnetic forces that shoot electrons downward into the upper atmosphere.

Figure 8. Auroral bands. Aurora appear from Earth as shimmering, dancing lights in the night sky. Only 100 years ago did scientists discover that the Sun was the source of these mysterious lights. Although green is the most common color, red and yellow hues are also observed. The most powerful displays occur when large clouds of particles from CMEs slam into our magnetosphere, but the constant outpouring of solar particles (called the solar wind) can cause them as well (http://www.geo.mtu.edu/weather/aurora/images/aurora/jan.curtis/, photographs by Jan Curtis).

Impacts of Solar-Terrestrial Processes on Technology

During a space weather storm electric currents flowing in the magnetosphere and ionosphere change rapidly. The variations produce temporal changes in the geomagnetic field. These changes are known as (geo)magnetic disturbances or storms. According to Faraday's law of induction, magnetic disturbances are accompanied by an electric field, which drives currents within the conducting earth. These currents affect the magnetic disturbance and the (geo)electric field occurring at the earth's surface, too. The electric field also creates currents in man-made conductor systems, such as electric power transmission networks, oil and gas pipelines, telecommunication cables and railway equipment, in which they are called geomagnetically induced currents (GIC). Inconveniences to the system may result from GIC (Pirjola et al. 1998). Large CIC occur most frequently in the auroral regions, in particular in North America. The increasing number of technological systems vulnerable by GIC and the approaching sunspot maximum with a higher geomagnetic activity make GIC research very actual and important now. In Table 1, many of technological systems are listed, which must include processes and parameters from the solar-terrestrial environment in their design and/or operations. These systems are grouped into categories that have similar physical origins. Some of the effects of the solar-terrestrial environment on technical systems deployed on the Earth's surface and in space, and/or whose signals propagate through the space environment are depicted in the paper of L. Lanzerotti et al. (1999).

Table 1 Impacts of Solar-Terrestrial Processes on Technology

● Ionosphere Variations
- Wireless signal reflection, propagation, attenuation
- Communication satellite signal interference, scintillation
- Interference with geophysical prospecting
- Source of electrical currents in the Earth
Power distribution systems
Long communications cables, land and ocean
Pipelines
● Radiation
- Solar cell damage
- Semiconductor device damage and failure
- Misoperation of semiconductor devices
- Spacecraft charging, surface and interior materials
- Astronaut safety
- Airline passenger safety
● Magnetic field variations
- Attitude control of spacecraft
- Compasses
● Solar radio bursts
- Excess noise levels in wireless communication systems
● Atmosphere
- Low altitude satellite drag
- Attenuation and scatter of wireless signals

Electric Power Systems: As compared to the 50 (or 60) Hz frequency used in electric power transmission, geomagnetic variations are slow with typical frequencies in the mHz range. Therefore GIC, when flowing through a transformer, affects as a dc current. In normal conditions the ac exciting current needed to provide the magnetic flux for the voltage transformation in a power transformer is only a few amperes, and the transformer operates within the range where the dependence of the exciting current on the voltage is linear. However, the presence of GIC implies an offset of the operation curve resulting in saturation of the transformer during one half of the ac cycle and in an extremely large non-linear exciting current (even some hundreds of amperes). The exciting current is asymmetric with respect to the ac half-cycles and is thus distorted by even and odd harmonics, which in turn may cause relaying problems in the system. The increased exciting current also produces large reactive power losses in the transformer contributing to a serious voltage drop. The harmonics and the reactive power demands also affect the transformer itself. The noise level is increased, and due to the saturation of the core, the magnetic flux goes through other parts of the transformer possibly resulting in overheading. The hot spots may permanently damage the insulators and cause gassing of transformer oil resulting in serious internal failures (more information in the paper of R. Pirjola et al., 1998).

Perhaps the most dramatic and famous GIC failure occurred in the Hydro-Quebec power system on March 13, 1989 (Kappenman and Albertson, 1990) so that for nine hours, large portions of Quebec were plunged into darkness.

Oil and Natural Gas Pipelines: GIC currents flowing in pipelines are known to enhance the rate of corrosion over time,

and this can have catastrophic effects (St. Odenwald, 1998).

