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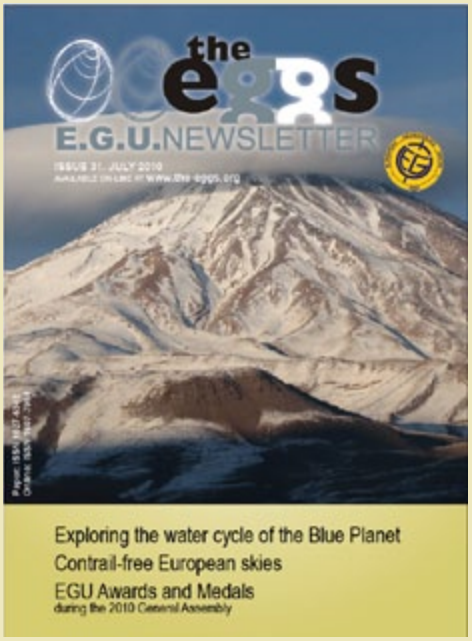
Exploring the water cycle of the Blue Planet

Contrail-free European skies

EGU Awards and Medals
during the 2010 General Assembly



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The EGGS is looking for Editors

to cover Solid Earth, Solar and Planetary, and Ocean Science

EGU is seeking to raise the profile of its quarterly online Newsletter (www.the-eggs.org). In this context, EGU is looking for three dynamic, motivated scientists with a good knowledge of the developments within their discipline to serve for a 3-year term as editors of the EGGS.

The editors will cover Solid Earth, Solar and Planetary, and Ocean Science. Editors should be committed and should be ready to devote the necessary time to raise the profile of the Newsletter.

Responsibilities include:

* soliciting manuscripts to ensure broad coverage and contact colleagues to submit interesting research results;

* deciding on the suitability of contributed items using, when needed, the advice of the EGGS Steering Committee;

* advising authors on what is needed to make contributions publishable, using, when needed, the advice of outside reviewers. Editors review material for scientific accuracy as well as for clarity, readability, and interest to the broad geosciences community;

* setting the editorial standards for Eggs in keeping with the objectives of the publication and the policies and guidance provided by the EGGS Steering Commitee; and

* contributing to the content of the Newsletter by passing to the editorial office any news or information, job advertisements, announcements of opportunity or meetings, funding opportunities or any other item that might be of interest to the geosciences community;

* suggesting recent book titles for review and potential reviewers for these titles;

* suggesting web sites that might contain information (research, educational or other) of interest to EGU members;

* making recommendations to improve the content of EGGS.

Interested individuals should send a CV and a letter of interest to support@the-eggs.org explaining their goals as an editor and how they plan to achieve these.

THe EGGS Steering Commitee

New open-access EGU journal

Earth System Dynamics (ESD)

We are pleased to announce the launch of the new Open Access journal Earth System Dynamics (ESD), published by Copernicus Publications on behalf of the European Geosciences Union (www.egu.eu). ESD is an international scientific journal dedicated to the publication and public discussion of studies that take an interdisciplinary perspective of the functioning of the whole Earth system and global change. ESD uses an interactive two-stage publication process involving the scientific discussion forum Earth System Dynamics Discussions (ESDD). Further information on ESD is available at: http://www.earth-system-dynamics.net/. You are kindly invited to play an active role by considering ESD for your future publication, or by serving the journal as a reviewer. Your support will be very much appreciated! For an initial period, the service charges for publishing in the Open Access journal ESD are waived by the EGU.

Press Office activity

during the 2010 EGU General Assembly in Wien

EGU 2010 was uncommonly succesful in terms of numbers - 10.463 scientists from 94 countries, presenting 4.431 oral and 9.370 poster presentations in 594 sessions - as well as in terms of special events. A series of last-minute sessions on the Eyjafjallajökull ash cloud attracted a large audience, one even filled Room D with more than 700 people. More than 900 people attended the Great Debate “To what extent do humans impact the Earth’s climate?” at noon on Tuesday. The debate, moderated by past EGU president John Ludden, contrasted favourably with the shrill tone that the climate debate has adopted in the public arena recently. The video webcast of this event is still online: http://www.cntv.at/EGU2010/?modid=18&a=show&pid=64.

The Press Office ran 16 press conferences on topics ranging from “Space weather” and “Early Earth and early biosphere” to “the Haiti and Chile earthquakes” and “the Iceland ash cloud”. See programme here http://www.egu-media.net/content/view/212/81/ and links to video webcasts. Many newsstories appeared in the press, on radio and tv worldwide, in the weeks following EGU 2010. See: http://www.egu-media.net/.

