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- Alan W. Brewer (1915-2007)
  The discovery of stratospheric dryiness
- Union Awards and Division & Section Medals Presentations

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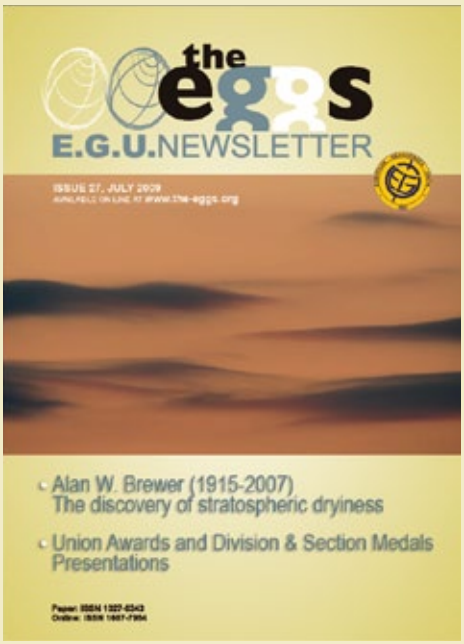

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Cover photo: Although they might look like a sierra crest viewed from an airplane, these are in fact cloud formations shot with an ultra-zoom lens, at dusk, sometime in late February 2009. Image Credit: Evangelos Karageorgos, Laboratory of Atmospheric Pollution and Pollution Control Engineering, DUTh, Xanthi - Greece. Distributed by EGU via www.imaggeo.net

European Geosciences Union

European Geosciences Union General Assembly 2009 Vienna, Austria, 19 – 24 April 2009

After the end of the EGU 2009, Europe's largest geoscientific event, it was already obvious that current concern about climate change was its foremost theme. Yet at the same time, excitement about new sustainable technologies and solutions was in the air. These, along with the latest findings in the Earth sciences, were presented in Vienna. The EGU 2009 brought together nearly 9000 geoscientists from all over the world into one meeting covering all disciplines of the Earth, Planetary and Space Sciences.

Human carbon emissions: New IPCC findings

Evidence that human activities are the major cause of recent climate change was mounting. Released in February 2007, the IPCC Fourth Assessment Report's Working Group I Summary for Policymakers synthesizes current scientific understanding of global warming and projects future climate change. After assessing decades of climate data, leading scientists have reported that human carbon emissions have most likely caused most of the observed global temperature increase since the mid-20th century. At the EGU 2009, geoscientists Dr Hermann Held and Dr Bert Metz presented recent and unpublished IPCC findings on climate change and made suggestions for possible solutions.

Press conference: Thursday 23 April

http://meetingorganizer.copernicus.org/EGU2009/oral_programme/143

Irreversible ice-shelf loss before Canada's coast

The rate of worldwide disappearance of land and sea ice is alarming. Ice shelves in Canada's High Arctic have lost much of their substance this year. For example, the ice attached to Ellesmere Island has been reduced by almost a quarter. Warm air temperatures and reduced sea-ice conditions in the region have added to the break-up. One ice shelf, the 50 sq km Markham shelf, has completely broken off and is now adrift in the Arctic Ocean. Dr Luke Copland of the University of Ottawa and his colleagues presented new findings at the Union Symposium "Cryosphere - for how much longer?" Their data underlined the rapidity of changes were taking place in the Arctic, which were irreversible under current conditions.

Press conference: Thursday 23 April

http://meetingorganizer.copernicus.org/EGU2009/session-programme/CR

Novel CO2 storage technologies

Carbon capture and storage is considered to be one of the options to mitigate climate change by reducing CO2 emissions released into the atmosphere. Scientists all over the world are carrying out research and development into geological storage of CO2. Several sessions specifically address the questions and issues that arise from these activities, particularly relating to its environmental impact. Results from the first European on-shore storage project were presented along with promising experimental results of other on- and off-shore CO2 storage projects. New monitoring technologies were presented and state of the art risk management was discussed.

Press conference: Monday 20 April

http://meetingorganizer.copernicus.org/EGU2009/meetingprogramme/ERE

Ocean acidification: An underestimated problem

Atmospheric CO2 is partially absorbed by the ocean. Currently, the ocean has taken up about one-third of human carbon emissions, some 430 billion tons. This absorption has significantly lowered greenhouse gas levels in the atmosphere. However, oceanic CO2 also lowers the pH of the water, posing a little-known but potentially devastating threat to ocean life. The film "A Sea Change", the first documentary about ocean acidification, was screened at the EGU 2009. The film was introduced by Dr Jelle Bijma, a marine bioscientist who specialises in ocean acidification, and María José Viñas of the American Geophysical Union. The screening was followed by a Q&A with panellists Dr Jelle Bijma, Alfred Wegener Institute for Polar and Marine Research, Germany, Gert-Jan Reichart, an organic geochemist at Utrecht University, the Netherlands, and Michiko Hama of the European Science Foundation.

Tuesday 21 April

http://meetingorganizer.copernicus.org/EGU2009/session/1782

April 22: Earth Day

Within the context of the EGU 2009, Europe's largest geoscientific event, Earth Day becomes even more meaningful. Is mankind responsible for climate change? To what extent is the IPCC report accurate? Climatic changes interact and affect the rate of global change through feedbacks coupling the atmosphere, the oceans, the land surface and the ice masses. All of these are affected by strong biogeophysical and biogeochemical couplings. The earth is undergoing significant changes associated with warming climate and with socio-economic changes during the entire 20th century. The many victims of the recent earthquake near l'Aquila in Italy once more stress the need for reliable earthquake predictions and damage control. Climate change and geohazards were, therefore, among the most important EGU 2009 issues and debates for an entire week – not just on Earth Day.

http://www.earthday.net/

EGU Press Office

EARTH FROM SPACE

Floating Sargassum seaweed

credit: ESA

15 May 2009.- This Envisat radar image features six of Hawaii's eight major volcanic islands. Visible from right to left are the Big Island of Hawaii, Kahoolawe, Maui, Lanai, Molokai and Oahu. In addition to two other major islands, there are also 124 islets.

The islands stretch more than 2575 km across the mid-Pacific Ocean and lie some 2367 km north of the equator. Unlike other U.S. states, Hawaii is not located within the North American continent but rather some 4000 km southwest of it.

All of the islands are projecting peaks of volcanic mountains that formed millions of years ago when fiery basalt rock erupted through a crack in the ocean floor. Having formed above a magma hotspot in the Pacific plate, Hawaii has some of the world's largest active and inactive volcanoes.

Reaching 4200 m, Mauna Kea (top centre on the Big Island of Hawaii) is Hawaii's tallest volcano. The heights of mountains are generally measured from sea level; however, Mauna Kea rises more than 10 203 m (9 km) from sea floor to summit, so if counted from base to peak it is actually the tallest mountain on Earth.

Mauna Loa, located beneath Mauna Kea, is the planet's largest volcano by mass (some 40 000 cu km). Having erupted more than 33 times since its first documented eruption in 1843, it is also one of the most active volcanoes on the planet. Its most recent eruption occurred in 1984.

Due to the high eruption rate of Mauna Loa, scientists continuously monitor the volcano for signs of unrest. Satellite radar, such as the Advanced Synthetic Aperture Radar (ASAR) aboard Envisat, allows scientists to track small changes in the Earth's movement that improves their ability to predict volcanic eruptions.

SAR Interferometry involves mathematically combining different radar images, acquired as near as possible from the same point in space at different times, to create digital elevation models and reveal otherwise undetectable changes occurring between image acquisitions.

Kilauea, located on the southeastern part of the island around the red and pink areas, is another of the Earth's most active volcanoes. The current eruption episode began in 1983 and has been ongoing ever since. According to local legend Kilauea is home of Pele, the Hawaiian goddess of volcanoes, and eruptions take place when she is angry.

This image was created by combining three Envisat ASAR acquisitions (27 March 2006, 16 April 2007 and 21 January 2008) taken over the same area. The colours in the image result from variations in the surface that occurred between acquisitions.

SeaDAS for Windows

The SeaWiFS Data Analysis System is an image analysis package for ocean color data.

Text: NASA's SeaDAS group recently released a fully functional version of SeaDAS that will run on Windows platforms. The SeaWiFS Data Analysis System (SeaDAS) is a comprehensive image analysis package for the processing, display, analysis, and quality control of ocean color data. This is a major accomplishment which should significantly broaden the accessibility of satellite data processing and analysis to a much larger user community. The SeaDAS Virtual Appliance - SeaDAS VA 5.3b (beta) - allows Microsoft Windows users to run SeaDAS on their systems within a virtual Linux machine. The appliance runs on Windows XP and Vista systems and includes a fully functional version of SeaDAS within a streamlined Linux environment. Installation is extremely simple and requires no knowledge of Linux. One might expect SeaDAS to run much slower in a virtual environment, but performance results indicate that SeaDAS VA runs nearly as fast as a standard installation. NASA requests your feedback to help further improve the package. To download NASA's SeaDAS Virtual Appliance (beta), go to: http://oceancolor.gsfc.nasa.gov/seadas/

IOCCG News

Terrasar-X Performance Confirmed

Orbit errors are as small as 20 centimetres for routine images available within 1 day of collection, and range errors of well under 1 metre are verified

16 March 2009.- The accuracy defined in the TerraSAR-X data product specifications has now been confirmed by the Civil and Commercial Applications Project (CCAP) Group within the National Geospatial-Intelligence Agency (NGA): The group published the results of their geolocation accuracy evaluation of TerraSAR-X radar satellite imagery during the ASPRS Annual Conference in Baltimore (MD, USA), held from 9 to 13 March 2009.

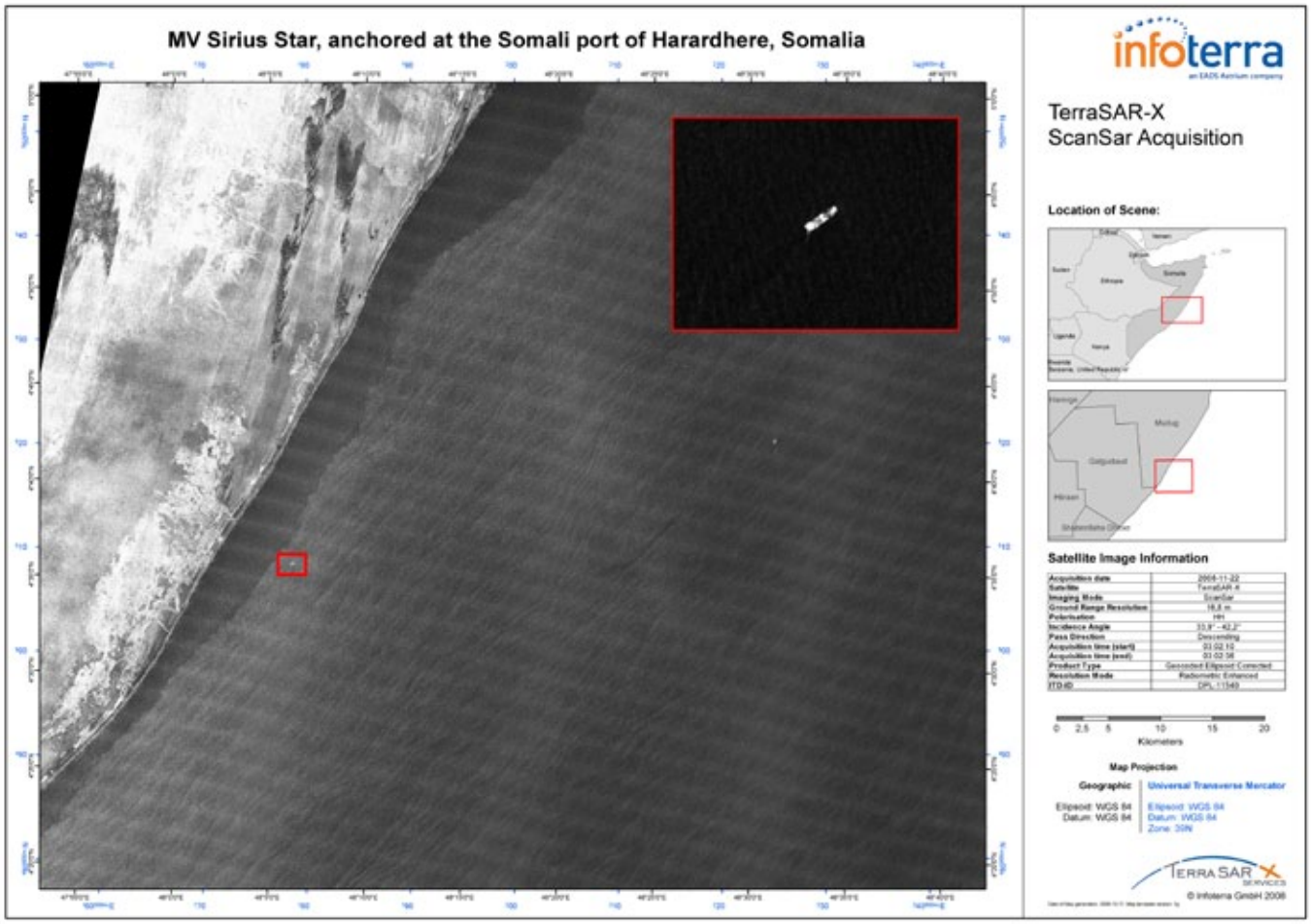
In a contribution titled "Geometric Precision in Space Radar Imaging: Results from TerraSAR-X", Thomas P. Ager, NGA System Engineer for Radar, and his co-author Paul Bresnahan of Observera Inc. describe the evaluation processes and parameters applied to 13 high-resolution SpotLight and another 13 StripMap acquisitions. These were collected in single-polarization (VV) mode, generated as Multi-look Ground-range Detected (MGD) products with Spatially-Enhanced (SE) processing, and included the rapid orbit metadata.

Ager confirms that `the results of this evaluation are consistent with the accuracy values listed in the product specification`, and even adds that `it is plausible that the TerraSAR-X accuracy is even better`.

Orbit errors are as small as 20 centimetres for routine images available within 1 day of collection, and range errors of well under 1 metre are verified. NGA's CCAP regularly performs geolocation accuracy evaluations for civil and commercial imagery being purchased or considered for purchase by the Agency.

A gallery of images is available at http://www.infoterra.de/image-gallery/images.html

Infoterra GmbH



On November 17, 2008, the MV Sirius Star, with 25 crew members on board and a load of 2 Mio barrels of crude oil worth at least US$ 100 Mio, was hijacked by Somali pirates southeast of the coast of Kenya. TerraSAR-X can help assure that the condition and position of the vessel remain known continuously while negotiations between the pirates and the owner are ongoing. The tanker's exact position was determined in a series of so-called ScanSAR acquisitions of the area in question. These radar satellite images cover an area of 100x150 sqkm with a ground resolution of 18m. They are ideally suited for large-scale monitoring purposes and - as in this case - the detection of objects when their exact position is only known approximately (Copyright: Infoterra GmbH).

DFG Research Centres to be Funded for Another Four Years

30 April 2009.- Following a second funding period, the first three DFG Research Centres will again be extended and will continue for another four years. This decision was made by the Joint Committee of the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) at its spring session in Bonn. As a result, among the three Research Centres established in 2001 "The Ocean in the Earth System" in Bremen, will be able to continue work through mid-2013. Each of the three centres will receive total funding of approximately 25 million euros in the next four years.