Effects on Spacecraft and Aircraft Electronics: Spacecraft systems are vulnerable to space weather through its influence on energetic charged particle and plasma populations, while aircraft electronics and aircrew are vulnerable to cosmic rays and solar particle events. These particles produce a variety of effects including total dose, lattice displacement damage, single event effects (SEE), noise in sensors and spacecraft charging (Dyer and Rodgers, 1998). Dose is used to quantify the effects of charge liberation by ionisation and is defined as the energy deposited as ionisation and excitation per unit mass of material. [SI units: J/kg or grays (=100 rads, where 1rad=100 erg/g)]. The majority of effects depend on rate of delivery and so dose-rate information is required. Accumulated dose leads to threshold voltage shifts in CMOS due to trapped holes in the oxide and the formation of interface states. In addition increased leakage currents and gain degradation in bipolar devices can occur. A proportion of the energy-loss of energetic radiation gives rise to lattice displacement damage and it is found that effects scale with NIEL (non-ionising energy loss per unit). Examples of damage effects are reduction in bipolar transistor gain, reduced efficiencies in solar cells, light emitting diodes and photodetectors, charge transfer inefficiency in charge coupled devices and resolution degradation in solid-state detectors. The primary cosmic rays are very energetic and are highly ionising, which means that they strip electrons from atoms, which lie in their path and hence generate charge. The density of charge deposition is proportional to the square of the atomic number of the cosmic ray so that the heavier species can deposit enough charge in a small volume of silicon to change the state of a memory cell, a “one” becoming a “zero” and vice versa. Thus memories can become corrupted and this could lead to erroneous commands. Such errors are referred to as single event upsets (SEU). Sometimes a single particle can upset more than one bit to give what are called multiple bit upsets (MBU). Certain devices could be triggered into a state of high current drain, leading to burn-out and hardware failure; such effects are termed single event latch-up or single event burn-out. These deleterious interactions of individual particles are referred to as single event effects (SEE). A classic example of hardware failure occurred in the PRARE instrument carried on the ERS-1 (European Ranging Sensing Spacecraft). Surface electrostatic charging can occur when spacecraft are bathed in energetic plasmas (several keV electron temperature) without the presence of neutralising cold plasma. Numerous anomalies have occurred from both surface and deep dielectric charging. Some of these have proved fatal (e.g. ANIK E1). Spurious counts, which constitute the background noise, are produced in many detector systems and these depend on the size distribution of individual depositions and can occur from both prompt ionisation and delayed depositions due to induced radioactivity. In the last ten years it has been realised that single event effects will also be experienced by sensitive electronics (avionics) in aircraft systems, which are subjected to increasing levels of cosmic radiation and their secondaries as altitude increases.

Radiobiology in Space Research

For high-altitude flights beyond the magnetic shielding of the earth, cosmic radiation i.e. high-energy particles from protons to iron ions predominate. Space radiation reaches its maximum values at a solar particle event where the lethal doses can be delivered within an hour or less (Testard et al. 1998). These events however are rather unlikely. Much more important is the permanent i.e. protracted exposure to the low-dose radiation of the heavy charged particles of cosmic galactic rays. Because of their high local dose these particles are able to create local damage in bio-molecules that can manifest itself in long-term alterations like genetic mutation and cancer induction. It is the induction of these biological changes that determines the general risk of long-term missions. For low altitude flights such as MIR or space station orbits, trapped electrons and protons from solar origin predominate. To study the biological radiation response, especially genetic alterations and cancerogenesis, X-ray experiments can be performed in order to mimic sparsely ionising electrons. The radiation environment is present both on earth and in space but differs in quality and intensity. Spaceflights are on average 300 times more exposure-intensive than our daily life. Depending on dose, acute or long-term effects can be induced by radiation exposure. Acute effects like nausea, vomiting, skin irritation, depletion of white blood cells occur at doses of about 1.5 Gy or more (Testard et al. 1998). These high doses are produced by solar storms. Long-terms effects are genetic alterations, cancer induction, damage to the central nervous system and peripheral neurons and accelerated aging. Among these effects cancerogenesis and neural damage seems to be the most important. The uncertaincies for the risk determination with regard to long-term effects are large and the risk estimation is mainly based on epidemiological data from the atomic bomb survivors.

Magnetic storms trigger myocardial infractions with mechanisms relating to heart rate variability (Halberg et al., 2001).

Travelling outside of the Earth’s atmosphere - Astronauts

Travelling outside of the Earth’s atmosphere, places one in extremely hostile surroundings. Space can be defined in many ways. Using the threshold at the point where humans can no longer survive without life support, space begins in the stratosphere (18 km to 50 km). Travelling beyond the stratosphere, astronauts encounter several more layers of Earth’s atmosphere before reaching the exosphere (above 300 km) and the vacuum of low-Earth orbit. Heat is transferred only by radiation in space, and temperature can vary from extremes near absolute zero (-273 degrees Celsius) to over 1200 degrees Celsius. When humans travel into space, temperature is not the only consideration. Two forms of radiation - electromagnetic and ionizing - are prevalent. Ionizing radiation, composed of high energy particles and photons, can be further categorized into the radiation found in the Van Allen Belts, solar cosmic rays (SCR), and galactic cosmic rays (GCR). All three can be potentially harmful to astronauts in space.

Van Allen Belts: The Van Allen radiation results from electrons and ions trapped in the Earth’s magnetic field. They form donut shaped rings around the Earth and are distributed non-uniformly within the magnetosphere. The two belts are located at altitudes of 300 to 1200 km and above 10,000 km. Extended stays in either can be fatal.

Solar Cosmic Rays: Regular and irregular forms of solar cosmic rays, or solar particle events (SPR), occur as solar wind and solar flares, respectively. This phenomenon contributes to the Van Allen Belts. Solar flares, resulting from “storms” in the Sun’s magnetosphere, yield extremely high radiation doses of radiation ranging from hours to days.

Galactic Cosmic Radiation: Having the highest energy of the three forms, GCR consists of protons, ?-particles, and heavy nuclei and is the most penetrating. It is emitted from distant stars and galaxies, diffusing through space and arriving at Earth in all directions. The flux of GCR is indirectly related to the solar cycle, with the minimum occurring at solar maximum (when the solar particles can best scatter the GCR from Earth.) Extra-vehicular activity in low-Earth orbit is shielded from this form of radiation, but in-transit crewmembers to the Moon or Mars would be susceptible to its effects.