The Press Office produced the daily newsletter EGU Today, which highlighted presentations and sessions that may be interesting to people outside the inside crowd. EGU Today also featured a column “Science under Fire”, discussing the role of scientists in society, particularly in the light of the often vehement debate in the media. Copies of EGU Today are available here: http://www.egu-media.net/content/category/19/60/80/.

You can comment the Science under Fire columns in the EGU Today blog http://egutoday.wordpress.com/

Dick van der Wateren, EGU Press Officer

BRIEF SESSION REPORT

EGU 2010 Union Session on Eyjafjallajokull - eruption, plume, and consequences, and ACP Special Issue

During the EGU General Assembly in Wien last May, the Union Session 7 'Eyjafjallajokull - eruption, plume, and consequences' was visited by more than 800 scientists during the evenings Tuesday (orals), Wednesday (posters), and Thursday (orals). This Icelandic vulcanic eruption has caused much delay in air traffic and at the time of the EGU 2010 General Assembly the eruption was still on-going. The convenors Euan Nisbit, Bruce Malamud and Charlotte Hasager worked hard with the EGU to organise this event with very short notice. It was a great pleasure to have the session so well-attended.

The different scientific contributions covered many aspects including the vulcanology, the atmospheric transport modelling and forecasting, and several types of observations. The observations spanned from satellite remote sensing, airborne campaigns, ground-based remote sensing and also collection of the sedimented material. One of the conclusions was that scientists in the many disciplines would benefit from closer collaboration and joint work.

An ACP Special Issue on Atmospheric implications of the volcanic eruptions of Eyjafjallajokull, Iceland 2010, is planned. The Special Issue is dedicated to contributions on the volcanic eruption of Eyjafjallajokull, the evolution and properties of the resulting plume, and their final consequences. The topics range from volcanic issues, source intensities of the plume to descriptions and forecasts of the dynamics and transport; physical and chemical observations encompassing satellite, aircraft, ground-based remote sensing and in-situ data collection. Also the consequences and regulation in air traffic are issues for a full picture of the Eyjafjallajokull eruption and plume, now and in case of future events for the applied societal needs. The deadline for submission is 31 May 2012. It is recommended to submit as soon as possible.

From today authors can submit their contributions by using the online registration form on the ACP website: http://www.atmospheric-chemistry-and-physics.net/submission/manuscript_submission.html

Manuscript preparations and peer-review are to be conducted according to the usual ACP guidelines http://www.atmospheric-chemistry-and-physics.net/submission/general_terms.html

During the registration process it is important that the correct special issue is chosen. The editor call is based on a "First Come - First Served" basis.

In case of questions, do not hesitate to contact one of the co-editors:

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Exploring the water cycle of the Blue Planet

The Soil Moisture and Ocean Salinity (SMOS) mission

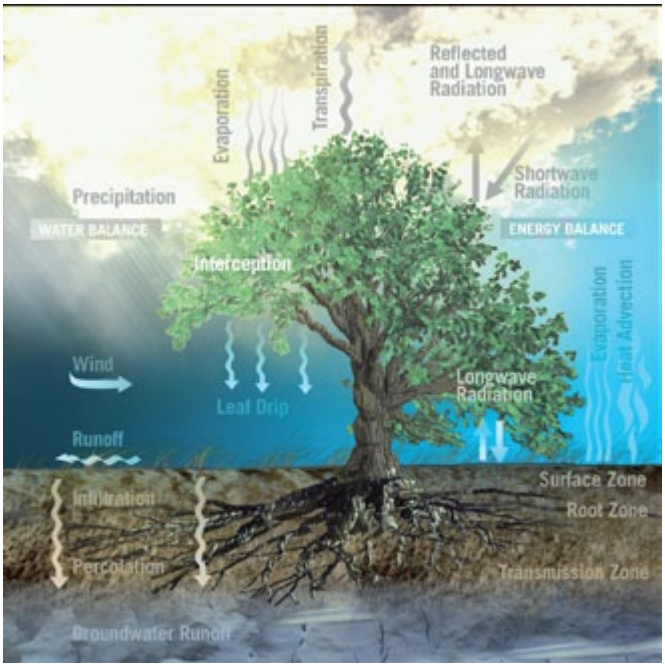
Known as ESA's Water Mission, SMOS will improve our understanding of Earth's water cycle, providing much-needed data for modelling of the weather and climate, and increasing the skill in numerical weather and climate prediction.