In recent months, all three centres were reviewed by peer review panels and were unanimously recommended for continued funding.

The DFG Research Centre in Bremen was able to lay claim to and further establish its position as one of the world's leading centres for marine-geoscientific research. Its objective is to use geoscientific analyses to obtain a better understanding of the ocean's role in the global Earth system. For the next four years are planned for the main topics of "Ocean and Climate", "Relationships Between Geosphere and Biosphere" and "Sediment Dynamics".

Detailed information on the Research Centres Programme as well as a list of the funded centres can be found at

http://www.dfg.de/en/research_funding/coordinated_programmes/dfg_research_centres/index.html

DFG

Constrainment of the sources of soot pollution over South Asia

23 January 2009.- A gigantic brownish haze from various burning and combustion processes is blanketing India and surrounding land and oceans during the winter season. This soot-laden Brown Cloud is affecting South Asian climate as much or more than carbon dioxide and cause premature deaths of 100 000s annually, yet its sources have been poorly understood.

In this week's issue of Science Örjan Gustafsson and colleagues at Stockholm University and in India use a novel carbon-14 method to constrain that two-thirds of the soot particles are from biomass combustion such as in household cooking and in slash-and-burn agriculture.

Brown Clouds, covering large parts of South and East Asia, originate from burning of wood, dung and crop residue as well as from industrial processes and traffic. Previous studies had left it unclear as to the relative source contributions of biomass versus fossil fuel combustion.

Combustion-derived soot particles are key components of the Brown Cloud in Asia. The soot absorbs sunlight and thereby heats the atmosphere while cooling Earth's surface by shading. The net effect of soot on climate warming in South Asia is rivaling that of carbon dioxide.

The Swedish-Indian team managed to address the uncertainty of the soot sources by the first-ever microscale measurements of natural C-14 (half-life of 5700 years) of atmospheric soot particles intercepted on a mountain top in western India and outside SW India on the Hanimaadhoo island of the Maldives.

Their results, presented in the Science article, demonstrated that the brown cloud soot was persistently about two-thirds from burning of contemporary biomass (C-14 "alive") and one-third from fossil fuel combustion (C-14 "dead").

These findings provide a direction for actions to curb emissions of Brown Clouds. Örjan Gustafsson, a professor of biogeochemistry at Stockholm University and leader of the study, says that the clear message is that efforts should not be limited to car traffic and coal-fired power plants but calls on fighting poverty and spreading India-appropriate green technology to limit emissions from small-scale biomass burning. "More households in South Asia need to be given the possibility to cook food and get heating without using open fires of wood and dung" says Gustafsson.

The rewards of decreasing soot emissions from biomass combustion may be rapid and sizeable. Globally, soot accounts for roughly half the warming potential of carbon dioxide. While carbon dioxide levels in the atmosphere respond on a sluggish 100 yr timescale to reductions in emissions, Brown Cloud soot particles only reside in the atmosphere for days-weeks raising the hope for a rapid response of the climate system.

Several additional positive effects would result from a reduction on Brown Cloud soot particle emissions. A recent report by the United Nations Environment Program, Atmospheric Brown Clouds: Regional Assessment Report with Focus on Asia (http://www.rrcap.unep.org/abc/impact/) outlines severe effects including melting of the Himalayan glaciers and weather systems becoming more extreme. The Brown Cloud is also having impact on agriculture and air quality in Asia.

Henning Rodhe, a professor of chemical meteorology at Stockholm University, vice-chair of the UNEP Atmospheric Brown Cloud Program and also co-author of the Science article, states that the report finds that 340 000 people in China and India die each year from cardiovascular and respiratory diseases that can be traced to human-induced emissions of combustion particles. "The impact on health alone is a strong reason to reduce these Brown Clouds" says Rodhe.

Rich countries' invisible emissions

24 February 2009.- Rich countries are contributing to the emission increases in developing nations, but this is not accounted for in international negotiations.

The report "Journey to world top emitter", to be published in Geophysical Research Letters, states that Chinese CO2 emissions increased by 45 percent from 2002 to 2005. Half of the increase was due to export production, 60 percent of which was exported to western countries. Electronic commodities and metals are important products.

Only 7 percent of the emissions increase was triggered through household consumption in China, the researchers from the University of Cambridge, CICERO, Carnegie Mellon University, and University of Leeds found.

– This makes us reflect on how we are a part of a global system, and how we partly drive emissions in other countries. It is important to take at least some responsibility for problems that we cause indirectly in other countries, says Glen Peters, researcher at CICERO - Center for Climate and Environmental Research in Oslo.

Electronic products, metals, chemicals, and machinery are export products contributing largely to the emissions increase.

– This doesn't mean that trade is a bad thing. The problem is rather the type of products and how they are produced. It wouldn't be so bad if China used its comparative advantage to produce products that meet global environmental objectives, he says.

International climate agreements do not account for how emissions cross national borders because of imports and exports. In the Kyoto Protocol, every country is responsible for emissions on its own territory.

The process where a country reduces emissions on its own territory but increases imports is known as «carbon leakage».

– We do not need to completely redesign Kyoto, but we could include incremental changes that address carbon leakage and competitiveness concerns. Climate policy could be designed in similar ways to existing tax policy. For example we could design carbon taxes in a similar way to value-added taxation which covers imported products. In that way the consumer would pay for the emissions caused by his or her consumption, Glen Peters says.

Following exports, capital formation – primarily construction – is the second largest driver of the emissions increase in China.

ESF names Dr. Marc Heppener as Director of Science & Strategy Development

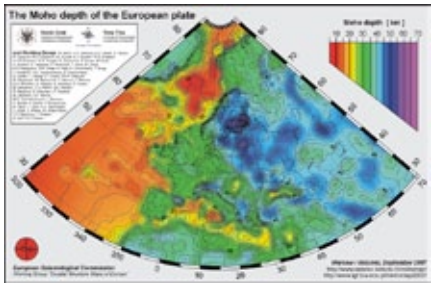
Dr. Marc Heppener

17 February 2009.- The European Science Foundation (ESF) has named Dr. Marc Heppener from the European Space Agency (ESA) as the new Director of Science and Strategy Development, making him the second-in-command of the more than 3-decade-old organisation.

Dr. Heppener began his duty this month, succeeding Dr. John Marks for the post. Prior to that, Dr. Heppener was the Head of the Science and Applications Division of the European Space Agency (ESA).

Dr. Heppener is also the President of the Nederlandse Vereniging voor Ruimtevaart (Netherlands Society for Aerospace), the Vice-President of the International Astronautical Federation and the Chairman of its Space and Society Committee.

European Moho depth map



The Moho depth map of the European Plate. credit: European Seismological Commission, Working Group "Crustal Structure Maps of Europe"

07 January 2009.- The European Plate has a 4.5 Gy long and complex tectonic history. This is reflected in the present-day large-scale crustal structures. A new digital Moho depth map is compiled from more than 250 data sets of individual seismic profiles, 3-D models obtained by body and surface waves, receiver function results and maps of seismic and/or gravity data compilations. Scientists from the University of Warsaw, the University of Helsinki and ESC Working Group compiled the first digital, high-resolution map of the Moho depth for the whole European Plate, extending from the mid-Atlantic ridge in the west to the Ural Mountains in the east, and from the Mediterranean Sea in the south to the Barents Sea and Spitsbergen in the Arctic in the north. In general, three large domains within the European Plate crust are visible. The oldest Archean and Proterozoic crust has a thickness of 40–60 km, the continental Variscan and Alpine crust has a thickness of 20–40 km, and the youngest oceanic Atlantic crust has a thickness of 10–20 km.

Community review of Guide to Best Practices in Ocean Acidification

open now until July 15, 2009

The Guide to Best Practices in Ocean Acidification Research and Data Reporting is intended as a reference to provide guidance for research in the rapidly growing field of ocean acidification. Its preparation was initiated by the European Project on Ocean Acidification (EPOCA) and the International Oceanographic Commission (IOC) and sponsored by EPOCA, IOC, the Scientific Council on Oceanic Research (SCOR), the U.S. Ocean Carbon and Biogeochemistry Project (OCB), and the Kiel Excellence Cluster "The Future Ocean". Each section of the guide listed below was seen by independent experts in the field whose comments and suggestions were incorporated.

Chapter 1: Seawater carbonate chemistry
1.1 Carbonate system measurements
1.2 Approaches and tools to manipulate the carbonate chemistry

Chapter 2: Experimental design of perturbation experiments
2.1 Atmospheric CO2 targets for ocean acidification perturbation experiments
2.2 Designing ocean acidification experiments to maximise inference
2.3 Bioassays, batch culture and chemostat experimentation
2.4 Pelagic mesocosms
2.5 Laboratory experiments and benthic mesocosm studies
2.6 In situ perturbation systems and natural CO2 venting site

Chapter 3: Measurements of CO2 sensitive processes
3.1 Studies of metabolism and acid-base status
3.2 Production and export of organic matter
3.3 Pelagic calcification
3.4 Benthic calcification

Chapter 4: Data reporting and data usage
4.1 Modeling considerations
4.2 Safeguarding and sharing ocean acidification knowledge

The community review of the guide is now open (http://www.epoca-project.eu/index.php/Home/Guide-to-OA-Research/). All scientists are invited to provide comments and suggestions on any aspect of the guide to the lead authors of the respective sections and cc to the editors (see below). Lead authors may decide to include the names of experts who have provided substantial input to their section to the list of contributing authors.

The recognition and usefulness of this guide critically depends on the level of community consensus it can generate. We therefore urge you to provide input on any part of this document. After completion the guide will be made available electronically and in printed form via EPOCA, IOC and OCB. It is envisioned to revisit and possibly revise the guide to accommodate new developments in the field in a few years time.

We are grateful to all colleagues who have contributed their time to the preparation of this guide as chapter editors, lead and contributing authors and expert reviewers.

Ulf Riebesell, Victoria Fabry, Jean-Pierre Gattuso (editors)

Monaco Declaration on Ocean Acidification: Ocean acidification is accelerating and severe damages ar

30 January 2009.- UNESCO and IGBP press releases introduced on Friday 30 January the Monaco Declaration on Ocean Acidification, supported by Prince Albert II of Monaco and signed by 155 scientists that participated in the "Second Symposium on the ocean in a high-CO2 world" meeting in Monaco last October. The scientists are calling for immediate action by policymakers to reduce CO2 emissions sharply so as to avoid widespread and severe damage to marine ecosystems from ocean acidification. A press conference presenting the declaration was held in Nice on 30 January during the last day of the 2009 ASLO Aquatic Sciences meeting. A welcome from Carlos Duarte, president of ASLO, was followed by a talk by Denis Allemand representing the "Prince Albert II of Monaco Foundation" and a presentation of ocean acidification and its possible impacts by Jean-Pierre Gattuso (CNRS) and Jim Orr (IAEA). The Monaco Declaration and the Research Priorities Report on which it is based, can be downloaded via the Ocean Acidification Network Homepage: http://www.ocean-acidification.net/.

An EGU Position Statement on Ocean Acidification was released on 11 December 2008 (http://www.egu.eu/statements/egu-position-statement-on-ocean-acidification.html).

Charged dust from Enceladus

to facilitate and build the connections between science and policy

17 April 2009.- A team working on the NASA/ESA/ASI Cassini-Huygens mission has discovered tiny charged icy particles in the plume from Saturn's moon Enceladus. Dr Geraint Jones and Dr Chris Arridge, both from University College London's Mullard Space Science Laboratory, presented the results on behalf of the Cassini Plasma Spectrometer (CAPS) instrument team on Wednesday 22nd April at the European Week of Astronomy and Space Science conference at the University of Hertfordshire.

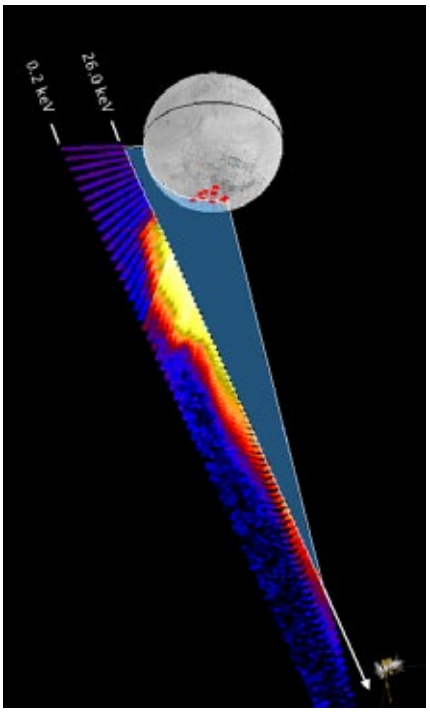
Cassini has been exploring Saturn and its moons since 2004. Five hundred kilometre (300 mile)-wide Enceladus, discovered from Slough in 1789 by William Herschel, has been found to possess active jets near its southern pole that spew gas and water out into space over thousands of kilometres. During two particularly close flybys of the moon in 2008, skimming only 52 and 25 km from the surface at around 15 km per second (54000 km per hour), the CAPS instrument on the spacecraft was pointed to scoop up gas as it zoomed through the plume.

The CAPS instrument is designed to detect charged gas (plasma), but the instrument also detected tiny ice grains in the plume whose signatures could only be present if they were electrically charged. These grains, probably only measuring a few nanometres across, fall into a size range between gas atoms and much larger ice grains, both of which were sampled directly during previous Enceladus flybys. The particles have both positive and negative electrical charges, and the mix of the charges varied as the Cassini spacecraft crossed the plume.

Jones and Arridge suggest that the grains may be charged through so-called triboelectric processes, through bumping together in the vent below Enceladus's surface before they emerge into the plume.

As these charged grains travel away from Enceladus, their paths are bent by electric and magnetic fields in Saturn's giant magnetosphere. In this way Saturn's magnetosphere acts as an enormous mass spectrometer for the plume particles, allowing obrervers to constrain their masses. Arridge has begun modelling the paths of these newly-discovered particles.

Plasma in Saturn's magnetosphere flows past Enceladus at over 80000 km/hr. Arridge's results show that for this enormous mass spectrometer to work and for these dust particles to reach Cassini, this river of plasma must be significantly slowed down, in and near the plume, to speeds of less than 3200 km per hour. This slowing of the plasma is a result of the plume injecting particles into the plasma stream - making the whole flow slow down in a similar effect to when cars join a busy motorway. These results provide further evidence that the material in the Enceladus plume has a huge influence on the moon's surroundings.



Observations from the Cassini Plasma Spectrometer (CAPS) made during the Cassini flyby. The red points on Enceladus show the locations of known jet sources. Credit: MSSL-UCL.

RAS

The lower atmosphere of Pluto

is "much hotter" than the surface

02 March 2009.- Pluto, about a fifth the size of Earth, is composed primarily of rock and ice. It is about 40 times further from the Sun than the Earth on average, with a surface temperature of about minus 220 degrees Celsius.

It has been known since the 1980s that Pluto also has a tenuous atmosphere, which consists of a thin envelope of mostly nitrogen, with traces of methane and probably carbon monoxide. As Pluto moves away from the Sun, during its 248 year-long orbit, its atmosphere gradually freezes and falls to the ground. In periods when it is closer to the Sun — as it is now — the temperature of Pluto's solid surface increases, causing the ice to sublimate into gas.