During the Apollo program, there were several near-misses between the astronauts walking on the surface of the Moon and a deadly solar storm event. The Apollo 12 astronauts walked on the Moon only a few short weeks after a major solar proton flare would have bathed the astronauts in a 100 rem blast of radiation. Another major flare that occurred half way between the Apollo 16 and Apollo 17 moonwalks would have had a much more deadly outcome had it arrived while astronauts were outside their spacecraft playing golf. Within a few minutes, the astronauts would have been killed on the spot with an incredible 7000 rem blast of radiation.

The MIR space station has been inhabited for over a decade, and according to Astronaut Shanon Lucid, the daily dosage of radiation is about equal to 8 chest X-rays per day. During one solar storm towards the end of 1989, MIR cosmonauts accumulated in a few hours, a full- years dosage limit of radiation. Meanwhile, the Space Station will be assembled in an orbit which will take it through the South Atlantic Anomaly. Moreover, Space Station assembly will involve several thousand hours of space walks by astronauts. The main construction work will occur between the years 2000 and 2002 during the sunspot maximum period of Cycle 23. We can expect construction activity to be tied to solar conditions in a way that will frustrate the scheduling of many complex activities and the launches of Space Station components.

Impacts on Earth's Climate

Scientists increasingly suspect that solar activity affects more than just satellites and power grids. Although sunspots and active regions themselves produce only minor variations in the energy output from the Sun, the magnetic activity that accompanies these regions can produce dramatic changes in the ultraviolet and soft X-ray emission levels. These changes over the solar cycle have important consequences for the Earth's upper atmosphere and are known to alter the dynamics, temperature and chemistry (e.g., ozone) in these layers. This may have implications on the Earth's climate (Brekke, 2001). Moreover, there have been suggestions that climate is related to the appearance and disappearance of sunspots. Researchers have found that the solar constant (s = 1.37 kW / m²), which describes the solar radiation that falls on an area above the atmosphere at a vertical angle, doesn't remain constant, but varies slightly with sunspots and other solar activity. The total solar invariance varies just as regularly as the sunspot activity over the 11-year-solar cycle. Satellite measurements showed that the solar output variation is proportional to sunspot numbers. A research of Lane at al. (1994) indicates that the combined effects of sunspot-induced changes in solar irradiance and increases in atmospheric greenhouse gases offer the best explanation yet for the observed rise in average global temperature over the last century. Using a global climate model based on energy conservation, Lane et al. constructed a profile of atmospheric climate "forcing" due to combined changes in solar irradiance and emissions of greenhouse gases between 1880 and 1993. They found that the temperature variations predicted by their model accounted for up to 92% of the temperature changes actually observed over the period -- an excellent match for that period. Their results also suggest that the sensitivity of climate to the effects of solar irradiance is about 27% higher than its sensitivity to forcing by greenhouse gases. The long term increase in the Sun's level of activity (both variations in the emitted energy and its magnetic fields) may have played a significant role in the measured global warming the last 150 years. It is important to quantify this effect before one can determine any human influences on our climate. Thus, it is of great importance to understand how the Sun works and how it varies over time so that we can better understand how it will affect us in the future.

Perspectives in the future: Space Weather Forecast

Recently there has been a revolution in understanding the Sun due to two major advances. The first is in theoretical modelling of the way the Sun's magnetic field interacts with solar matter. The second advance is a series of observational discoveries from three space born solar satellites: ULYSSES, Yohkoh (a Japan-USA-UK Satellite), SOHO (the Solar and Heliospheric Observatory, a joint ESA-NASA project), and TRACE (NASA). These missions are providing high resolution observations of the Sun using sophisticated imaging telescopes and spectrographs that separates out observed light into the colours it is made of. This coordinated attack on solar physics has provided breathtaking new views of the Sun and a wealth of information.

The ULYSSES Mission (Figure 9) is a joint undertaking between the European Space Agency (ESA) and the National Aeronautics and Space Administration (NASA). Its goal is the exploration of the Sun's environment far out of the ecliptic plane. ULYSSES is the only spacecraft to have visited this unique region above and below the poles of the Sun.

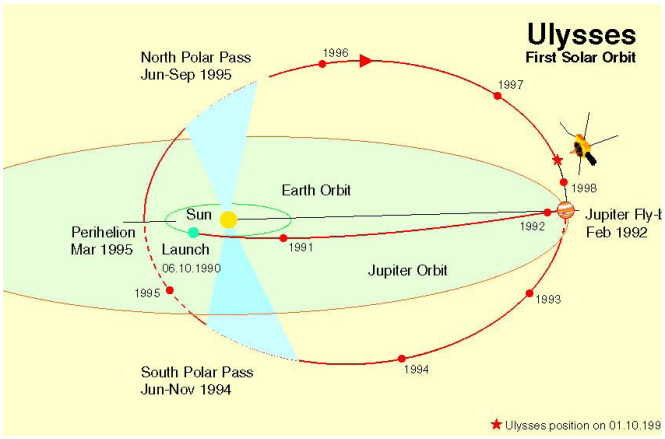

Figure 9. ULYSSES mission. First solar orbit.