One of the highest priorities in Earth science and environmental policy issues today is to understand the potential consequences of modification of Earth's water cycle due to climate change. The influence of increases in atmospheric greenhouse gases and aerosols on atmospheric water vapour concentrations, clouds, precipitation patterns and water availability must be understood in order to predict the consequences for water availability for consumption and agriculture.

In a warmer climate, increased evaporation may well accelerate the water cycle, resulting in changes in the patterns of evaporation over the ocean and land, and an increase in the amount of moisture circulating through the atmosphere. Many uncertainties remain, however, as illustrated by the inconsistent results given by current numerical weather and climate prediction models for the future distribution of precipitation.

Today, there are insufficient data available to help improve our scientific knowledge and understanding of the processes influencing the water cycle. So ESA teamed up with the French space agency CNES and Spanish Centre for the Development of Industrial Technology (CDTI) to address this key scientific challenge - by delivering a fundamentally new satellite tool to create these new global datasets.

The resulting regular and consistent measurements will be used to improve our understanding of the way in which both the time-varying distribution of soil moisture and ocean salinity regulate the water cycle of our planet. The Soil Moisture and Ocean Salinity (SMOS) mission promises to be one of the trailblazers that comprise ESA's Earth Explorers.



The energy and water balance of a physical climate system including the main land and atmosphere components of the water cycle (AOES Medialab/ESA)

The importance of water

The total amount of water in the Earth system is believed to remain constant, though the portion residing in each of the primary 'subsystems' (land, ocean, cryosphere and atmosphere) is constantly changing in response to the complex set of processes that link them.

On the land, the amount of water held in soil at a given location varies as a function of seasonal rates of evaporation and precipitation, percolation and 'runoff' – as governed by the type of soil, vegetation and topography. Similarly, in the ocean, subtle variations in the salinity of the surface brine are brought about by addition or removal of freshwater due to changes in evaporation and precipitation, river runoff, or by melting or freezing of ice in the polar oceans. It is evident that any changes in the processes that modulate these rates of exchange of water can have a dramatic impact on Earth's water cycle.

In most parts of the world, the amount and temporal evolution of water present in the soil is the dominant factor influencing plant growth. However, the retention of water in the soil is crucial not only to sustain primary productivity, but is also strongly linked to our weather and climate. This is because soil

moisture is a key variable controlling the exchange of water and energy between the land and atmosphere through evaporation and plant transpiration. As a result, soil moisture plays a key role in the development of weather patterns over the land surface.

In spite of the water cycle being one of the most fundamental life-sustaining processes on our planet, this system remains relatively poorly understood. SMOS is a direct response to the current lack of global observations of soil moisture and ocean surface salinity, and has a primary objective to observe these key variables over a mission lifetime of at least three years.

Water source	Water volume (km³)	% of freshwater	% of total water
Oceans, seas, bays	1 338 000 000	-	96.5
Ice caps, glaciers and permanent snow	24 064 000	68.7	1.74
Groundwater (fresh)	10 530 000	30.1	0.76
Groundwater (saline)	12 870 000	-	0.94
Ground ice and permafrost	300 000	0.86	0.022
Lakes (fresh)	91 000	0.26	0.007
Lakes (saline)	85 400	-	0.006
Soil moisture	16 500	0.05	0.001
Atmosphere	12 900	0.04	0.001
Swamp water	11 470	0.03	0.0008
Rivers	2120	0.006	0.0002
Total	1 386 000 000*	-	100

1 cubic km = 1 km³ = 1000 x 1000 x 1000 m = 1 x 10⁹ m³ = 1000 million m³
*Includes biological 'waste', approx. 1120 km³

Table 1: Estimates of global water distribution (adapted from P.H. Gleick, 1996: Water resources. In Encyclopaedia of Climate and Weather, Ed. S.H. Schneider, Oxford Univ. Press, New York, vol. 2, pp. 817-823)