Until recently, only the upper parts of the atmosphere of Pluto could be studied. By observing stellar occultations, it was demonstrated that Pluto's upper atmosphere was some 50 degrees warmer than the surface, or minus 170 degrees Celsius. New observations made with the CRyogenic InfraRed Echelle Spectrograph (CRIRES), attached to ESO's Very Large Telescope, have now shown that the atmosphere as a whole, not just the upper atmosphere, has a mean temperature of minus 180 degrees Celsius, and so it is indeed "much hotter" than the surface.

In contrast to the Earth's atmosphere, most, if not all, of Pluto's atmosphere is thus undergoing a temperature inversion: the temperature is higher, the higher in the atmosphere you look. The change is about 3 to 15 degrees per kilometre.

The reason why Pluto's surface is so cold is linked to the existence of Pluto's atmosphere, and is due to the sublimation of the surface ice; this sublimation has a cooling effect on the surface of Pluto.

The CRIRES observations also indicate that methane is the second most common gas in Pluto's atmosphere, representing half a percent of the molecules.

ESO PR, Reference: E. Lellouch et al. 2009, A&A, in press, Pluto's lower atmosphere structure and methane abundance from high-resolution spectroscopy and stellar occultations.

Artist's impression of how the surface of Pluto might look, according to one of the two models that a team of astronomers has developed to account for the observed properties of Pluto's atmosphere, as studied with CRIRES. The image shows patches of pure methane on the surface. At the distance of Pluto, the Sun appears about 1000 times fainter than on Earth. Credit: ESO/Luis Calçada

IFM-GEOMAR Director Peter Herzig to become chairman of POGO

Leibniz Institute of Marine Sciences (IFM-GEOMAR)

Prof. Dr. Peter Herzig

Professor Peter Herzig, Director of the Leibniz Institute of Marines Sciences (IFM-GEOMAR) in Kiel, Germany has been elected as next chairman of the international association of marine research institutes, the Partnership for Observation of the Global Oceans (POGO), on their annual meeting in Conception, Chile Herzig will start his term in January 2011 in Seoul, South Korea. Professor Herzig now joins the executive committee of POGO, which supports a comprehensive observational concept for the world ocean. This concept comprises observing systems for the ocean and the sea floor as well as satellite based atmospheric systems. POGO cooperates with the secretariat for Global Earth Observations (GEO). "It will be one of my tasks to work on the integration of the existing subsystems for ocean observations in the future", Professor Herzig stated. Herzig is also coordinator for maritime affairs of the State of Schleswig-Holstein and maritime ambassador of the EU-commission in Brussels.

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Cosmic rays, cloud condensation nuclei and clouds – a reassessment using satellite data

no statistically significant correlations were found between MODIS cloud parameters and galactic cosmic rays

A new study supports earlier findings that changes in cosmic rays most likely do not contribute to climate change.

The study Cosmic rays, cloud condensation nuclei and clouds – a reassessment using MODIS data was recently published in the journal Atmospheric Chemistry and Physics. A group of researchers from the University of Oslo, Norwegian Institute for Air Research (NILU), CICERO Center for Climate and Environmental Research, and the University of Iceland, are behind the study.

Kristjansson and his collegaues have used observations from so-called Forbush decrease events: Sudden outbreaks of intense solar activity that lead to a strong reduction of cosmic rays, lasting for a couple of days. The researchers have identified 22 such events between 2000 and 2005.

Based on data from the space-borne MODIS instrument, the researchers have investigated whether these events have affected cloud formation. While previous studies have mainly considered cloud cover, the high spatial and spectral resolution of the MODIS data also allows for a more thorough study of microphysical parameters such as cloud droplet size, cloud water content and cloud optical depth.

No statistically significant correlations were found between any of the four cloud parameters and galactic cosmic rays.

Reference URL:
http://www.atmos-chem-phys.net/8/7373/2008/acp-8-7373-2008.html

Analysis of atmospheric neutral and charged molecular clusters

in boreal forest using pulse-height CPC

The authors measured the size distribution of atmospheric neutral and charged clusters and particles down to mobility diameter around 1.5 nm by applying pulse-height CPC technique at SMEAR II station in Hyytiälä, southern Finland during spring 2007 and May 2008. The concentration of molecular clusters smaller than 3 nm seems to be highly variable in boreal forest environment, the concentration varied typically between 500–50.000 cm−3. By comparing to concentrations measured with ion spectrometers, they conclude that ion clusters and neutral clusters produced by ion-ion recombination are usually not sufficient to explain all of the observed clusters; the median fraction of recombination products from all neutral clusters was 4.9%. Before and during most new particle formation events the cluster formation rate rose only slightly, or remained close to stable. Nocturnal formation of clusters was also frequently observed.

The full paper is available free of charge at
http://www.atmos-chem-phys.net/9/4177/2009/acp-9-4177-2009.html

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Cloud particle size distributions

measured with an airborne digital in-line holographic instrument

Holographic data from the prototype airborne digital holographic instrument HOLODEC (Holographic Detector for Clouds), taken during test flights are digitally reconstructed to obtain the size (equivalent diameters in the range 23 to 1000 um), three-dimensional position, and two-dimensional image of ice particles and then ice particle size distributions and number densities are calculated using an automated algorithm with minimal user intervention. The holographic method offers the advantages of a well-defined sample volume size that is not dependent on particle size or airspeed, and offers a unique method of detecting shattered particles. The holographic method also allows the volume sample rate to be increased beyond that of the prototype HOLODEC instrument, limited solely by camera technology.

HOLODEC size distributions taken in mixed-phase regions of cloud compare well to size distributions from a PMS FSSP probe also onboard the aircraft during the test flights. A conservative algorithm for detecting shattered particles utilizing their depth-position along the optical axis eliminates the obvious ice particle shattering events from the data set. In this particular case, the size distributions of non-shattered particles are reduced by approximately a factor of two for particles 15 to 70 um in equivalent diameter, compared to size distributions of all particles.

The full paper is available free of charge at
http://www.atmos-meas-tech.net/2/259/2009/amt-2-259-2009.html

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Molecular biology techniques and applications for ocean sensing

a review of some of the most commonly used techniques

The study of marine microorganisms using molecular biological techniques is now widespread in the ocean sciences. These techniques target nucleic acids which record the evolutionary history of microbes, and encode for processes which are active in the ocean today. Molecular techniques can form the basis of remote instrumentation sensing technologies for marine microbial diversity and ecological function. The authors review some of the most commonly used molecular biological techniques. These techniques include the polymerase chain reaction (PCR) and reverse-transcriptase PCR, quantitative PCR, whole assemblage "fingerprinting" approaches (based on nucleic acid sequence or length heterogeneity), oligonucleotide microarrays, and high-throughput shotgun sequencing of whole genomes and gene transcripts, which can be used to answer biological, ecological, evolutionary and biogeochemical questions in the ocean sciences. Moreover, molecular biological approaches may be deployed on ocean sensor platforms and hold promise for tracking of organisms or processes of interest in near-real time.

The full paper is available free of charge at
http://www.ocean-sci.net/5/101/2009/os-5-101-2009.html

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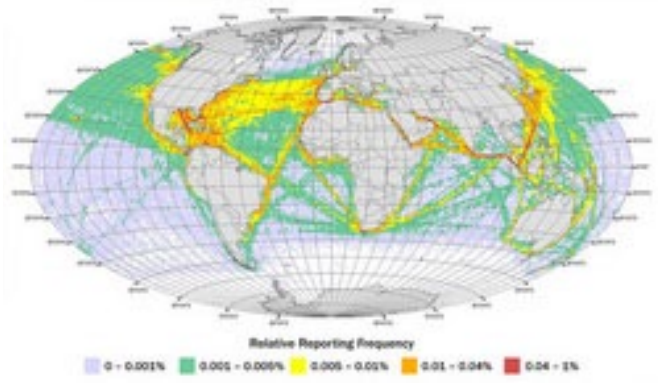
Ship-generated emissions

increase acid rain on shore and may be responsible for over 25% of the ground-level ozone in a number of coastal areas



Ocean roads: map shows world's shipping routes, credit: Dalsøren et al

Past studies have shown that 70% of shipping occurs within 400 kilometres of land. Taking this research further, Stig B. Dalsøren, from the Centre for International Climate and Environmental Research at the University of Oslo in Norway, and his team, investigated the amount of pollution generated by ships and located the affected sites. They evaluated data that was collected globally in 2004.

In 2004 the global merchant fleet comprised more than 90 000 ships — each weighing 100 gross tonnes (101 metric tonnes). The researchers split the ships (e.g. cruise ships, supertankers and tugboats) into 15 categories in order to compute the pollution they emitted. Each category was subdivided into seven weight ranges. The team then estimated the emissions they believed would be generated while the ship was at sea or in port.

Information about the routes sailed by more than 30 000 ships during that period was used to establish the location of the generated emissions. 'The ships burned around 217 million metric tonnes of fuel in 2004 and 5% of this was consumed while in port,' said Dalsøren.

The majority of the burned fuel was sulphur-rich diesel, leading to emissions containing over 16 million tonnes of sulphur dioxide.

On a global scale, the team calculated that ships are responsible for more than 10% of acid rain due to NOx emissions, and almost 5% of acid rain due to sulphur dioxide emissions. Data show, for instance, that around 15% of the sulphur dioxide in the air at the port of Singapore is generated by ships. A number of coastal areas (e.g. the Nordic region) that lack industrial activity but that have ships passing close by, report that almost 50% of the acid rain is potentially caused by ship emissions.

Ulrich Pöschl, Ken Carslaw, Thomas Koop, Rolf Sander & William Thomas Sturges, Atmospheric Chemistry and Physics (ACP)

Microphysical and radiative characterization of a subvisible midlevel Arctic ice cloud

by airborne observations – a case study

During the Arctic Study of Tropospheric Aerosol, Clouds and Radiation (ASTAR) campaign, which was conducted in March and April 2007, an optically thin ice cloud was observed south of Svalbard at around 3 km altitude. The microphysical and radiative properties of this particular subvisible midlevel cloud were investigated with complementary remote sensing and in situ instruments. Collocated airborne lidar remote sensing and spectral solar radiation measurements were performed at a flight altitude of 2300 m below the cloud base. Under almost stationary atmospheric conditions, the same subvisible midlevel cloud was probed with various in situ sensors roughly 30 min later.

From individual ice crystal samples detected with the Cloud Particle Imager and the ensemble of particles measured with the Polar Nephelometer, microphysical properties were retrieved with a bi-modal inversion algorithm. The best agreement with the measurements was obtained for small ice spheres and deeply rough hexagonal ice crystals. Furthermore, the single-scattering albedo, the scattering phase function as well as the volume extinction coefficient and the effective diameter of the crystal population were determined. A lidar ratio of 21(±6) sr was deduced by three independent methods. These parameters in conjunction with the cloud optical thickness obtained from the lidar measurements were used to compute spectral and broadband radiances and irradiances with a radiative transfer code. The simulated results agreed with the observed spectral downwelling radiance within the range given by the measurement uncertainty. Furthermore, the broadband radiative simulations estimated a net (solar plus thermal infrared) radiative forcing of the subvisible midlevel ice cloud of −0.4 W m−2 (−3.2 W m−2 in the solar and +2.8 W m−2 in the thermal infrared wavelength range).

The full paper is available free of charge at
http://www.atmos-chem-phys.net/9/2647/2009/acp-9-2647-2009.html

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A survey of European sea level infrastructure

NEAMTWS network in good shape but with major gaps along the North African coastline and on European Mediterranean and Black Sea coasts

This paper summaries findings from a survey of European sea level infrastructure (tide gauges, telemetry methods, ancillary information) conducted at the end of 2008 on behalf of the Tsunami Risk ANd Strategies For the European Region (TRANSFER), Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS), European Sea Level Service (ESEAS) and Global Sea Level Observing System (GLOSS) projects and programmes. Approximately 478 strategic tide gauges were found to be operational at this time, of which about three-quarters have near-real time data telemetry of various kinds. Around half of the gauges take part in real-time international data exchange. The NEAMTWS network can be considered to be in good shape in that most of its sites for which a gauge exists will be capable of meeting required standards in the near future. On the other hand, NEAMTWS (and the European and North African network in general) contains major gaps along the North African coastline and on European Mediterranean and Black Sea coasts which require new installations. The paper also summaries standards for the various sea level programmes, and reviews existing European infrastructure in the form of data centres and web sites.

The full paper is available free of charge at
http://www.nat-hazards-earth-syst-sci.net/9/927/2009/nhess-9-927-2009.html

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Evidence for surface organic matter modulation of air-sea CO2 gas exchange

high surface organic matter contents may lead to lower air-sea CO2 fluxes for a given air-sea CO2 partial pressure gradient

Air-sea CO2 exchange depends on the air-sea CO2 gradient and the gas transfer velocity (k), computed as a function of wind speed. Large discrepancies among relationships predicting k from wind suggest that other processes also contribute significantly to modulate CO2 exchange. Here the authors report, on the basis of the relationship between the measured gas transfer velocity and the organic carbon concentration at the ocean surface, a significant role of surface organic matter in suppressing air-sea gas exchange, at low and intermediate winds, in the open ocean, confirming previous observations. The potential role of total surface organic matter concentration (TOC) on gas transfer velocity (k) was evaluated by direct measurements of air-sea CO2 fluxes at different wind speeds and locations in the open ocean. According to the results obtained, high surface organic matter contents may lead to lower air-sea CO2 fluxes, for a given air-sea CO2 partial pressure gradient and wind speed below 5 m s−1, compared to that observed at low organic matter contents. The authors found the bias in calculated gas fluxes resulting from neglecting TOC to co-vary geographically and seasonally with marine productivity. These results support previous evidences that consideration of the role of organic matter in modulating air-sea CO2 exchange may improve flux estimates and help avoid possible bias associated to variability in surface organic concentration across the ocean.

The full paper is available free of charge at
http://www.biogeosciences.net/6/1105/2009/bg-6-1105-2009.html

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Overview and summary of the Spread F Experiment (SpreadFEx)

motivation was to define potential role of gravity wave motions propagating upward from the lower atmosphere in seeding Rayleigh-Taylor instability and plasma bubbles

The authors provide here an overview of, and a summary of results arising from, an extensive experimental campaign (the Spread F Experiment, or SpreadFEx) performed from September to November 2005, with primary measurements in Brazil. The motivation was to define the potential role of neutral atmosphere dynamics, specifically gravity wave motions propagating upward from the lower atmosphere, in seeding Rayleigh-Taylor instability (RTI) and plasma bubbles extending to higher altitudes. Campaign measurements focused on the Brazilian sector and included ground-based optical, radar, digisonde, and GPS measurements at a number of fixed and temporary sites. Related data on convection and plasma bubble structures were also collected by GOES 12, and the GUVI instrument aboard the TIMED satellite.

Initial results of their SpreadFEx analyses are described separately by Fritts et al. (2009). Further analyses of these data provide additional evidence of 1) gravity wave (GW) activity near the mesopause apparently linked to deep convection predominantly to the west of their measurement sites, 2) small-scale GWs largely confined to lower altitudes, 3) larger-scale GWs apparently penetrating to much higher altitudes, 4) substantial GW amplitudes implied by digisonde electron densities, and 5) apparent influences of these perturbations in the lower F-region on the formation of equatorial spread F, RTI, and plasma bubbles extending to much higher altitudes. Other efforts with SpreadFEx data have also yielded 6) the occurrence, locations, and scales of deep convection, 7) the spatial and temporal evolutions of plasma bubbles, 8) 2-D (height-resolved) structures in electron density fluctuations and equatorial spread F at lower altitudes and plasma bubbles above, and 9) the occurrence of substantial tidal perturbations to the large-scale wind and temperature fields extending to bottomside F-layer and higher altitudes. Collectively, their various SpreadFEx analyses suggest direct links between deep tropical convection and large GW perturbations at large spatial scales at the bottomside F-layer and their likely contributions to the excitation of RTI and plasma bubbles extending to much higher altitudes.