SOHO has been leading the way into a new era in the field of helioseismology – a study of the solar interior through the analysis of vibrations on the surface.

The fact that the Sun is affecting us in so many ways makes it very important to learn more about our own star. We need to monitor it continuously to better understand the solar cycle and any long term changes in the Sun's activity level.

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Life in the extreme

Studies of cold seeps and mud volcanoes in EUROMARGINS

by Sofia Valleley

Cold seeps are deep-sea environments, usually a few square meters in size, where fluid is released through slow diffusion from the sea floor. Mud volcanoes which are active areas of fluid seepage, are other extreme environments discovered in the 1990s. These harsh conditions give rise to some of the most extreme and scientifically challenging environments for life to exist on the planet. Extensive fields of hydrocarbon-rich gas seepage, mud volcanoes and pockmarks have all been mapped by the EUROCORES programme EUROMARGINS. On 4 - 6 October 2006, scientists from 50 different research groups in 12 different countries came together in Bologna, Italy to discuss future cross-discipline, pan-European and pan-World research following in the footsteps of this four year programme as EUROMARGINS is coming to an end.

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Collaboration in the 'cold'

As ocean sediments compact in cold seeps, fluids ooze out of the sediment and into the water. The cold-seep fluids contain chemical compounds produced by the decomposition of organic materials or by inorganic chemical reactions which occur at high temperatures and pressures.

Near cold seeps in the Eastern Mediterranean, Sébastien Duperron from Université Pierre et Marie Curie in France has found unique bacterial symbiosis with mussels. Symbiotic associations between bivalves (mussels) and bacteria allow the former to benefit from the bacteria's ability to chemosynthetically (without light) derive energy from the chemical compounds produced and use this energy to ensure primary production.

"In the bivalve species Idas sp., we have found an association with six different symbionts. This is the widest diversity of symbionts ever described in a bivalve species," said Duperron.

This means that the mussel, depending on which type of symbionts it carries, can derive its energy from either sulphide or methane. In addition, Duperron has also found that in the Idas sp., three of the symbionts belong to bacterial groups previously not reported to include symbiotic bacteria. They seem to provide their hosts with nutrient from a yet unidentified source.

But life in these alien environments can also exist without symbionts as Ian MacDonald from Texas A&M University, Corpus Christi US has demonstrated. His observations of the fauna around coastal margin hydrocarbon seeps in the Gulf of Mexico have revealed a habitat rich in biological activity and without a need for symbionts to extract nutrients.

MacDonald found that the productivity of deep-water seeps is overwhelmingly based on chemosynthesis (deriving energy from chemical compounds instead of light) and also some chemoautotrophic symbiosis (using a symbiont to derive energy from chemical compounds). However some communities of deep-sea corals associated with many seeps are probably filter feeders. Recent research findings indicate that the corals around the seeps may be much more widespread at seeps than previously realised. This fact adds to the biological diversity and ecological complexity of seep communities.

Underwater mud volcanoes

In the Nile deep-sea fan, mud volcanoes were discovered in the mid-1990s and they are still being investigated by a EUROMARGINS project. In the Gulf of Cadiz, the first mud volcanoes were discovered in 1999. The deepest mud volcano in this area is located at 3890m.

Luis Pinheiro from the University of Aveiro in Portugal participated in the 1999 cruise when mud volcanoes were first discovered. Pinheiro and his team have been investigating this area in close collaboration with Spain, France and Belgium. So far they have mapped 40 mud volcanoes, some as big as over 4km across and a few hundred meters high supporting characteristic ecosystems with particular faunal communities, living directly or indirectly on methane, some of which appear to represent completely new species to science.

Over four years, the EUROMARGINS have gatherered about 75 teams from 12 countries on a variety of complementary topics dedicated to the imaging, monitoring, reconstruction and modelling of the physical and chemical processes that occur in the passive margin system. Further information is available at www.esf.org/euromargins or by contacting euromargins@esf.org. When it comes to an end in late 2007, EUROMARGINS will be succeeded by new EUROCORES Programmes such as EuroMARC and Topo-Europe, which will both contribute to the future of European geosciences.

EUROMARGINS at EGU 2007

Union Symposia 5 - Prospective views for European Cooperation in Geosciences / Environmental Sciences: Contributions in a global context.

Convener: John Marks; Co-convener: Bernard Avril; Inge Jonckheere; Daniela Turk.

Oral session: Monday 16 April - 10:30-19:00, room 4H.

TM05 US5 “get-together” reception: European Cooperation in a global context: Make it happen!

Oral session: Monday 16 April - 19:00-20:00, room 4H.

EUROMARGINS has set up an open session as follows:

TS5.2/SSP24 Processes of rifting, sediment transport, fluid flow and biogenic activity: EUROMARGINS (co-organized by SSP) (co-listed in BG & CL).

(TS = Tectonics and Structural Geology, SSP = Stratigraphy, Sedimentology and Palaeontology, BG = Biogeosciences, CL = Climate: Past, Present, Future).

Oral session: Wednesday 18 April, 08:30-12:00, room 3.

Poster session: Friday 20 April, 08:30-12:00.