Mission objectives

Soil moisture

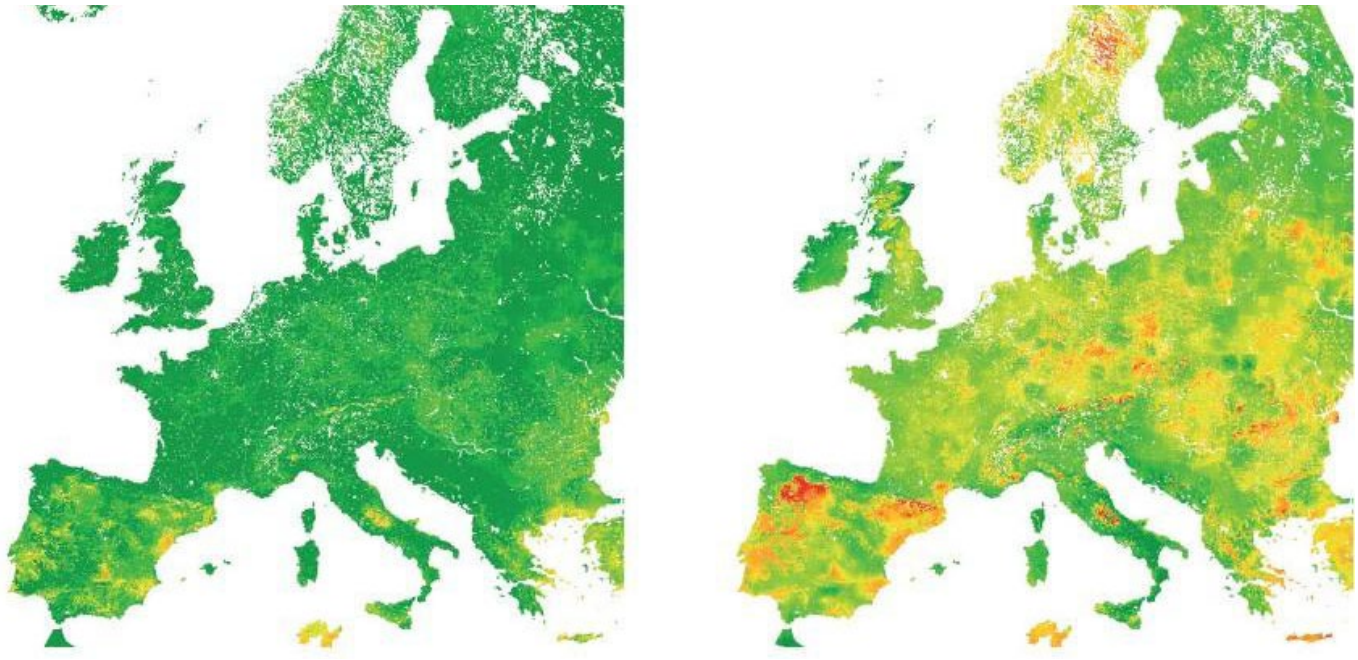
It is a challenge to define soil moisture, or water content of soil, because it means different things to people in different disciplines. A farmer's concept of soil moisture, for instance, differs from that of a water resources manager or a weather forecaster. Generally, soil moisture is the water held in the spaces between soil particles. Surface soil moisture is the water in the upper soil, whereas root-zone soil moisture is the water available to plant roots.

In terms of a quantity, soil moisture is the amount of water expressed in either a volumetric or gravimetric basis. It is often expressed as a ratio ranging from 0 (completely dry) to the value of the soil porosity at saturation. Volumetric soil moisture is defined as a ratio between the volume occupied by the water and the volume of the soil (i.e. m3 water/m3 soil) and is expressed as a percentage (or fraction) and typically occupies a range between values of 0 and 40% (or 0.4).

Usually, soil moisture is considered over different depths depending on the application. The first few centimetres (down to 2-4 cm depth), for instance, drives evaporation, while vegetation pumps water through its root system between the surface and depths of up to 1 m. Groundwater is generally stored in deeper layers.

Soil moisture is a variable required by many scientific and operational applications such as climate monitoring, flood/drought forecasting, studies of ecology or bio-geochemical cycles. For example, plant water supply is the dominant factor affecting plant growth and crop yield monitoring. Measuring soil moisture is a valuable way to detect periods of water 'stress' (excess or deficit) for yield forecasting or biomass monitoring, especially in regions where weather stations are sparse.

Surface soil moisture is crucial in regulating water and energy exchanges between the land surface and lower atmosphere. Its measurement as a variable is important for various reasons: in hydrology and meteorology, the water content of the surface soil layer is a descriptor of the balance between precipitation and evaporation between the surface and the atmosphere. In addition, it is used for estimating the partitioning of precipitation between surface runoff or storage, and for calculating several key variables of land surface energy and water budget, such as albedo or soil hydraulic properties.