The full paper is available free of charge at
http://www.ann-geophys.net/27/2141/2009/angeo-27-2141-2009.html

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Freaque waves during Typhoon Krosa

two new identification indices are tentatively proposed

This paper presents a subjective search for North Sea Draupner-like freaque waves from wave measurement data available in the northeastern coastal waters of Taiwan during Typhoon Krosa, October 2007. Not knowing what to expect, the authors found rather astonishingly that there were more Draupner-like freaque wave types during the build-up of the storm than anticipated. As the conventional approach of defining freaque waves as Hmax/Hs>2 is ineffective to discern all the conspicuous cases they found, two new indices are also tentatively proposed based on different empirical wave grouping approaches which hopefully can be used for further development of effective indexing toward identifying freaque waves objectively.

The full paper is available free of charge at http://www.ann-geophys.net/27/2633/2009/angeo-27-2633-2009.html

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A summary of observational records on periodicities above the rotational period in the Jovian magnet

particularly concentrating on those observed in energetic particle data

The Jovian magnetosphere is a very dynamic system. The plasma mass-loading from the moon Io and the fast planetary rotation lead to regular release of mass from the Jovian magnetosphere and to a change of the magnetic topology. These regular variations, most commonly on several (2.5–4) days scale, were derived from various data sets obtained by different spacecraft missions and instruments ranging from auroral images to in situ measurements of magnetospheric particles. Specifically, ion measurements from the Galileo spacecraft represent the periodicities, very distinctively, namely the periodic thinning of the plasma sheet and subsequent dipolarization, and explosive mass release occurring mainly during the transition between these two phases. The authors present a review of these periodicities, particularly concentrating on those observed in energetic particle data. The most distinct periodicities are observed for ions of sulfur and oxygen. The periodic topological change of the Jovian magnetosphere, the associated mass-release process and auroral signatures can be interpreted as a global magnetospheric instability with analogies to the two step concept of terrestrial substorms. Different views on the triggering mechanism of this magnetospheric instability are discussed.

The full paper is available free of charge at http://www.ann-geophys.net/27/2565/2009/angeo-27-2565-2009.html

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ELF and VLF signatures of sprites

registered onboard the low altitude satellite DEMETER

The authors report the observation of ELF and VLF signature of sprites recorded on the low altitude satellite DEMETER during thunderstorm activity. At an altitude of ~700 km, waves observed on the E-field spectrograms at mid-to-low latitudes during night time are mainly dominated by up-going 0+ whistlers. During the night of 20 July 2007 two sprites have been observed around 20:10:08 UT from the observatory located on the top of the mountain Śnieżka in Poland (50°44'09" N, 15°44'21" E, 1603 m) and, ELF and VLF data have been recorded by the satellite at about 1200 km from the region of thunderstorm activity. During this event, the DEMETER instruments were switched in the burst mode and it was possible to register the wave forms. It is shown that the two sprites have been triggered by two intense +CG lightning strokes (100 kA) occurring during the same millisecond but not at the same location. Despite the distance DEMETER has recorded at the same time intense and unusual ELF and VLF emissions. It is shown that the whistler wave propagates from the thunderstorm regions in the Earth-ionosphere guide and enters in the ionosphere below the satellite. They last several tens of milliseconds and the intensity of the ELF waveform is close to 1 mV/m. A particularly intense proton whistler is also associated with these emissions.

The full paper is available free of charge at http://www.ann-geophys.net/27/2599/2009/angeo-27-2599-2009.html

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Alan W. Brewer (1915-2007)

The discovery of stratospheric dryiness

Alan W. Brewer died on 21 November 2007 at the age of 92. Among his scientific achievements was the discovery, during World War II, that the stratosphere was unexpectedly dry. In 1949 he wrote a seminal paper for the Quarterly Journal of the Royal Meteorological Society describing how air enters the stratosphere over the Equator and leaves it at higher latitudes in what became known as the Brewer-Dobson circulation (Brewer, 1949).

Alan Brewer, Kirill Semeniuk, and Michael McIntyre discussing the Brewer Spectrophotometer. Credit: From the SPARC website.

Prof. Alan W. Brewer died on 21 November 2007 at the age of 92. He was born in Montreal in Canada, but raised in Derby, England. He was an outstanding meteorologist and designer of instruments for observation of the stratosphere. His observations enabled him to make seminal contributions to knowledge of the physics, chemistry and dynamics of the stratosphere.

His carreer sterted after he won a scholarship to University College London to read Physics. After getting his MSc he joined the Met Office in 1937. In 1942 he was doing research into the formation of condensation trails together with Dobson. During World War II, Dobson directed his attention to the humidity of the stratosphere. The work on water vapour began because the Meteorological Office had a problem with forecasting the conditions and heights when aircraft make condensation trails (because they attracted enemy aircraft). He looked at the dew-point, or frost-point, method of measuring humidity and designed the frost-point hygrometer. A. W. Brewer was appointed to be the Meteorological Officer at Boscombe Down. He was responsible for flying these instruments and also did a lot of the design work. The first flights, involving working unpressurised in the stratosphere, showed that the region was unexpectedly dry. The meteorologists of the day took a long time to be convinced by the new data, having expected the air in the stratosphere to be saturated. His subsequent research led to the identification of the Brewer-Dobson circulation of the stratosphere.

In his academic career that took him to Oxford, MIT, and the University of Toronto he contributed greatly to the measurement and understanding of stratospheric ozone. Among other achievements, in 1960 A. W. Brewer developed his mast ozonesonde for measuring the ozone in the stratosphere. The device was heavier than the lightweight instruments carried in balloons to investigate the physical characteristics of the upper air. It therefore required a larger balloon than used before to reach the stratosphere.

After his retirement from University of Toronto he returned to England and farmed in Devon until he was nearly 80. He was also a passionate and skilled carpenter and had also a talent for repairing clock movements. He married Iris, a fellow UCL physicist, in 1939. They had three children, seven grandchildren, and (so far) three great-grandchildren.

To mark 50 years since Brewer's seminal paper on the transport of water vapour (Brewer, 1949), and 70 years since Dobson's paper on the transport of ozone (Dobson et al., 1929), a 3-day workshop was held to review all aspects of the Brewer-Dobson circulation (Brewer-Dobson Workshop, 13-15 December 1999, Oxford, UK). The venue was the Subdepartment of Atmospheric, Oceanic and Planetary Physics, University of Oxford, where Alan Brewer worked from 1948 to 1962. During this Workshop, Prof. Brewer made a presentation entitled `The Stratospheric Circulation: a Personal History`. This presentation appeared in the SPARC Newsletter and we reproduce it here:

The Stratospheric Circulation: a Personal History

by Alan Brewer

My involvement with the stratosphere began in the height of summer 1942, in the very depths of World War II. The Germans controlled the Atlantic coast, from the North of Norway to the south of France. They were besieging Stalingrad, in sight of Moscow, crossing the Donne and looking forward to dealing with the great oil fields of Asia Minor. In Africa they had reached El Alamein and Rommell was satisfied that with one last push they would capture Alexandria, the Nile Valley and the Suez canal. The Commonwealth would be split in two and Germany would join with Japan.

Me, I was just a shift forecaster at an RAF station not far from Oxford. In an afternoon off, a messenger came to say I had to return to the office because I was going to be moved. I was informed that I had to be at HQ in London first thing the next day. I got there and was briefed. The problem I was asked to deal with was condensation trails. It is quite easy to make a physical theory in which you balance the effects of water and heat from the aircraft. In a height-temperature plot, on one side of a line that we called Mintra (sloping from high altitude and low temperature to low altitude and high temperature) an aircraft was able to make trails because its passage increased the humidity, on the other side it was not. Everybody was very satisfied with this theory and this is what the pilots were told. However, in practice, pilots were rather worryingly reporting trails when they were flying at moderate altitude in regions where we expected no trails; and they were reporting no trails when flying at high altitude in regions where we were expecting big trails. Understanding this discrepancy was very important. In a raid on Nuremberg we had lost 93 aircraft, a totally unsustainable loss. It was therefore essential that we found out what was happening.

I was invited to investigate this. I was sent to Boscombe Down to a special unit, which was to be just me, attached to High Altitude Flight. I was briefed by the Director of the Met Office himself, who emphasised the problems and also mentioned the difficulties of making air temperature measurements from aircraft. I was told that Dobson had already started on hygrometry and would help and supervise. I was to have 2 Bostons and 1 sergeant instrument maker. (When I arrived at High Altitude Flight, I met a recent Cambridge graduate, a red-headed character who proved immensely helpful. His name was Richard Goody, and he was concerned with the avionics section. We worked side-by-side for the rest of the war.).

I realised that the air temperature measurement problem was a very acute one, and I soon learned that no-one had any idea how to solve it. (They were very busy, let me say). I knew that there was a real problem because we were getting quite ridiculous temperature measurements across the forecast bench. So the first thing to do was to solve this problem, which I was able to do very quickly and with great asset to my own prestige. A forecaster's prestige was not really very good -in modern terms somewhere between a lawyer and a politician- and to come in and solve a problem that was worrying the experts was a good start and it stood me in good stead for a long time. It also enabled me to capture a very competent instrument maker, whom Richard Goody had tipped me off about.

Dobson was rather annoyed at the delay. Dobson looked after me very closely, travelling the 50 miles down from Oxford to Boscombe Down. In the first place Dobson supplied a hygrometer which he had shown to work in the lab. under a wide range of temperatures. However, in the aircraft it suffered from the fact that the light changes as the aircraft passes through cloud and turns etc. So, for aircraft use it was clear that we needed a proper illumination system. We therefore further developed the frost point hygrometer. The object is to watch for deposition of dew or frost on a surface that is ventilated by outside air. It is cooled by pumping a coolant from below. The temperature is measured by a resistance thermometer. The viewing surface is at a focus of an elliptical glass lens, with a lamp at the other focus for illumination. You watch for deposition on the surface through a good magnifying glass. We soon had this working and the first time we made condensation trails under conditions when we ought not to have made them, it was clear that we were in that no-man's land where the air was saturated with respect to ice, but was not saturated with respect to super-cooled water; so the air could be clear, but the passage of the aircraft caused the trail. We had that solved fairly quickly. There was not much trouble with the fact because the physical possibility was well known.

The Boston aircraft had a performance almost exactly equal to that of the modern Hercules, with a ceiling of about 30,000 ft and so we could not get into the stratosphere where the expected trails did not occur. The air force provided a Flying Fortress said to be one of six that were given as a personal present from Roosevelt to Churchill. We took everything we could move out of it and we got it to 37,000 ft and this was the first time we got into the stratosphere. To my surprise, as the temperature turned up, the frost point turned down, and at the highest levels I could get no deposit. We were using solid carbon dioxide as a coolant and we obviously had to change to liquid oxygen, which we did, but it was clear that the reason that there were no trails in the stratosphere was that the air was exceedingly dry. I would not have believed before I had started that the air could be so dry, but I saw it with my own eyes. I had plenty of trouble with people convincing them that we could really measure that dryness.

The war progressed and we got the Mosquito aircraft. The instrument was redesigned and rebuilt to work in the pressure cabin. The Mosquito was a lovely airplane. The cockpit was size of a small car and I sat side-by-side with the pilot, with the frost point hygrometer by my right hand and a short pipe going outside. I made very great effort indeed to ensure that the exceedingly dry measurements were really right. With the Mosquito could get higher, and with the new instrument the lowest frost point I ever measured was 190K absolute. The effects at the tropopause were very striking. Personally, I very soon formed the opinion that the very dry air had come from the equatorial tropopause. All we knew about temperatures at different altitudes in the tropics came from Brunt (1934), which

had a figure based on measurements in the Dutch East Indies, now Indonesia. This showed the equatorial tropopause to be about 190K absolute consistent with my lowest frost point.

Dobson gave the 1946 Bakerian Lecture (Dobson, 1946). It was Dobson's lecture; Cwilong's name and my name were put on it simply because he used the humidity measurements. If you examine it you will find that he is actually merely reviewing the traditional theory that had been started by Emden (1913) and had continued through Simpson (1928) and in it he recalculates the radiation balance of the stratosphere with the new humidity measurements. Simpson had assumed that there was 0.3mm of precipitable water in the stratosphere, we had divided that by something like 50. Dobson was attempting to make a new calculation with the new concept of the dryness.

Eric Eady was an old friend. We had been on a Met Office training course together, we had worked on the same forecast bench. He came and visited me occasionally and he would stay at my home. He came to my office and we would talk. He would tell me about long waves in the westerlies and baroclinic waves and I would tell him how the stratospheric air had come from the equatorial tropopause. He was not convinced. He had very great difficulties with the momentum problem and in fact there is a caveat in my 1949 paper (Brewer, 1949) to the effect that there is a problem with momentum. Dobson was not very impressed with my suggestions as an explanation of the ozone observations. I came to Oxford and at about that time Dobson began to work with R.H. Kay developing a sampler to measure ozone concentration that could be flown on an aircraft, it was based around being flown on a Met Flight Mosquito. It followed the method in which iodine is produced by the ozone and is measured electrochemically. We got no useful results in Southern England. Then one day Dobby came into the lab and said he had had a letter from Tönsberg in Tromsö. Tönsberg was the very active director of the observatory in Tromsö and had worked with Dobson for many years on ozone measurements. The early high latitude measurements that are so often quoted are due to him. I suspect that Tönsberg had been measuring the low level of the ozone and no-one was believing him. Tönsberg said that if we sent someone with the sampler he could get flights from Tromsö to measure ozone through the tropopause. Dobby asked me what we should do and I said we should take up the offer. Dobby asked who we should send and I said a student, and if we can't find a student then I would go. Well, we didn't have a student and I went. I was able to get 4 good flights there in July 1955 on a Vampire jet that flew to 43,000 ft. The results showed a very sharp transition in ozone concentration at the tropopause (Brewer, 1957). Dobby had been totally committed to a stagnant stratosphere, but after these results he was convinced and he published his well known paper. The results convinced me that we needed an ozonesonde. Soon afterwards James Milford joined the department as a graduate student and took on the job of making one.

Now, there was in the late fifties the atom bombs and hydrogen bombs. The hydrogen bombs were penetrating stratosphere and going to a great height. We were told that it didn't matter because the debris would go up there and float around for years and years, quietly decaying. But, of course it came out PDQ. What was more, they fired the hydrogen bombs in the Pacific, but the debris came out in a broad swathe from California to Boston, where it worried people who mattered. As a result, in New York in 1960 the UN Scientific committee held a discussion on the problem of the transfer of debris into the troposphere. I received a letter from the Director of the Met Office, who was Sutton at the time, saying that he had an invitation for me to go to the discussion, but that there were no provisions in any budget for my expenses. So, I proposed not to go, but I was on sabbatical leave at MIT at the time, and MIT encouraged me to go and offered to pay my expenses. So I went. It was a meeting of about 50 people, and it covered a lot more than just the stratosphere, focusing on all aspects of the fallout problem. I gave my opinions and MIT, having paid my expenses, reasonably invited me to write up what I said. I had forgotten about this until a copy of the MIT report (Brewer, 1960) turned up in Dobson's papers and was brought to my attention by John Barnett. One of the things that I pointed out was that there is a great readjustment of the level of ozone. We had made some ozone ascents in 1958 using Milford's ozonesonde. Some were made in Antarctica, I went to Malta (36°N), and I sent John Houghton (!) to Tromsö (70°N). The differences at different latitudes were very clear. In my 1949 paper I noted that there has to be this circulation, but I hadn't the foggiest how fast it was. It might be a hundred metres a day, it might only be a few. By 1960, it was obviously fairly large because the fallout was coming very fast. I guessed, based on the outflow of radioactive debris, that the annual downflow was a tenth to a fifth of the hemispheric store. This was the greatest I dared say without being laughed out of court.