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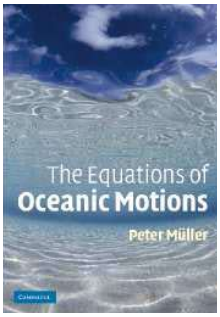
The Equations of Oceanic Motions



Authors: Peter Müller
Publisher: Cambridge University Press
ISBN: 0521855136
YEAR : 2006
EDITION : 1st
PAGES : 291
PRICE : 71.00 €
hardback

Modeling and prediction of oceanographic phenomena and climate is based on the integration of dynamic equations. The Equations of Oceanic Motions derives and systematically classifies the most common dynamic equations used in physical oceanography, from large scale thermohaline circulations to those governing small scale motions and turbulence. After establishing the basic dynamical equations that describe all oceanic motions, Müller then derives approximate equations, emphasizing the assumptions made and physical processes eliminated. He distinguishes between geometric, thermodynamic and dynamic approximations and between the acoustic, gravity, vortical and temperature-salinity modes of motion. Basic concepts and formulae of equilibrium thermodynamics, vector and tensor calculus, curvilinear coordinate systems, and the kinematics of fluid motion and wave propagation are covered in appendices. Providing the basic theoretical background for graduate students and researchers of physical oceanography and climate science, this book will serve as both a comprehensive text and an essential reference.

International School of Space Science (ISSS): Magnetospheric Dynamics - (Course)

09/04/2007 - 15/04/2007 - L'Aquila, Italy

The course will present the current understanding of the Earth's magnetosphere dynamics under the influence of changing solar wind conditions. The lectures will be based on historical and recent observations both from satellites and from the ground, and will review some of the most used modelling techniques. Afternoon sessions will be dedicated to teach the students how some important analysis tools should be practically used in the treatment of satellite and ground based data. Specific sessions will also allow students to present their own scientific results with the possibility to discuss and exchange ideas directly with leading scientists.

Application deadline: February, 28 2007

Organizer:

Consorzio Interuniversitario per la Fisica Spaziale (C.I.F.S.)

http://www.cifs-isss.org/

Ocean Colour 2007 Africa, 24 September-5 October 2007. - (Course)

24/09/2007 - 05/10/2007 - Mombasa, Kenya

Within the 7th Framework Programme, the Joint Research Centre is building the observation, monitoring, modelling and analytical capacity of an 'ACP (African, Caribbean, Pacific) Observatory for Sustainable Development'. The system will provide ready-to-use information on environment, food security and crisis issues on which to base appropriate policy responses. The implementation of such Observatory will involve both European based activities as well as direct capacity building in ACP countries. Accordingly, through its Action 'Monitoring Natural resources for Development Co-operation' (MONDE), the Global Environment Monitoring Unit (GEM) of the Institute for Environment and Sustainability (IES) is offering a training course on:

"Methods and Applications of Ocean Colour Remote Sensing in African Coastal and Regional Seas".

Objective of the Course

Coastal and marine environment plays a vital role in the economy and society of African countries. In recent years, however, both the increasing rate of the urban population occupying a narrow coastal margin and the industrial development has created negative trends on the coastal environment and marine resources. This course has been designed to provide the theoretical basis of ocean colour satellite measurements, as well as key applications in monitoring and managing the coastal zone, in protecting marine ecosystems and resources.

Course structure

The duration of the course will be 10 working days, each day combining of:

Lecture sessions covering theory and applications of satellite oceanography (Example: - Fundamental of satellite oceanography; Water optics; In-water ocean colour algorithms; Phytoplankton Biomass and primary production; Biodiversity; Satellite applications for marine resources; Coral reefs and habitat mapping; Satellite application to coastal zone management; Geo-statistics and time series analysis).

Practical sessions including training on various image processing software packages (Example: SeaDAS, Bilko) and micro-project and application scenarios.

In continuation of the practical sessions, the candidates will be encouraged to conduct a mini-project using their own data in application of the course material.

Fees

There are no registration fees to the course. Some scholarships will be awarded to the successful candidates to cover both travel costs and daily expenses (e.g. accommodation).

http://amis.jrc.ec.europa.eu/oc2007africa.php

Climate Change 2007: the physical science basis - (Meeting)

13/06/2007 - 13/06/2007 - Institute of Physics, 76 Portland Place, London W1B 1NT

Evening lecture by Prof Jonathan Gregory, University of Reading, UK

6:30pm, Wednesday 13 June 2007, at the Institute of Physics, 76 Portland Place, London W1B 1NT

What recent progress has been made in understanding and attributing climate change? What do observations of the atmosphere, oceans, sea level, snow and ice tell us? What are the projections of future changes? The Intergovernmental Panel on Climate Change (IPCC) is the world's leading authority on climate change. Its next assessment report, due to be published in mid-May, will provide the latest answers to the above questions and more. Jonathan Gregory, one of the lead authors, will explain the key findings and their implications.

Free tea/coffee from 6pm, free wine and food after the talk. Please notify Beverley Harker if you plan to attend, to ensure there is adequate catering (B.J.Harker@open.ac.uk, 01908 655 253). Further information from Paul Williams (p.d.williams@reading.ac.uk).