Daily estimate of soil moisture in Europe (left panel) and the associated 10-day forecast of soil moisture anomalies based on meteorological forecasts and soil properties (right panel). Comparison of the forecast with the long-term average conditions over the period 1958-2001 gives an indication of whether the soil is wetter (green) or drier (red) than the 44-year average (ECMWF/JRC LISFLOOD)

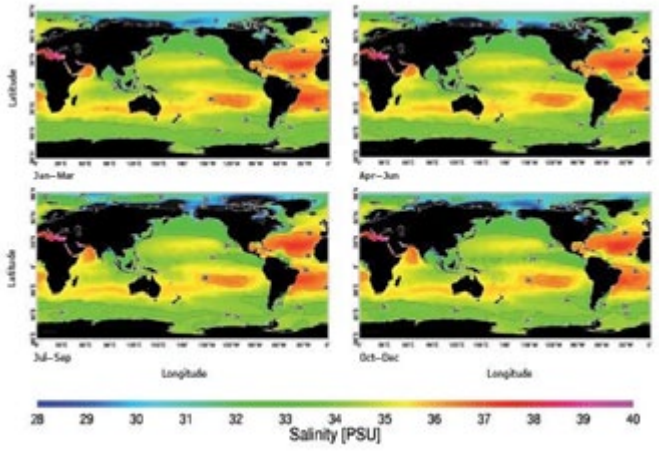
Furthermore, through photosynthesis and respiration, plants regulate the CO2 gas exchanges from and to the atmosphere via their pores (stomata). Since the processes are controlled in the plants by the available water, an estimation of the available root-zone soil moisture is very important for estimating and monitoring the terrestrial CO2 cycle.

Regular measurements of soil moisture at the 10-100 km scale would provide valuable input for the representation of vegetation in land surface schemes. Soil-vegetationatmosphere transfer schemes currently used in meteorological and hydrological models are designed to describe the basic evaporation processes and the redistribution of water between vegetation transpiration, drainage, surface runoff and soil moisture variations. Though the latest computer models manage to describe first-order responses, they are still unable to capture the complete behaviour of the system, especially at the landscape scale. One of the main limitations is the ability to constrain the models by appropriate observations of soil moisture.

Today, the quality of estimates of soil moisture used in model forecasts is limited by the sparse point measurements made by the global network of weather stations, rain gauges and precipitation radars. Constraining the modelling by routine observations of the surface soil moisture will therefore provide a better representation of land surfaces in computer models, with broad-reaching benefits.

Ocean salinity

All water, even rainwater, contains dissolved chemicals or 'salts'. However, the average concentration of dissolved salt in the ocean is equivalent to about one teaspoon of salt in a glass of water. This is over 200 times saltier than fresh lake water. In scientific terms, the average salinity value is about 35 practical salinity units (psu), which equates to 35 grams of assorted dissolved salts to 1 kg (around 1 litre) of water.



Sea-surface salinity maps generated from all available historical data, indicating seasonal changes characterised by freshening of the Arctic and North Atlantic during northern hemisphere summer, due to snow and ice melt, and the typical pattern of a saltier Atlantic compared to the Pacific ocean. The eastern Mediterranean and Red Seas stand out as the saltiest seas on Earth, with values of around 40 psu. (World Ocean Atlas 2005)

Changes in ocean surface salinity from one part of the globe to another, and over time, are a response to large-scale variations in the workings of the global hydrological cycle. They reflect the way in which the different components of the Earth system interact and exchange freshwater. Water transfer between the large reservoirs: ice and snow, the atmosphere, the geosphere, the biosphere and the ocean is driven by a combination of the dynamic and thermodynamic processes that underpin all climate variability.

Observing the freshwater signal in the ocean, and its complement ocean salinity, is an extremely challenging prospect in these global-scale reservoirs. This is because the processes that govern variability in ocean salinity operate from the local to global scale.

The salinity of surface seawater is largely controlled by a balance between evaporation and precipitation. An estimated 334 000 km3 of water evaporates from the ocean and is transferred to the atmosphere each year, to return as precipitation on land and sea. The balance among these processes leads to a global average salinity value of around 35 psu, and values in the open ocean typically ranging between 32 to 38 psu. Salinity is at its greatest in subtropical latitudes, where evaporation exceeds precipitation.

Meanwhile, surface waters near the Equator and at higher latitudes are generally less saline because of greater rainfall and melting ice (or snowfall) respectively.