While I was at MIT on sabbatical in 1960 I had a bet with Reggie Newell. At the time, I said that I bet 25 cents that in spring we would get new outflow events even though there had been no bomb in the last six months. He bet 25 cents that there wouldn't be. We wrote it on a piece of paper, got it properly typed and signed it. I found the piece of paper about 20 years later and sent it to Reggie, claiming my 25 cents with interest. He sent me a silver dollar.

In 1960, Anthony Wilson joined the department and I invited him to make measurements of the UV that was producing the ozone. The hope was that by measuring the UV radiation at wavelength 200nm and its divergence we could, by using the Chapman equations, get an idea of the rate of ozone production and perhaps the rate at which it was being turned over. The results that we published in 1965 were that the solar radiation at wavelength 200nm is three times less than that reported by Detwiler et al. and that the oxygen absorption cross-section is about 25% lower than reported in Ditchborne and Young. We went on to examine what the consequences of this were. I thought that if we took an account of the whole global store of ozone and watch it swilling about from the equator to the winter hemisphere, and assume that it is always going downwards (so that it is made but never comes back), we ought to get a rough idea of the total turnover in ozone. We did the calculation and found that the downward transport was much larger than I had expected with about half the total store of ozone coming down each year. There was no doubt that the turnover was very large, and it was confirmed by the debris data that was coming in. The calculation also showed that the outflow is seasonal and that in the northern hemisphere is about three times that in the southern hemisphere. So then we set out to do the calculations to relate the radiation to the outflow of ozone. One problem is, where is the ozone being made? This was discussed in our 1968 paper (Brewer and Wilson, 1968). The difficulty was to get people to grasp that the ozone that matters is not being made at the top of the atmosphere, it is being made relatively low down. At the top of the atmosphere the ozone concentration, in mixing ratio terms, is highest and therefore

people thought that this is where the ozone is made, but in fact this region is in photochemical equilibrium. This means that the Lagrangian equation gives you no ozone production, there may be lots of chemistry going on, but there is nothing being made to transport downwards. The main production region is at 10mb. There is considerable negative feedback in the ozone production process. If at high levels, some of the ozone is destroyed by nitrogen dioxide or chlorine, then the radiation that was absorbed by that ozone is able to penetrate to lower levels where it is able to create more ozone. This gives considerable stability to the ozone levels in the world.

Much the same story was told from radioactive fallout. The radioactive fallout is a body of very useful information and I hope that people are aware of it and will make use of it where possible. In a figure from Cambray et al., quoted by Peirson, (1970), it can be seen from the radioactive measurements that the northern hemisphere fallout is much more than the southern hemisphere fallout, in a ratio of about 3:1, as we deduced from the ozone measurements. In the period around 1966, the debris was pretty uniformly mixed through the stratosphere and the fallout is indeed diminishing by about 50-60 per cent per year. I hope that people realise that this information is available.

What were people thinking around 1970? In 1969 the Royal Meteorological Society (RMS) held a major meeting on discussions of the global circulation. This is an extract from the paper on The structure and dynamics of the stratosphere (Murgatroyd, 1970); `The earliest explanation of the general form of the vertical temperature profile by such workers as Gold (1909), Emden (1913) and Gowen (1947) was that the troposphere is broadly in convective equilibrium and the stratosphere is in radiative equilibrium. These conclusions have been broadly confirmed by recent authors (e.g. Goody 1949, Leovy 1964, Manabe et al., 61,64,67)…' I would like to say about the 1949 paper that I knew very well that it was not in accordance with most people's views, and that it would be difficult to get published. Indeed, part of the paper was designed to be acceptable to the referees and the editor. It would have been very easy for the referees to rubbish it, and to say that I had no experience in this field, was out of touch and that the idea was ridiculous because it was widely recognised that the stratosphere was in radiative equilibrium. I thank Reggie Sutcliff, who was the editor at the time, for it being published. Twenty years later, with a good deal of hindsight, the RMS paper was written. At this time the humidity measurements were beginning to be accepted, and I've talked about the fallout information, so the conclusions of the paper are particularly surprising.

We are now up to 1970, and I had learned that there was a lot of valuable information in the ozone measurements, but the Dobson spectrometer was becoming a problem. The supply had dried up and it was difficult instrument to maintain and required considerable skill to operate. So, I decided to prepare the ground for a new instrument which was to make use of digital methods of measurement. We had started that work when another stratospheric problem reared its ugly head. Concorde was being built and looked like being a success, and it looked, moreover, that it would become a big European symbol. It was receiving a lot of publicity. The Russians entered the race, making their copy which people called Concordski. The proposal was to build 250 Concordes and 250 Concordskis. The Americans were not to be left out. Boeing had plans for a bigger and better supersonic transport and they were going to make 500. An unthinkable fraction of the world's total fuel resources would be burnt in the stratosphere. I wasn't worried about the stratosphere, but I think there is a lot to be said for walking and cycling!

The suggestion which started to receive a lot of publicity was that NOx would be produced by these transports and is incompatible with ozone, that it would catalytically destroy ozone and in the stagnant stratosphere this NOx would accumulate indefinitely, the ozone would go and we would all die. From what I could see of pollution operations and measurements, NOx and ozone seemed to be positively commensal and the argument that they were mutually destructive I did not think very sensible. Also, was the pristine stratosphere really free of NOx? I wondered whether we could settle something about this by remote sensing method which we were working on for the new Dobson spectrometer. We dug out the spectrum of nitrogen dioxide, and at 450nm (in the blue) there was a very striking feature which meant that we could measure the NO2 between us and the sun. There were three wavelengths quite close together, which gave us a strong curvature of absorption and using methods similar to the Dobson AD method of calculation we could get the NO2 with very little interference from other substances. So we made a suitable instrument and took it onto the roof of the physics building in Toronto, where I was at the time. It was quite obvious as soon as we started that the NO2 in the Toronto atmosphere meant that it was quite impossible to work there. The instrument was quite small. It was considerably smaller than the modern `Brewer' as they call it. The actual spectrograph went in a light-tight enclosure about the size of a top hat, and looked a bit like one too. I decided to take it to the family cottage, our datcha. There, 100 miles at least from either Toronto or Montreal and almost that from Ottawa and Rochester and lots of countryside and Lake Ontario around, we would be free from pollution. There was a very good horizon as the astronomers call it. During the winter of 1972/3 we made a new instrument taking advantage of all the experience we had so far and it was a very considerable success. Part of the requirement for the Dobson successor was transportability and at weekends and holidays I would dump this thing in the car and drive out to the cottage. So we only got measurements on fine days when I was at the cottage at weekends and in the vacations.

The instruments worked liked a dream. It was a fabulous success, it proved very stable and gave consistent results throughout. It was small, so when we felt we wanted measurements from an aircraft, we could use it as a carry-on device, and we could take it from the cabin of the aircraft looking at the sun through the porthole and we could carry it into the pilot's cockpit and take the zenith sky measurement where there was possibility of seeing the sky. We took the measurements in spring and summer 1973 and we decided we needed some high level measurements because the tropospheric pollution is in the way and is very variable. We got some results of the concentration of nitrogen dioxide over southern Ontario. They surprised us very much and I think most people would disagree with them. The striking thing is the very large diurnal variation which we observed. The sunrise and sunset values were remarkably stable throughout the period I was making measurements. We were surprised they were so steady when all the other daytime measurements were so variable, and I understand that in fact they show remarkable little variation over the whole globe. They do vary with latitude and season, but not a great deal. Sunrise is always less than sunset, and the noon is

very, very variable. I published the results in '73 in a paper with Kerr and McElroy (Brewer et al. 1973). The sunrise and sunset figures are quite easily measured by a variety of methods, and are accepted. The noon values are totally rubbished.

The Concorde story proved different from what was expected. A Concordski crashed at the Paris Air Show and the Russians abandoned civilian supersonic entirely. After a lot of effort, Boeing decided that their aircraft wasn't even going to get off the drawing board and they abandoned it. So an important prestige field was left to Concorde. This resulted in a very unholy collaboration between Boeing who did not want Concorde to work, and the Greens who did not want anything to work. I am satisfied that we bounced the eco-warriors and got our Nature paper published before they even knew it was there, and it caused great annoyance - still does.

The students that I was working with, Kerr and McElroy, are still interested in the problem and they recently sent me some NO2 measurements taken in the northern suburbs of Toronto. They are from two days close together, and yet they show enormously different mid-day peaks. In interpreting these values you need to take into account that the tropospheric values are highly variable, but I am sure the stratospheric values are variable too. However, there is immensely little data on this. Adrian Tuck (Tuck, 1996), in his very valuable Symons memorial lecture makes no mention of NOx or of NO2, which is rather strange given the amount of fuss that was made about it.

In our 1973 paper there is an example of the observations as they were taken from the instrument. When I look back at it, I see that on 23 July 1973 I started work with the sun 6° below the horizon and was still working when it was 6° below the horizon in the evening. Whether it was a weekend or holiday I don't know. The difference between the morning and evening is visible and when the sun is getting high, at 76° zenith angle, the difference is very clear. The problem is how much is tropospheric and how much is stratospheric.

In the paper we mention the problem of where does the NO2 go at night. We suggested that it turns into NO3. If you put NO2 and ozone in a bottle in the lab it turns a beautiful green with NO3, which has a very nice absorption spectrum. Mervyn Davis came to work with us and made use of this absorption spectrum to measure NO3. We found none. Modern theories include the conversion to N2O5, and N2O5 necessarily includes NO3 on the way. If there is no NO3, or very little, then I don't think that there is much chance of there ever being much N2O5.

I thought a very great deal about this work recently. I came to the conclusion that my measurements were correct. I am totally satisfied in my own mind that in the stratosphere we get a strong but very variable diurnal variation of the NO2 content. We may show its nature by plotting the NO2 against solar elevation (positive and negative). We get a curve rather like the well known hysteresis curve of magnetism. In electronics we sometimes get a similar figure when we produce a Lissajous' figure on an oscilloscope. I think that NO2 follows this sort of variation but differently every day, and that NOx offers the potential of being a very useful tracer.

If we are to get any one to accept this we need a coherent explanation of the chemistry. Contemporary accepted chemistry of NOx, so far as I understand it, seems to me to be very clever; but the effects I observed were very strong and we need a good simple explanation. What does it take to get such a curve? It needs (1) positive feedback (2) storage and (3) nonlinearity provided by limits or stops.

I think there is a simple theory. I suggest that the NOx in the stratosphere has no significant components other than NO and NO2, that the total (NO + NO2) is very variable, and might sometimes be as much as 20 DU. Now it was part of the doctrine of the eco-warriors that there was little NOx in the native, pristine, stratosphere. I think it is more probable that there was (and is) a lot. Stratospheric air comes from the cold equatorial tropopause where thunderstorms are important; and we know that thunderstorms produce a lot if NO. NO will also be produced by lightening between thunderstorm tops and the ionosphere.

NO2, which we measured, is decomposed (photolysed) by radiation from the sun (l < 300nm). These penetrate the atmosphere and always tend to convert NO2 into NO. Why then do we observed the NO2 when the sun is high? It need not be complicated chemistry.

The NO2 occurs in the day through a reaction with atomic oxygen which is being produced by solar UV. It could be through a three body reaction or through a reaction where the excess energy is got rid of by a yellow-green chemiluminesence. This reaction has been shown in the laboratory to occur over a wide range of temperatures and pressures by Gaydon (1946). The suggestion is not entirely stupid. The atomic oxygen is provided by photodecomposition of ozone and also oxygen, it depends totally on the illumination which of course changes from none to full sunlight, and also on the ozone concentrations. Ozone always decompose when it absorbs light. Visible light at 600nm will give a small amount of product so visible light will never get rid of the NO2 completely. At 300-350nm there is strong absorption and rapid production of O when the sun is high, but as the sun goes down you get very much reduced production. There is also production at 200nm from oxygen. This is the atomic oxygen coming from ozone which produces ozone. If the hypothesis that NO2 results from the reaction with atomic oxygen and nitric oxide is right, and if nitric oxide is also very variable, then you have a very complicated picture and it is not surprising that the NO2 is very variable. So I put it forward as a suggestion that I think that NOx, which is not discussed by Adrian Tuck in his Symon's memorial lecture, ought to be discussed, and that you need to consider NO + NO2, nothing more clever. I think there is a lot of useful information there.

Well now it seemed to me that there was a lot of harm being done because NOx was not getting the attention it should and that it was being treated too much as something we knew everything about. So I put this together in a short letter to the editor of the Quarterly Journal. I was not optimistic that it would get accepted; just as I thought I was lucky to get the '49 paper published. But the referees said that I was out of touch. I think that it is very serious that these ideas are too easily thrown out. I can't do anything about this matter now, but clearly much more research on NOx is needed.

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Alan Brewer`s contribution to the Dobson-Brewer Workshop is from the SPARC website. The transcript of Brewer`s talk is from the Workshop Report Report, by Warwick Norton, Clarendon Laboratory, Oxford, UK, and Emily Shuckburgh, Department of Applied Mathematics & Theoretical Physics, University of Cambridge, UK.

Union Awards and Division & Section Medals Presentations

during the last EGU Assembly

During the April 2009 EGU meeting in Wien, Union Awards and Section metals were presented to honour scientists for their contributions.

Long term weather forecasting: Andreas Weigel received EGU 2009 Outstanding Young Scientist Award

The continuing advancement of computer technology continues to enable new possibilities for weather forecasting. Weather and climate models must be as accurate as possible. Andreas Weigel studied forecast accuracy and methods, as well as ways to improve their performance.

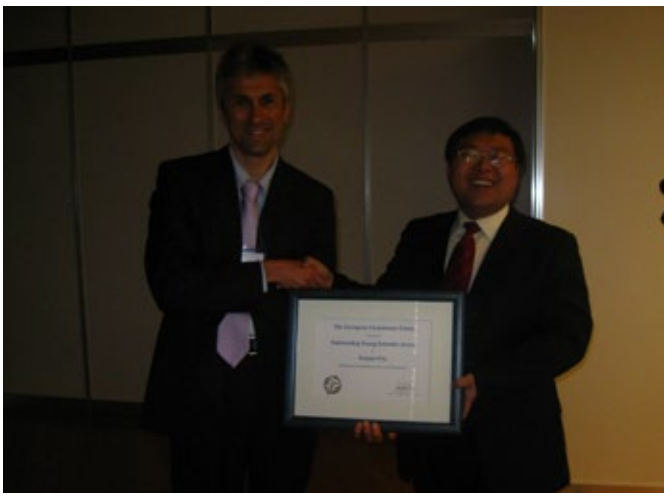
Andreas Weigel, credit: EGU

Water resources management: Junguo Liu received EGU 2009 Outstanding Young Scientist Award

In China, a country where population growth, increasing food demand and industrial development all have contributed to water scarcity, climate change now poses a significant threat to sustainability. Agriculture is the sector with the greatest water use by far. As climate change puts further stress on China's water supply, Dr Junguo Liu investigated how climate change will affect China's future need for irrigation water.