Organizer:

Environmental Physics Group and London & South East Branch of the UK Institute of Physics.

http://www.iop.org/activity/groups/subject/env/Forthcoming_Events/page_7421.html

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37th COSPAR Scientific Assembly. - (Meeting)

13/07/2008 - 20/07/2008 - Montreal, Canada

The Local Arrangements Committee (LOC) for COSPAR 2008 along with its partners, the Canadian Space Agency and the National Research Council for Canada, cordially invites you to the 37th COSPAR Scientific Assembly which will take place in Montreal from July 13-20, 2008 at the Palais des Congrès de Montréal.

This Assembly is open to scientists of all nations.

Topics

Approximately 85 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)
- Panel on Education
- Special events: 50th anniversary lectures, interdisciplinary

lectures, space agency round table, session on "EGY - Towards an Earth and Space Science Commons"

Abstract deadline

The abstract submission deadline for this Assembly will be 17 February 2008.

Organizer:

COSPAR Secretariat, c/o CNES, 2 place Maurice Quentin, 75039 Paris Cedex

01, France

cospar@cosparhq.cnes.fr

http://www.cospar2008.org/

5th International Planetary Probe Workshop (IPPW-5). - (Meeting)

23/06/2007 - 29/06/2007 - Bordeaux, France

The next steps in the robotic exploration of the solar system include missions to planets and satellites with significant atmospheres. Many of these missions will include entry probes. The International Planetary Probe Workshop series was established to bring together scientists, spacecraft engineers, technologists, and mission designers interested in the technological challenges and scientific opportunities involved in entry, descent, and flight in these planetary atmospheres.

Objectives

The 5th Workshop (IPPW-5), to be held in Bordeaux in June 2007, will build upon the accomplishments of the four earlier workshops: two held in Europe (Lisbon, Portugal, 2003 and Athens, Greece, 2005) and two in the USA (NASA Ames Research Center, 2004 and Pasadena, 2006). As with previous workshops, key objectives include fostering international involvement and collaboration in planetary exploration with probes, and engaging the next generation of scientists and engineers in this exciting field of planetary exploration.

The focus of IPPW-5 will continue to be on outer planet probe missions as well as concepts for probe and aerial platform missions to Mars, Venus, and Titan. There will be a session on technologies for the extreme environments experienced in entry, descent, and flight at these targets. Immediately preceding the workshop, a two-day short course, "Controlled Entry and Descent into Planetary Atmospheres" will be held.

Workshop Goals

The general goals of the International Planetary Probe Workshops are:

- To Review the state-of-the-art in science, mission design, engineering implementation and technology for the in situ robotic exploration of planets with atmospheres.
- To Share ideas, mission opportunities, and emerging technologies to enable future mission success.
- To Serve as a forum for initiating discussions on innovative methodologies and techniques for future missions to explore planets and satellites with atmospheres.
- To Involve young scientists and engineers in the field of entry, descent and flight in planetary atmospheres in an opportunity to learn from experienced researchers and practitioners.
- To Foster international collaboration among the communities of scientists, engineers, and mission designers interested in planetary probes.

Abstract Submission deadline: 13 April 2007

http://www.rssd.esa.int/SM/IPPW/

COAST GIS, 07: The 8th International Symposium on GIS Computer Mapping for Coastal Zone Management - (Meeting)

08/10/2007 - 10/10/2007 - Santander, Spain

The organizing committee invites you to attend CoastGIS

07, the 8th International Symposium on GIS and Computer Mapping for Coastal Zone Management. The conference will take place in Santander, Spain, between the 8th and the 10th of October, 2007.

This is the eighth of a series of conferences with an important international scope (up to 30 countries from all continents). The CoastGIS conferences began in 1995, and the last host was the city of Wollongong, Australia, during which over 80 papers were presented. Other important venues have been Aberdeen in Scotland, Brest in France, Halifax in Canada and Genoa in Italy.

Over 200 professionals from the GIS and/or coastal management fields are expected to attend, representing a wide range of academic, governmental and commercial interests.

Objective

The main objective of this conference is to create a meeting place in which the most relevant issues and the newest breakthroughs in GIS applications for coastal and marine environments will be tackled by internationally renowned experts. The official language of the conference is English.

Conference Topics

Two main sections have been scheduled: a section devoted to GIS applications, both to studying and managing coastal areas and the marine environment; and another section dealing with SDI design and implementation processes.

I. GIS and related technologies applied to coastal matters

- Disaster and risk management/monitoring/remediation
- Resource management/monitoring
- GIS-related earth observation (EO) technology(ies) or tools
- Use of GIS tools, especially the newer near-GIS capabilities offered by Google Earth
- Climate change
- Human Impact
- Modelling

II. GIS in the Marine and Coastal component of SDIs

- SDI development and implementation processes
- Web services
- Data, standards and metadata issues
- Integration and interoperability
- Capacity building, training and education
- (Coastal) SDI around the globe: experiences, differences and common ground

ABSTRACTS AND PAPERS

Prospective authors are invited to submit papers or posters dealing with the conference subjects or related topics.