Fossil bacteria help climate research: EGU 2009 Outstanding Young Scientist Award for Johan Weijers

Climate scientists have always had problems describing past climate changes on land. Records are usually short and fragmentary. The key to reconstructing continental climate change lies in the ocean. Marine sediments are continuous through time and contain material from the whole area drained by the river. University of Bristol researcher Dr Johan Weijers investigated these biomarkers produced by bacteria living in soils and peat bogs.



Junguo Liu, credit: EGU

Johan Weijers, credit: EGU

Weather forecasting: Lennart Bengtsson received Alfred Wegener Medal

Lennart Bengtsson, a Swedish meteorologist with 50 years experience in weather forecasting, was awarded the prestigious Alfred Wegener Medal for his notable contributions to climate modelling. Bengtsson, a former director of the Max Planck Institute for Meteorology, presented his latest findings on extratropical cyclones and their impact on this century's climate change at the EGU 2009 in Vienna. On this occasion he received the prestigious Alfred Wegener Medal & Honorary Membership. This award, named after the discoverer of continental drift, is presented each year to a scientist who has achieved "exceptional international standing in atmospheric, hydrological or ocean sciences". For Bengtsson, it crowns a long and remarkable career.

Understanding ice: Eric W. Wolff received Louis Agassiz Medal

For cryospheric scientists, ice is more than just frozen water. The chemical composition of accumulated snow in ice sheets contains a wealth of information about the earth's climate in the past. Ice cores show us global fluctuations in temperature and greenhouse gas concentration. Most importantly, they reveal ice ages. The study of these huge periodic swings in temperature is crucial for our understanding of the climate system. Eric Wolff, researcher at the British Antarctic Survey, has played a central role in the successful European Polar Ice Coring in Antarctica Programme (EPICA), recovering a 740,000 year long climate archive. Eric Wolff also studied physical properties of ice sheets such as electrical conductivity and mechanical strength. In his medal lecture at the EGU General Assembly, Wolff gave a comprehensive overview of the science of ice. Eric Wolff received the Louis Agassiz Medal at the EGU 2009.

Eric W. Wolff, credit: EGU

Soil erosion: Gerard Govers received Ralph Alger Bagnold Medal

Soil erosion is a natural process, shaping landscapes over the course of time. However, in those parts of the world where population density is high and cultivatable land is scarce, soil erosion is a major problem. When vegetation cover on a slope is reduced, usually for growing crops or grazing livestock, soil is washed away easily during rain showers. Geomorphologists study these processes; their laboratory and field research have already produced a considerable amount of knowledge that can be used to counter this problem. Yet up until now, they haven't really made use of short-term, small-scale agriculturalists' data. Gerard Govers, researcher at Leuven University, has found that incorporating this knowledge into long-term landscape evolution models can greatly benefit the science of geomorphology. For this, and many other significant contributions to the field of geomorphology, Govers received the Ralph Alger Bagnold Medal at this year's EGU General Assembly.

Gerard Govers, credit: EGU

Grasping the geodynamo: David Gubbins received Arthur Holmes Medal

Since Einstein described the origin of the Earth's magnetic field as one of the greatest unsolved problems of science, this phenomenon has been studied thoroughly by physicists and geologists. Arthur Holmes, after which this award is named, made an important contribution to so-called dynamo theory in 1944 by suggesting that convection might take place in the earth's mantle. Indeed, convection is a critical factor in the genesis of the geodynamo, as David Gubbins showed in his EGU 2009 medal lecture in Vienna, even though it is the deeper convection in the earth's core that defines earth magnetism. Gubbins, a research professor at Leeds University, studies the still largely unknown processes at the border of the earth's solid inner and liquid outer core, as well as at the core-mantle boundary. Convection and heat flux between these layers are responsible for the behaviour of the magnetic field, including geomagnetic reversals. The causes behind these reversals are still a major topic of debate. At the EGU 2009, David Gubbins received the Arthur Holmes Medal.

Looking for life on Mars: Rafael Navarro-Gonzáles received Alexander von Humboldt Medal

Deserts on earth can be so inhospitable that hardly any form of life can survive there. Traces of life may be present in the soil, but they are difficult to find. Rafael Navarro-Gonzáles, a biochemist at the National Autonomous University of Mexico, studies life in such extreme environments. His most renowned research focussed on the Atacama Desert in South America, west of the Andes Mountains and one of the driest and oldest deserts in the world. Here, Navarro-Gonzáles managed to indi-

David Gubbins, credit: EGU

cate the presence of organic material by conducting incubation experiments. For the search for life on Mars, this is an interesting finding as the geological circumstances in the Atacama Desert are similar to those on Mars Both NASA and ESA are now testing their new equipment there. In the autumn of 2011, the Mars Science Laboratory will be launched. Rafael Navarro-Gonzáles will be a member of the science team that will analyse the collected data. At the EGU 2009, Navarro-Gonzáles received the Alexander von Humboldt Medal, awarded each year to a scientist from a developing country, for his outstanding scientific achievements.

Feedbacks in climate: J. Ray Bates received Vilhelm Bjerknes Medal

Feedback loops are a vital feature of the climate system as they cause a change in conditions to be either amplified or weakened. The Albedo feedback, for example, increases temperature in polar regions even further when ice is melting, as the darker ground absorbs more heat as it is being exposed to the sun. Feedbacks make our climate less stable and less predictable; climatologists struggle to correctly incorporate them into their models. J. Ray Bates, an expert in mathematical issues like these, presented new results from his study on the use of feedbacks in climate modelling at the EGU 2009. A major problem, Bates argues, is the lack of internationally agreed standardised definitions. A clear distinction needs to be made between different types of feedbacks, such as the distinction between stability-altering and sensitivity-altering feedbacks. Currently employed at the University College of Dublin, Prof. Bates previously worked at NASA Goddard Space Flight Center in Maryland, USA and at the Niels Bohr Institute in Copenhagen, Denmark. At the EGU 2009, J. Ray Bates was awarded the Vilhelm Bjerknes Medal for his distinguished achievements in atmospheric sciences.

J. Ray Bates, credit: EGU

Christopher A. Jones received Petrus Peregrinus Medal at EGU 2009

Christopher A. Jones is a professor in applied mathematics at the University of Leeds. His specialisation is magnetic field generation in the earth, as well as in other planets. To understand the “geodynamo”, scientists build computer models to simulate processes in the inner earth, such as convection. It is the motion of fluid rock around the solid iron core that generates the magnetic field. Jones contributed greatly to this kind of modelling by demonstrating the importance of electrical conductivity in the inner core. This property makes the earth’s magnetic field more stable and explains why geomagnetic reversals, the shifting of the magnetic poles, occur only on long geological time scales. Professor Jones also solved a persisting mathematical problem regarding the onset of convection in rotating spheres. In his medal lecture at the General Assembly, he gave an overview of the significant advancements that have been made in the field of earth magnetism over the past fifteen years. Nowadays, the most powerful computer models are able to accurately display the characteristics of the earth`s magnetic field, extending thousands of kilometres into space. They can even reproduce field reversal events. At the EGU 2009, Christopher A. Jones received the Petrus Peregrinus Medal.

Christopher A. Jones, credit: EGU

Eigil Friis Christensen received Petrus Peregrinus Medal at EGU 2009

Eigil Friis Christensen is the director of the Danish National Space Center in Copenhagen. In his career, he made some fundamental contributions to the observation of the earth’s magnetic field. While employed at the Danish Meteorological Institute, he conducted research based on the establishment

of the Greenland Magnetometer Array, a network of 17 geomagnetic instruments spread across the island. This facility is now internationally regarded as a highly valuable research tool. In 1999, Christensen was closely involved in the launch of the first Danish satellite, the Ørsted, which measures magnetic and gravity field variation. Its sensitivity allows it to even observe changes caused by oceanic tides. Christensen discussed the succes of the Ørsted and other geomagnetic observation missions in his medal lecture at the EGU General Assembly. He also gave attention to the multi-satellite mission "Swarm", to be launched in 2010, aimed to provide the best ever survey of the earth's geomagnetic field and its changes. At the EGU 2009, Eigil Friis Christensen received the Petrus Peregrinus Medal.

Models and reconstructions in climate change: Pascale Braconnot received Milankovitch Medal

Small variations in the orbit of the earth and the rotation of the earth's axis continuously change the amount of solar radiation that reaches the earth. This theory, published in 1920 by Milutin Milankovitch, is nowadays one of the most famous in climate science. It explains long-term climate changes such as ice ages. Pascale Brannocot is one of many scientists who presently applies the theory of Milankovitch to better understand the earth's climate. She is for example interested in the influence of solar irradiance on the Indian and African monsoons, and on the strength of El Niño. Braconnot is also involved in the Paleoclimate Modelling Intercomparison Project (PMIP), in which the output of different climate models is compared between each other and to data from climate reconstructions. For some time periods, it shows, model results are still quite inconsistent. In the organisation of PMIP, Braconnot fostered the relationships between the modelling and climate reconstruction communities, which led her to act as lead author of the chapter "Understanding and Attributing Climate Change", in the last IPCC report. In her medal lecture, Braconnot showed the importance of the analyses of past climates, to help us understand how the climate reacts to changes in solar irradiance. At the EGU 2009, Pascale Braconnot received the Milutin Milankovitch Medal.

Pascale Braconnot, credit: EGU

The physics of mountain creation: Stefan M. Schmid received Stephan Mueller Medal

The formation of the Alps is a complex geological process that still isn't fully understood. Several tectonic plates have been pressed into each other, folding together to form a rough mountain range. Modern techniques allow geologists to examine the internal structure of mountains, showing how they formed. Stefan Schmid has achieved great success with geophysical deep sounding of the alps. With this technique, electromagnetic and shock waves are sent into the ground, and their reflections are recorded. The transition from one rock type into another causes the waves to refract. Otherwise hidden information about the anatomy of a mountain range is now revealed. Combined with modern fieldwork, Schmid developed detailed cross sections of the Alps. As he showed in his Medal Lecture at the EGU General Assembly, their formation was far more complex than hitherto believed. Schmid has also lent his experience to applied geology, specifically relating to railway tunnel construction in the Alps and earthquake risk assessment in the upper Rhine Graben area. Stefan M. Schmid received Stephan Mueller Medal at the EGU 2009.

Rainfall and runoff: Jeffrey J. McDonnell received John Dalton Medal

Jeff McDonnell holds the Richardson Chair in Watershed Science at Oregon State University. He is a hydrologist with great experience in runoff processes. In other words, McDonnell is occupied with the question: "where does water go when it rains?" The basic principle of this issue is simple: Rain water either flows on the surface to the stream, or it infiltrates into the soil where it is transported much slower. The exact amounts, timespan and pathways are very difficult to determine, however. McDonnell conducted field research in watersheds all over the world, and integrated this data into computer simulations. He has led the hydrological community towards a paradigm shift in hydrological thinking by arguing that storm water in the stream, despite its rapid response to storm rainfall, is composed largely of water stored in the catchment prior to the event. From 2005 to 2007, McDonnell chaired a research programme called PUB: Prediction in Ungauged Basins. The PUB programme is focussed on predicting runoff in data-scarce environments. McDonnel discussed practical approaches to engage in this challenging research in his Medal Lecture. At the EGU 2009, Jeffrey J. McDonnell received the John Dalton Medal.

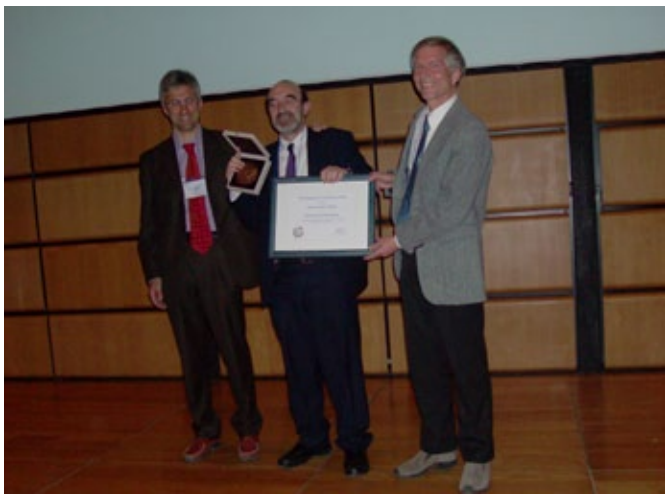
Jeffrey J. McDonnell, credit: EGU

Weather in the solar system: Albert A. Galeev received Hannes Alfvén Medal

The space within the solar system is not empty. The sun permanently excretes a wind of charged particles called plasma. The earth's magnetic field shields us from this space weather, but sometimes the solar wind is perturbed and particles are directed towards the earth. This occurs at the poles and causes beautiful auroras. Since the onset of space missions in the 1950s, Prof Albert Galeev is a prominent specialist in this field. In 2002, he retired as director of the Space Research Institute in Moscow, a position he held for 14 years. During his career, he received several awards for his contributions to the science of astrophysics, among which two Russian President awards for outstanding achievements, promotion of international cooperation and valuable contributions to space education in Russia. As Prof Galeev was not able to attend the General Assembly in Vienna, the Hannes Alfvén Medal Lecture was held by this successor at the Space Research Institute, prof Lev M. Zelenyi.

The future of hydrologic prediction: Demetris Koutsoyiannis received Henry Darcy Medal

In order to predict hydrologic phenomena such as rainfall or river discharge, hydrologists statistically analyse data from the past. When this analysis reveals regular patterns instead of random noise, knowledge is obtained to reduce flooding risks and improving the reliability of water supply systems. As concerns about water resources are rising in many parts of the world, understanding the physics and statistics of hydrological records becomes ever more important. It has been shown that hydrologic statistics in their current state are not consistent with the varying character of climate. Demetris Koutsoyiannis is a professor at the National Technical University of Athens and studies uncertainty in hydrology. He has been engaged in projects throughout Greece and South-Eastern Europe, and developed a hydrologic information system for managing the Athens water supply. In his Medal Lecture at the EGU General Assembly, Demetris Koutsoyiannis showed the latest improvements and promising future paths in hydrological and water resources research.



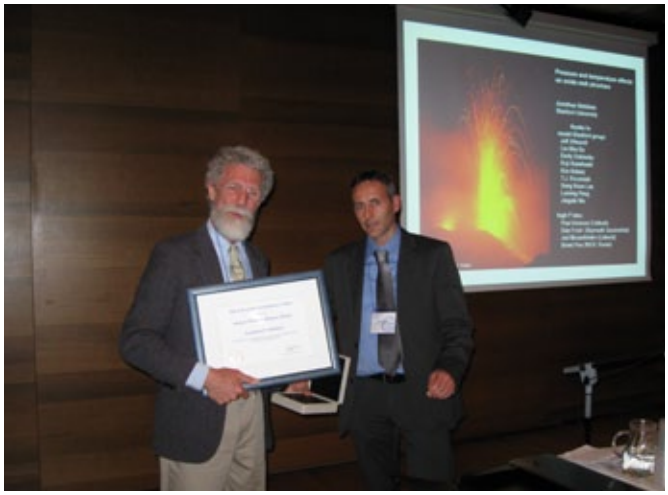
Demetris Koutsoyiannis, credit: EGU

Jean-André Sauvaud received Julius Bartels Medal

The 2009 Julius Bartels Medal was awarded to Jean-André Sauvaud for his outstanding contributions to the measurement and understanding of the complex particle populations in the Earth's magnetosphere. Sauvaud, Director of the Centre d'Etude Spatiale des Rayonnements (CESR) in Toulouse, has been responsible for the design and calibration of excellent particle instruments flown on numerous space missions. In his Medal Lecture, he discussed acceleration processes of solar and terrestrial particles in the Earth's magnetosphere.

Jonathan F. Stebbins received Robert Wilhelm Bunsen Medal

The 2009 Robert Wilhelm Bunsen Medal was awarded to Jonathan F. Stebbins in recognition of his outstanding work on the structure and physical properties of materials of geological interest. Stebbins is a professor at Stanford University, studying the dynamic structure of minerals at atomic, microscopic and macroscopic level. His Medal Lecture at the EGU General Assembly was on silicate melts, which have played a fundamental role throughout the Earth's history as they are the most efficient agents to transfer matter and energy.



Jonathan F. Stebbins, credit: EGU

Fiorenzo Cesare Ugolini received Philippe Duchaufour Medal

The 2009 Philippe Duchaufour Medal was awarded to Fiorenzo Cesare Ugolini for his outstanding research in the field of soil science, with special emphasis on his contributions to the research of soil forming processes in the polar environment. He is active as emeritus professor at the University of Florence. Ugolini participated in 25 polar expeditions: To Antarctica, the Canadian and Alaskan arctic, Svalbards, West Siberia, and to North-East Greenland. In recognition of his scientific achievements, a mount in Antarctica was named Ugolini Peak. Fiorenzo Ugolini summarised the most important findings throughout his scientific career in his Medal Lecture.

Valery Korepanov received Christiaan Huygens Medal

The 2009 Christiaan Huygens Medal was awarded to Valery Korepanov for his significant achievements in the development of sensors and instrumentation for electrical and magnetic instruments for investigating the Earth and the solar

system. Dr. Korepanov is Scientific Director of the Institute of Space Research in Lviv, Ukraine. Magnetic field measurement is as old as 5000 BC. In his Medal Lecture, Dr. Korepanov discussed the progress that has been made since then.

Maurice E. Tucker received Jean Baptiste Lamarck Medal

The Jean Baptiste Lamarck Medal was presented to Maurice E. Tucker for his outstanding work on carbonate sediments. Tucker is a researcher at Durham University and studies stratigraphic records: Sequences of rock formed by the deposition of carbonate, sand and organic material in the geological past. A better understanding of the formation of these sequences can lead to the discovery of oil and natural gas reserves. His passion for the subject is perhaps best illustrated by the title of his Medal Lecture: “Limestones: the love of my life”.

Maurice E. Tucker, credit: EGU

Ulrich R. Christensen received Augustus Love Medal

The 2009 August Love Medal was awarded to Ulrich R. Christensen for his fundamental contributions to geodynamics: The study of the internal physics of the earth and other planets. Professor Christensen is Director of the Max Planck Institute for Solar System Research in Katlenburg-Lindau, Germany, and devotes much of his time to planetary missions. During his career, Prof. Christensen has been very successful in developing computer models for investigating internal processes of planets. In his Medal Lecture, Ulrich Christensen demonstrated the importance of these instruments in present-day research.

Ulrich R. Christensen, credit:EGU

Susanna Zerbini received Vening Meinesz Medal

The 2009 Vening Meinesz Medal was awarded to Suzanna Zerbini for her distinguished research in geodesy; the measurement of important characteristics of the earth such as its gravity field. Dr Zerbini is a researcher at the University of Bologna. She specialises in the use of advanced satellite techniques for the study of plate tectonics and sea level variations. Because of her prominent role in satellite geodesy and geodynamics, she was asked to become member of a large number of important committees, such as ESA review panels. Suzanna Zerbini is also a member of the board of administrators of the Italian Space Agency. In her Medal Lecture, Dr. Zerbini showed how four-dimensional observation techniques improve our understanding of the Earth’s system.

Susanna Zerbini, credit: EGU

Jochem Marotzke to receive Fridtjof Nansen Medal

The 2009 Fridtjof Nansen Medal was awarded to Jochem Marotzke for his significant work on ocean circulation, one of the most important drivers of the Earth’s climate. Dr Marotzke is Director and Scientific Member of the Max Planck Institute for Meteorology in Hamburg. He is also Acting Scientific Director of the German Climate Computing Centre (DKRZ), and an Honorary Professor at the University of Hamburg. His major research interest is the role of large-scale ocean circulation in climate and climate change. A monitoring system for circulation in the North Atlantic Ocean was discussed in his Medal Lecture.

Yves Guéguen received Louis Néel Medal

The 2009 Louis Néel Medal was awarded to Yves Guéguen in recognition of his outstanding contributions to mineral and rock physics. Professor Guéguen is the Head of the Laboratoire de Géologie at the École Normale Supérieure in Paris. In addition to being an international leader in rock physics, he has also provided significant service to the community, for example in establishing and coordinating international research programsand in encouraging collaboration between European research groups. His present-day focus is on the study of porous rocks: Reservoirs of fossil fuels and possible locations for carbon dioxide storage.

Thomas Stocker received Hans Oeschger Medal

The 2009 Hans Oeschger Medal was awarded to Thomas Stocker for his contributions to the understanding of the role of the oceans in past climate changes and for his involvement in ice core studies. Thomas Stocker is the Head of the Division of Climate and Environmental Physics at the University of Bern, a position he took over from Hans Oeschger himself. Professor Stocker served as a Coordinating Lead Author and contributor for the IPCC Third Assessment Report, published in 2001, and has coordinated the chapter "Global Climate Projection" in the Fourth Assessment Report of IPCC published in 2007. As a member of the IPCC, Prof Stocker was co-recipient of the 2007 Nobel Peace Prize.

Thomas Stocker, credit: EGU

Helen Crowley received Plinius Medal

The 2009 Plinius Medal was awarded to Helen Crowley in recognition of her outstanding contributions in the fields of earthquake risk assessment and seismic risk mitigation, and in the neighbouring fields of structural engineering and engineering seismology. The Plinius Medal was established by the EGU Division on Natural Hazards to recognise interdisciplinary research in natural hazards by young scientists. Dr. Crowley is a researcher at the European Centre for Training and Research in Earthquake Engineering (EUCENTRE) in Pavia, Italy. Her Medal Lecture comprised the use of computer models to estimate earthquake losses at the level of cities, regions and countries.

Crowley Helen, credit: EGU

Stéphan Fauve received Lewis Fry Richardson Medal

The 2009 Lewis Fry Richardson Medal was awarded to Prof Stéphan Fauve for his many contributions to nonlinear geosciences, the study of dynamics in fluids such as magma in the earth's mantle. Dr Fauve works at the École Normale Supérieure in Paris. Since early in his career, he has been involved in experiments and theory on thermal convection, the motion of heated fluids. These processes are responsible for magnetic field reversals, a phenomenon that is still poorly understood. In his Medal Lecture, Dr. Fauve discussed the similarities between reversals in the geological past and the ones observed in his laboratory experiments.

Jochen Zschau received Sergey Soloviev Medal

The 2009 Sergey Soloviev Medal was awarded to Jochen Zschau for his commitment and enthousiasm to bridge the gap between fundamental research related to the physics of natural hazards, and the implementation of risk reduction technologies for the benefit of society. Dr. Zschau is Director of the Physics of the Earth department at the GeoForschungsZentrum Potsdam. He also holds a full professorship at the University of Potsdam. Throughout his scientific career, Jochen Zschau had a strong affinity for natural hazards like storm tides, earthquakes, volcanic activities and tsunamis. Presently, his focus is on the development of the Global Earthquake Model, a public-private partnership for establishing an independent standard to calculate, monitor and communicate earthquake risk globally, raise awareness and promote mitigation.

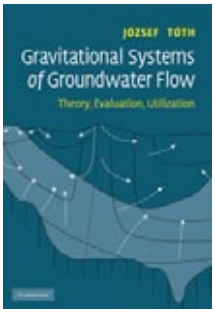
Zschau Jochen, credit: EGU

Creep and Fracture of Ice

Authors: Erland M. Schulson, Paul Duval
Publisher: Cambridge University Press
ISBN: 9780521806206
YEAR : 2009
EDITION : 1st
PAGES : 401
PRICE : 74.00 €
Hardback

Ice creeps when loaded slowly and fractures when loaded rapidly. This book is the first complete account of the physics of the creep and fracture of ice, and their interconnectivity. It investigates the deformation of low-pressure ice, which serves as the basis for the study of a variety of natural phenomena – glaciers, polar ice sheets, floating ice covers and the uppermost region of icy moons of the outer Solar System. The central argument of the book focuses on the structure of ice and its defects, and proceeds to describe the relationship between structure and mechanical properties, including elasticity. It reviews observations and measurements, and then interprets them in terms of physical mechanisms. A section on creep concludes with a discussion on modeling the ductile behavior of isotropic and anisotropic ice in relation to the flow of glaciers and polar ice sheets. A section on fracture assesses ice forces on engineered structures and analyses the deformation of the ice cover on the Arctic Ocean from the perspective of physical mechanisms. The book provides a road-map to future studies of the mechanics of ice by exploring its new contexts – the behavior of glaciers and ice sheets in relation to climate change, the dating of deep ice cores, and the projected behavior of sea ice. It also highlights how this knowledge of ice can be transferred into an understanding of other materials, especially the mechanical behavior of rocks, minerals, metals and alloys. Written by two experts in the field (Duval on creep and Schulson on fracture), the book is ideal for graduate students, engineers and scientists in Earth and planetary science, and materials science.

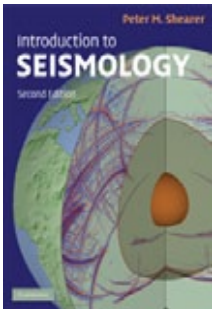
Gravitational Systems of Groundwater Flow



Authors: József Tóth
Publisher: Cambridge University Press
ISBN: 9780521886383
YEAR : 2009
EDITION : 1st
PAGES : 297
PRICE : 79.00 €
Hardback

This book recognizes groundwater flow as a fundamental geologic agent, and presents a wide-ranging and illustrated overview of its history, principles, scientific consequences and practical utilization. The author, one of the founding fathers of modern hydrogeology, highlights key interrelationships between seemingly disparate processes and systems by tracing them to a common root cause - gravity-driven groundwater flow. Numerous examples demonstrate practical applications in a diverse range of subjects, including land-use planning, environment protection, wetland ecology, agriculture, forestry, geotechnical engineering, nuclear-waste disposal, mineral and petroleum exploration, and geothermal heat flow. The book contains numerous user-friendly features for a multidisciplinary readership, including full explanations of the relevant mathematics, emphasis on the physical meaning of the equations, and an extensive glossary. It is a key reference for researchers, consultants and advanced students of hydrogeology and reservoir engineering.

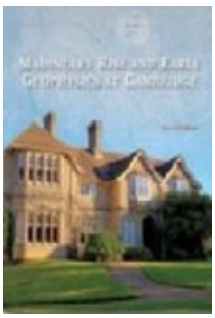
Introduction to Seismology



Authors: Peter M. Shearer
Publisher: Cambridge University Press
ISBN: 9780521708425
YEAR : 2009
EDITION : 2nd
PAGES : 396
PRICE : 41.00 €
Paperback

This book provides an approachable and concise introduction to seismic theory, designed as a first course for undergraduate students. It clearly explains the fundamental concepts, emphasizing intuitive understanding over lengthy derivations. Incorporating over 30% new material, this second edition includes all the topics needed for a one-semester course in seismology. Additional material has been added throughout including numerical methods, 3-D ray tracing, earthquake location, attenuation, normal modes, and receiver functions. The chapter on earthquakes and source theory has been extensively revised and enlarged, and now includes details on non-double-couple sources, earthquake scaling, radiated energy, and finite slip inversions. Each chapter includes worked problems and detailed exercises that give students the opportunity to apply the techniques they have learned to compute results of interest and to illustrate the Earth's seismic properties. Computer subroutines and datasets for use in the exercises are available at www.cambridge.org/shearer.

Madingley Rise and Early Geophysics at Cambridge



Authors: Carol Williams
Publisher: Third Millennium Publishing, London
ISBN: 9781906507183
YEAR : 2009
EDITION : 1st
PAGES : 208
PRICE : 45.00 €
Hardback

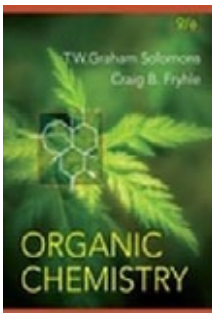
Third Millennium Information, has signed an agreement with the Department of Earth Sciences at the University of Cambridge, to publish the story of Madingley Rise and the 'revolution in earth sciences', which reached its climax during the late 1960s and 1970s. The author and geologist, Carol Williams, who herself spent a number of years at Madingley Rise, describes how a large Victorian house in Cambridge, privately-owned in the 1950s by the distinguished astronomer, Professor Hugh Newall, became one of the world's most important centres for groundbreaking research into the theory of plate tectonics. Despite its rapid success in the 1960s, plate tectonics had a long previous history. The central ideas, and the technology and measurements on which they were based, had been slowly put together over the previous 70 years by a small number of people working at a handful of laboratories around the world. One of the smallest of these was the Department of Geodesy and Geophysics at Cambridge. Williams tells the fascinating story of how this department came into existence, and of how a variety of forceful and brilliant scientists worked together (most of the time!) to carry out the research that lead to the new ideas, and produce an environment that was attractive and exciting to bright young raduates. At the centre of her story is Madingley Rise and the part played by a number of key individuals involved in such important pioneering research. Copies of Madingley Rise and Early Geophysics at Cambridge can be ordered in advance online at www.tmiltd.com or by phone (020 7336 0144), direct from Third Millennium at a special pre-publication price of £30 + p&p. (RRP on publication will be £40).

Managing and Transforming Water Conflicts

Authors: Jerome Delli Priscoli and Aaron T. Wolf
Publisher: Cambridge University Press
ISBN: 9780521632164
YEAR : 2009
EDITION : 1st
PAGES : 354
PRICE : 80.00 €
Hardback

All living things need water.…Where water crosses boundaries – be they economic, legal, political, or cultural – the stage is set for disputes among different users trying to safeguard access to a vital resource, while protecting the natural environment. Without strategies to anticipate, address, and mediate among competing users, intractable water conflicts are likely to become more frequent, more intense, and more disruptive around the world. In this book, Jerome Delli Priscoli and Aaron T. Wolf investigate the dynamics of water conflict and conflict resolution, from the local to the international. They explore the inexorable links among three facets of conflict management and transformation: alternative dispute resolution (ADR), public participation, and institutional capacity. This practical guide will be invaluable to water management professionals, as well as to researchers and students in engineering, economics, geography, geology, and political science who are involved in any aspect of water management.