Important dates

Admission of abstracts until April 1st 2007
Correction of abstracts: April 30th 2007
Admission of papers until June 30th 2007
www.coastgis07.com

The Eighth International Conference on the Mediterranean Coastal Environment, MEDCOAST 2007 - (Meeting)

13/11/2007 - 17/11/2007 - Alexandria, Egypt

Since the first conference organised in Antalya, Turkey during 2-5 November 1993, seven events in the “Mediterranean Coastal Environment” conference series of MEDCOAST have made this series a major international scientific and environmental meeting focusing on the management of the coastal and sea areas with particular emphasis to the Mediterranean and the Black Sea. The past seven conferences produced 18 volumes of proceedings, adding up to 13000 pages, and four special issues of two leading coastal management journals. These meetings, together with three thematic workshops and two specialty conferences, organised over a period of thirteen years, have created a steadily growing group of MEDCOAST people, among which various significant collaboration initiatives have developed.

With MEDCOAST 2007, the conference moves for the second time to the southern shores of the Mediterranean, .to an attractive historical town. We expect to have another successful event in the magnificent setting offered by Alexandria, enhanced by the Egyptian hospitality and rich marine culture. Scientists, experts, managers, planners, policy makers, resource developers, users and conservationists from both the Mediterranean and the Black Sea countries, or from outside the basins, are cordially invited to participate!

Topics

- Coastal Systems and Conservation issues
- Integrated Coastal Management
- Sustainable Development of Coastal Areas
- Coastal Engineering, Modelling, Decision Support Systems and Data Management

Abstract Submission

Abstracts for MEDCOAST 2007 Conference must be submitted to the MEDCOAST Secretariat no later than 16 April 2007. They should be limited to single-spaced one page, and list the names, titles, affiliations, mailing addresses, telephone and facsimile numbers, and e-mail addresses of each author.

Deadlines

Abstract Submission: April 16, 2007
Acceptance Notification: April 30, 2007
Manuscript submission: September 17, 20

For abstract submission and general information, contact Conference Secretariat:

MEDCOAST Secretariat
c/o Middle East Technical University
06531 Ankara - Turkey
Telephone: 90 - 312 - 210 24 97 / 210 54 29
Facsimile: 90 - 312 - 210 79 87
E-mail: medcoast@metu.edu.tr
www.medcoast.org.tr

A UV Conference celebrating One Century of UV Radiation Research - (Meeting)

18/09/2007 - 20/09/2007 - Davos, Switzerland

To celebrate the 100th anniversary of the Physikalisch-Meteorologisches Observatorium Davos (PMOD/WRC), a conference dedicated to solar UV radiation research will be held at the Congress Centre Davos, Switzerland, from 18 to 20 September 2007. The conference will bring together scientists interested in solar UV radiation, with topics ranging from measurements and modelling, to the influence of UV radiation on humans and climate.

Topics

Solar UV measurements and modelling
Instrumental developments
Case studies (factors affecting UV radiation)
Modelling of surface UV Radiation
Satellite retrieved surface UV radiation
UV reconstruction techniques
UV radiation climatology and trends
Climate change and UV radiation
UV radiation effects on humans and the biosphere

Invited speakers

The Scientific Committee is pleased to announce invited presentations from:

Claus Fröhlich, PMOD/WRC
Germar Bernhard, Biospherical Instruments Inc.
Alkiviadis Bais, University Of Thessaloniki
Bernhard Mayer, Deutsches Zentrum für Luft und Raumfahrt (DLR)
Pawan K. Bhartia,NASA Goddard Space Flight Center
Anders Lindfors,Finish Meteorological Institute
Richard McKenzie,National Institute of Water and Atmospheric Research (NIWA)
Joanna Haigh,Imperial College London
Ann R. Webb,University of Manchester

Location

The conference will be held at the Kongresszentrum Davos, Promenade 92, in Davos Platz. Frequent public transport between the Conference centre and the hotels is available from 6:00 to 23:30 which is free to hotel guests. Consider that walking distances in Davos are short, and any location downtown can be reached within less than a 30-minute walk.

Organizer:
PMOD/WRC
Dorfstrasse 33
CH-7260 Davos Dorf, Switzerland
http:\\www.pmodwrc.ch\uvconf2007\

14th Conference on Middle Atmosphere - (Meeting)

20/08/2007 - 24/08/2007 - Portland, Oregon

The 14th Conference on the Middle Atmosphere, sponsored by the American Meteorological Society and organized by the AMS Committee on the Middle Atmosphere, will be held 20-24 August 2007 at the Doubletree Hotel-Lloyd Center in Portland, Oregon. The conference will be held in conjunction with the 15th Conference on Air-Sea Interaction. A preliminary program, plus general registration on the conference, registration, and hotels, will be posted on the AMS Web site (http://www.ametsoc.org/meet/fainst/200715isa14m.html) in April 2007.

Papers are solicited in all areas of middle atmosphere science (from the upper troposphere through the mesosphere). We seek a balanced program of observational studies, modeling and theory. In additional to a general middle atmosphere session, eight special sessions are planned.

The deadline for online abstract submission is 25 March 2007 at http://www.ametsoc.org/meet/online_submit.html. An abstract fee of $70 (payable by credit card or purchase order) will be charged at the time of submission (refundable only if the abstract is not accepted). When submitting your abstract, please indicate your preference for an oral or poster presentation. Authors of accepted presentations will be notified via e-mail by 25 April 2007. No preprint volume is planned.