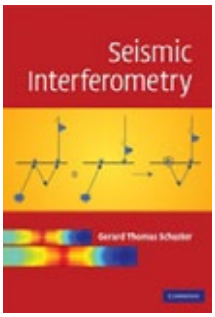
Organic Chemistry



Authors: T. W. Graham Solomons, Craig B. Fryhle
Publisher: John Wiley & Sons
ISBN: 9780471684961
YEAR : 2008
EDITION : 9th
PAGES : 1280
PRICE : 54.00 €
Hardback

The Ninth Edition of Organic Chemistry continues Solomons-Fryhle\'s tradition of excellence in teaching and preparing students for success in the organic classroom and beyond. Students are often overwhelmed by the early rigors of organic chemistry. Solomons-Fryhle prepares students for these early rigors by introducing acids & bases--topics they know from general chemistry--early, followed by chapters on structure and stereochemistry. Next, a discussion of ionic reactions gives students a foundation for the vast majority of reactions that they will encounter. The Ninth Edition continues to introduce IR spectroscopy in chapter 2 (after functional groups) and Carbon-13 NMR spectroscopy in chapter 4, providing synergy with most lab courses and, again, reinforcing learning. The new edition of Solomons-Fryhle also has a completely revised WileyPLUS course to help students and instructors reach their full potential. WileyPLUS provides instructors with the most robust online homework solution in organic chemistry. This revision of WileyPLUS meets students where and when they learn and provides them with a learning platform that offers real learning solutions that complement their approach to managing and mastering organic concepts.

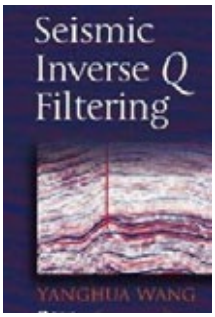
Seismic Interferometry



Authors: Gerard Thomas Schuster
Publisher: Cambridge University Press
ISBN: 9780521871242
YEAR : 2009
EDITION : 1st
PAGES : 260
PRICE : 81.00 €
Hardback

Seismic interferometry is an exciting new field in geophysics utilising multiple scattering events to provide unprecedented views of the Earth`s subsurface. This is the first book to describe the theory and practice of seismic interferometry with an emphasis on applications in exploration seismology. Exercises are provided at the end of each chapter, and the text is supplemented by online MATLAB codes that illustrate important ideas and allow readers to generate synthetic traces and invert these to determine the Earth`s reflectivity structure. Later chapters reinforce these principles by deriving the rigorous mathematics of seismic interferometry. Incorporating examples that apply interferometric imaging to synthetic and field data, from applied geophysics and earthquake seismology, this book is a valuable reference for academic researchers and oil industry professionals. It can also be used to teach a one-semester course for advanced students in geophysics and petroleum engineering.

Seismic Inverse Q Filtering



Authors: Yanghua Wang
Publisher: Wiley-Blackwell
ISBN: 1405185406
YEAR : 2008
EDITION : 1st
PAGES : 238
PRICE : 96.00 €
Hardback

Seismic inverse Q filtering is a data processing technology for enhancing the resolution of seismic images. It employs a wave propagation reversal procedure that compensates for energy absorption and corrects wavelet distortion due to velocity dispersion. By compensating for amplitude attenuation, seismic data can provide true relative-amplitude information for amplitude inversion and subsequent reservoir characterization. By correcting the phase distortion, seismic data with enhanced vertical resolution can yield correct timings for lithological identification. This monograph presents the theory of inverse Q filtering and a series of algorithms, collected with the following selection criteria in mind: robustness, effectiveness and practicality. The book is written for processing geophysicists who are attempting to improve the quality of seismic data in terms of resolution and signal-to-noise ratio, as well as for reservoir geophysicists who are concerned about seismic fidelity in terms of true amplitudes, true timings and true frequencies. It will also be particularly valuable as a guide for seasoned geophysicists who are attempting to develop seismic software for various research settings. Finally, it can be used as a reference work or textbook for postgraduate students in seismic and reservoir geophysics.

Local Air Quality and its Interactions with Vegetation - (Meeting)

21/01/2010 - 22/01/2010 - Antwerp, Belgium

During this one-and-a-half-day symposium, we will focus on the state-of-the-art knowledge of local air quality and plant-atmosphere interactions within urban areas. Topics of interest are plant-atmosphere interactions in urban areas, assessments of local air quality and vegetation interactions, and model implementation of plant-atmosphere interactions.

The conference will take place in the historical city centre of Antwerp in the Cultural Conference Centre Elzenveld.

Please find in the attachment our invitation to submit abstracts and visit our website for more information:

www.vito.be/aq-vegetation-workshop

Important dates:

- Deadline for abstract submission: September 30, 2009
- Notification of acceptance: October 31, 2009
- Deadline full paper abstract: December 31, 2009
- Deadline registration: January 13, 2010

Organized by VITO (Flemish Institute for Technological Research) and Antwerp University, within the framework of the CLIMAQS project funded by IWT-Flanders.

www.vito.be/aq-vegetation-workshop

Arctic Frontiers 2010 - (Meeting)

27/01/2010 - 29/01/2010 - Tromsø, Norway

The scientific conference of Arctic Frontiers 2010 consists of three parallel sessions that will focus on the effects of ongoing climatic changes on sea-ice and marine biodiversity as well as social science and health research on economy, self-governance, and well-being in Arctic communities;

· Session I: Ice and climate, including paleo climate

· Session II: Sustainable communities in the High North

· Session III: Marine biodiversity under change

We kindly invite the submission of oral and poster presentations on these topics.

Important dates

* 19.10.2009: Deadline for submission of abstracts for oral and poster presentations

* 02.11.2009: Confirmation of accepted oral and posters presentations

* 30.11.2009: Deadline for final updated abstracts

For full details and instructions on submitting an abstract please see the Arctic Frontiers homepage.

www.arcticfrontiers.com

SAFARI International Symposium on Remote Sensing and Fisheries - (Meeting)

15/02/2010 - 17/02/2010 - Kochi, India

The SAFARI initiative (Societal Applications in Fisheries & Aquaculture using Remotely-Sensed Imagery) will be hosting an international symposium on Remote Sensing and Fisheries from 15-17 February 2010 in Kochi, India. The SAFARI project aims to accelerate the assimilation of satellite Earth observation data into fisheries research and management on a global scale. This initiative, funded by the Canadian Space Agency, falls under the Group of Earth Observation (GEO) Task AG-06-02, which calls for consultation at the international level to identify opportunities for enhanced utilization of Earth observation data in fisheries and aquaculture.

The symposium will highlight case studies using Earth observation data with contributions from key fisheries systems around the world. There will be a number of plenary and poster sessions including, for example, sessions on:

- Earth observation ecosystem indicators to assess fish health, growth and recruitment
- Use of Earth observation data to facilitate fisheries operations
- Ecosystem approach to fisheries management using Earth observation data

Suggestions for other themes are welcome. Registration is free, but participants will be responsible for covering their own travel and accommodation expenses to attend the meeting. It is anticipated that the Proceedings of the symposium will be submitted for publication in a Special Issue of an international journal (under discussion).

The organisers are drawing up a mailing list to disseminate information about the symposium. If you are interested in attending this symposium and would like to be placed on this mailing list, please send an email to Dr. Meenakumari (meenakumarib@gmail.com) with a copy to Lisa Delaney (Lisa.Delaney@dal.ca), with the subject line: Subscribe Mailing List Kochi Symposium.

www.geosafari.org

3rd International Symposium on Recent Advances in Quantitative Remote Sensing: RAQRS'III - (Meeting)

27/09/2010 - 01/10/2010 - Valencia, Spain

The Symposium addresses the scientific advances in connection with real applications, its main goal being to assess the state of the art of both theory and applications in the analysis of Remote Sensing data. This Symposium should greatly contribute to define common research priorities. The Symposium will offer a unique framework for socializing and interacting with the members of the international remote sensing community, at the same time enjoying a stay in Valencia. Presentations by scientists from around the world will provide an in-depth view and evaluation of the current advances of remote sensing.

Papers should deal in general with recent advances and applications of the different techniques and research methods used in remote sensing and in particular cover one or more of the following topics:

1. Land surface radiation and inversion modelling
2. Multispectral Remote Sensing and Imaging Spectroscopy
3. Multiangular and Multitemporal measurements
4. Fusion, reduction and assimilation of data
5. Scaling
6. Carbon and Water cycle observation and modelling
7. Land cover/use and change
8. Global change and sustainable development
9. Sensor calibration, atmospheric correction, and product validation
10. Passive and actives microwaves & SAR data processing/ applications
11. Laser active remote sensing and fluorescence
12. Earth Observation Missions & Services

The Symposium will consist of 14 plenary sessions allowing about 50 papers plus 4 interactive posters sessions with 50 papers each. The total number of papers is limited to 250. The papers submitted will be subject to a selection process by the International Scientific Committee. The number of participants will be limited to about 250 in order to facilitate exchanges and discussions among the participants. The Symposium will end with a general concluding session prepared by the chairpersons and reporters of each session. The concluding statements will emphasise the key points of the presentations and outline trends in future research programmes.

All participants, including invited speakers and session chairs must pay a registration fee. Details on registration and accommodation can be found on the web site: http://ipl.uv.es/raqrs

Abstracts (300-500 words) dealing with scientific topics selected for the Symposium should be submitted either in English or Spanish for plenary sessions or interactive poster sessions. The abstracts should be typed on A4-format paper (21x29.7 cm) on one side only, single spacing, and margins of 2.5 cm top and bottom, right and left. Title, authors and affiliations should be centred at the top of the page. The name of the main author should be underlined and the telephone and fax numbers and e-mail addresses should be indicated clearly. The abstract must be followed by a list of 3 or 4 keywords and the presentation preference “oral” or “poster”. Final placement in an oral or poster session is subject to the Chairs’ discretion. The full paper versions (deadline 15th October 2010) will be included in the symposium proceedings. Authors interested can submit full paper versions as candidates for publication in a special issue of the International Journal of Remote Sensing covering the conference.

Abstracts should be submitted before 28 February 2010. Your abstract should be sent through e-mail (sobrino@uv.es), mentioning title, authors & affiliation and the full coordinates of the corresponding author.

Deadlines

Submission of Abstracts: 28 February 2010
Notification of Acceptance: 15 April 2010
Issue of Preliminary Program: 15 May 2010
Early Registration: 1 June 2010
Release of Final Program: At the Symposium
Submission of Full Paper: 15th October 2010

CONTACT INFORMATION

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13th Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes - (Meeting)

01/06/2010 - 04/06/2010 - Paris, France

The series of international conferences on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes is concerned with the improvement of “modelling culture” both in Europe and also more internationally.

Dispersion modelling is widely used for regulatory purposes, both for permits and for assessments, but there is a lack of sufficient mechanisms to make modelling processes transparent and generally to ensure trust in modelling results.

There are many aspects of this such as:

* ensuring that models are scientifically sound
* model validation
* guidance to ensure proper use of models
* promotion of good practice and elimination of bad
* quality assurance with respect to model development
* establishment of reference problems
* comparability of input and output
* ensuring proper exchange of experiences

Such issues that are not specific to one particular model, but common to several, are in focus at the 13th International conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes.

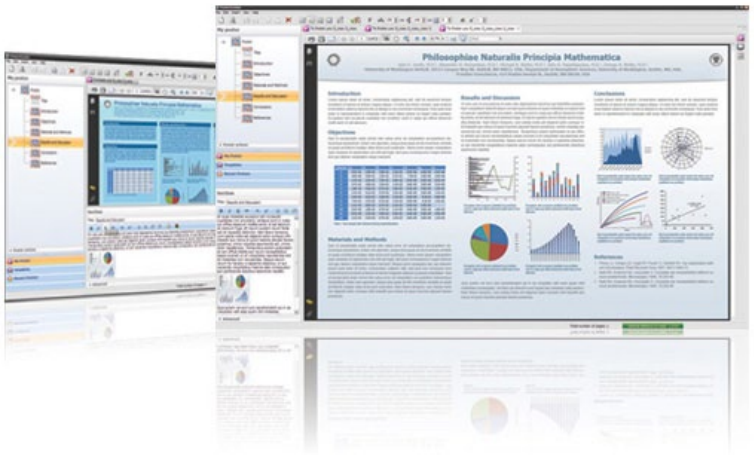
The conference is a natural forum for discussing modelling issues related to the European Union air quality directives. European networks can use the conference to expose their work to a wider audience.

At the web site you can download a leaflet in pdf format (direct link:

http://www.aria.fr/harmo/pdf/HARMO13FirstAnnouncementLeafletV3.pdf , size 1 MB).

The deadline for short abstracts is November 15, 2009. You are encouraged to pre-register at the conference web site. This is not binding, but ensures that you will receive e-mails with updated information on the conference.

ARIA Technologies and ARIANET
http://www.aria.fr/harmo/



PosterGenius

http://www.postergenius.com

PosterGenius is a software application that simplifies the creation of scientific posters. Designed by scientists, researchers and engineers, PosterGenius offers a workflow tailored to the needs of people who create scientific posters. Featuring a series of automations, it separates the content from the design of the poster, thus helping one focus on what matters most; the results of their research. At the same time it formats the content in a professional way, ensuring one ends up with an effective scientific poster that stands out in the conference hall.

Atmospheric Sciences-Academic

Post-doctoral research fellows

Company: Guy Carpenter Asia-Pacific Climate Impact Centre
Location: China-Hong Kong
Date Posted: 02/09/2008
[show details...]

PhD position at IMK-FZK

Company: Institut fuer Meteorologie und Klimaforschung (IMK), Forschungszentrum Karlsruhe
Location: Germany-Forschungszentrum Karlsruhe
Date Posted: 16/02/2009
[show details...]

Interdisciplinary / Other-Academic

Postdoctoral Fellows at the Built Environment Group

Company: Department of Mechanical Engineering, University of Hong Kong
Location: Hong Kong-Hong Kong
Date Posted: 18/02/2009
[show details...]

Research Associates in Energy Efficient Cities

Company: University of Cambridge
Location: England-Cambridge
Date Posted: 03/03/2009
[show details...]

Lecturer in Atmospheric Sciences: Modeling, Meteorology and Chemistry

Company: University of Orleans
Location: France-Orleans
Date Posted: 16/03/2009
[show details...]

Crystal2Plate - PhD and postdoctoral positions

Company: CRYSTAL2PLATE
Location: France-UK-Switzerland-Italy-Netherlands-Spain-Montpellier-Paris-Bristol-Zurich-Roma- Utrecht-Granada
Date Posted: 03/04/2009
[show details...]

PhD Studentship: Building-Resolved Large-Eddy Simulation for Heat Transfer in Urban Environments

Company: University of Southampton
Location: England-Southampton
Date Posted: 04/06/2009
[show details...]

PhD studentship on the health impacts of low carbon dwellings

Company: London School of Hygiene & Tropical Medicine, University of London
Location: United Kingdom-London
Date Posted: 01/07/2009
[show details...]

Planetary and Solar System Sciences-Academic

ESA Postdoctoral Fellowships in Space Science

Company: European Space Agency
Location: Netherlands or Spain-Noordwijk or Madrid
Date Posted: 07/07/2009
[show details...]

Climate-Government

Climate Postdoctoral Fellow

Company: Lawrence Berkeley National Laboratory
Location: United States-Berkeley
Date Posted: 10/07/2009
[show details...]

Climate Research Scientist

Company: Lawrence Berkeley National Laboratory
Location: United States-Berkeley
Date Posted: 10/07/2009
[show details...]

Interdisciplinary / Other-Studentship/Graduate

Research positions - in situ sensor development for the marine environment

Company: National Oceanography Centre
Location: Europe-wide-Various
Date Posted: 09/07/2009
[show details...]

More details on these jobs can be found online at www.the-eggs.org (click on the button “Job Positions” on the left). Job positions online are updated twice a week.