For further information, please contact the program chairperson, Laura Pan (Email: liwen@ucar.edu, Tel: 303-497-1467).

http://www.acd.ucar.edu/Events/Meetings/Middle_Atmosphere/

Tropical Stratosphere - Upper Troposphere Symposium - (Meeting)

05/11/2007 - 09/11/2007 - Reunion Island, Saint-Gilles les Bains

It is a SPARC / SCOUT-O3 / NDACC / CNRS symposium covering all aspects of ozone and other trace gases evolution and budget is planned to take place in Reunion Island in November 2007. The symposium aims to debate on mechanisms by which air is exchanged between stratosphere and troposphere, and between tropics and mid-latitudes, with emphasis on the related coupled chemistry-dynamics processes in the tropical Stratosphere - Upper Troposphere.

Please note that:

- Deadline for submission of abstracts is 20 June 2007.
- Applications for young scientist travel grants must be submitted no later than 30 June 2007.

http://riis2007.univ-reunion.fr

IX EMTE National-International Conference of Meteorology-Climatology and Atmospheric Physics - (Meeting)

28/05/2008 - 31/05/2008 - Thessaloniki, Greece

The Department of Meteorology-Climatology, School of Geology, Aristotle University of Thessaloniki, Greece in cooperation with the Hellenic Meteorological Society (EMTE) has the pleasure to invite you to the IX EMTE National-International Conference of Meteorology-Climatology and Atmospheric Physics.

The Department of Meteorology –Climatology had organized the first conference on May 1992, which is considered as the leading one of this institution, as well as two other conferences in the past years (1994 and 2000).

The conference is motivated by the interest in informing the scientific society, the relevant organizations, as well as the young researchers, about the up-to-date developments on Atmospheric Sciences. Also, it will try to disseminate all the new methodologies applied in Meteorology, Climatology and Atmospheric Physics. Moreover, this conference aims at highlighting the need of an inter-scientific collaboration for a more integrate and complete research of weather, climate and atmospheric subjects.

Papers are solicited on all aspects of Earth and Atmospheric Sciences.

Important dates and deadlines

31 May 2007: Deadline for submission of abstracts

15 July 2007: Notification for abstract approval

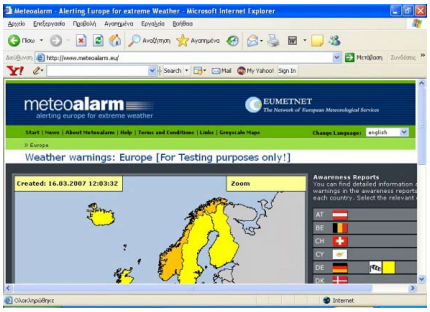
31 January 2008: Deadline for submission of extended abstracts/papers

15 March 2008: Deadline for the payment of registration fees for the first authors of the extended abstracts/papers

http://icemte08.geo.auth.gr

Meteoalarm: a new pan-European service on severe weather

http://www.meteoalarm.eu



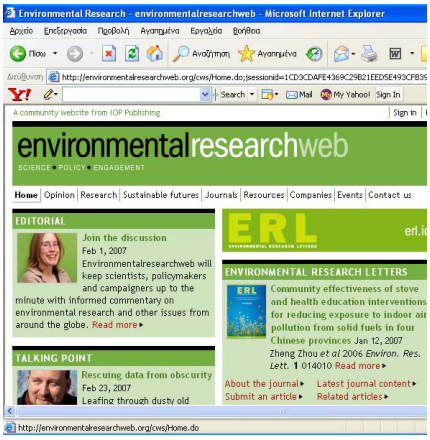
On World Meteorological Day, 23 March 2007, a Website will be launched that will provide a snapshot of where severe and potentially dangerous weather might occur over the following 48 hours.

The website, www.meteoalarm.eu, has been developed by Eumetnet, the European weather services network, with the support of WMO. The warnings are provided by the various National Weather Services in Europe.

The Website is easy to understand, using a combination of symbols and colour codes to represent different types and severity of weather events. The service includes a vast amount of weather phenomena such as heavy rainfall with flooding; coastal storm surges and high tides; thunderstorms; extreme heat or cold; snow and avalanches.

Institute of Physics launches new environmental science website

http://environmentalresearchweb.org



14 February 2007.- The Institute of Physics is launching a new website, a central source of information on these issues covering the whole of environmental science with articles by leading environmental scientists from academia and industry.

The site combines news articles on current issues with opinion pieces, links with environmental journals, a comprehensive database of organisations in the field and an up-to-date events calendar.

Liz Kalaugher, editor of the new website, said: “The site is aimed at people who are already interested in topics covered by environmental science such as climate change and the development of biofuels, whether they are policy makers, working in industry, members of the public, or part of the environmental science community.”

“Environmentalresearchweb will provide people with much more in depth information on, for example the science behind climate change and other environmental issues and enable them to learn more about what is being done to tackle these problems.”

Other articles now live on the site include details of a new Energy Biosciences Institute in the US funded by energy giant BP, how environmental researchers are using satellite mapping tools to help their work, why climate data derived from 6500-year-old coral has serious implications for drought in western Indonesia, and a summary of the IPCC report.

The site also has links to new articles from the open access IOP Publishing journal Environmental Research Letters, launched earlier this year. Registration for membership of environmentalresearchweb is free - members will gain free access to premium content, receive a weekly newsletter and be able to update the site with their comments, details of their events and their company.