Due to its part in determining seawater density, salinity has a direct effect on the buoyancy of a water mass and the extent to which it will sink due to gravity. Salinity-driven densification of surface ocean water in certain parts of the globe plays a fundamental role in forcing the surface ocean water to sink and mix, and to be replaced by other water masses. This vertical element of the ocean circulation is a key component of the temperature and salinity-driven global ocean circulation pattern known as the 'thermohaline circulation'. This three-dimensional 'conveyor belt' circulation links all the ocean basins around the globe and is an important element regulating weather patterns and Earth's climate.

In the context of global climate change detection, the practical value and distribution of historical ship-borne measurements of surface salinity data are largely limited by the sparse distribution of standard vessel routes. More recently, the Argo float programme has made a significant step in providing regular assessments of the distribution of salinity in the oceans. However, almost all of these autonomous Argo profiling devices are limited to operations in the open ocean (away from sea-ice cover) and to measurement at depths below approximately 10 m. This means that the salinity of a huge proportion of the surface ocean remains unsampled, while large parts of the highlatitude oceans remain unsampled at all depths.

Since ocean surface salinity is closely linked to estimates of net evaporation minus precipitation (known as E-P), it remains of fundamental importance to assess this aspect of the freshwater balance from the global to regional scale. The benchmark sampling requirement to enable detection of weather and climate relevant variability in E-P is to obtain at least one mean value per 100 km square every month with an accuracy of 0.1 psu. Depending on the scale of the process to be addressed, this may be relaxed to one mean value per 200 km square every 10 days with an accuracy of 0.2 psu or better.

Today the surface salinity distribution and E-P balance remains difficult to measure accurately or regularly over the global ocean with any conventional means. Clearly, satellite-based maps of global and regional-scale surface features in sea-surface salinity offer the only solution to this problem today. Additionally, while satellites are needed to measure and characterise the large-scale time and space variability, the

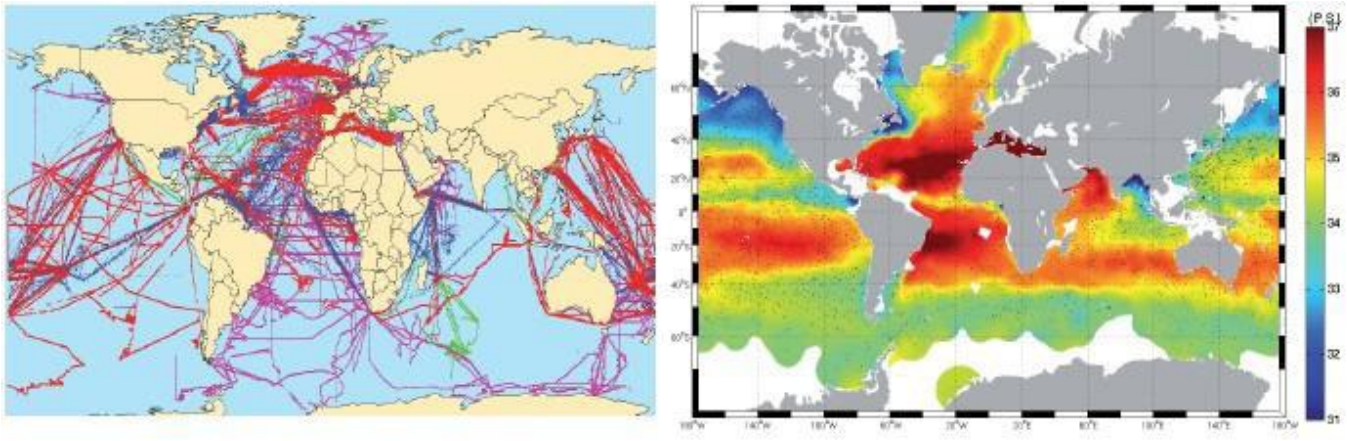
in situ measurement techniques can be used to complement these information at smaller scales or in the three-dimensional picture of the ocean.

SMOS mission requirements

The scientific requirements for SMOS have been formulated such that the measurements should allow retrieval of surface soil moisture and ocean salinity with sufficient accuracy to capture the range of natural variability in these parameters.

instabilities and large current systems. To observe this ocean variability on scales relevant to ocean modelling, the observations must allow features in the 200–300 km range, characterising large-scale salinity gradients, to be resolved.

Ocean model simulations show that, even at reduced spatial resolution, seasonal features will be observed with much better accuracy than the present knowledge of global seasonal sea-surface salinity variations. Many individual measurements can be accumulated in space and time grid cells while preserving the required measurement resolution. Together with



Relying on commercial vessels to measure ocean salinity/ temperature leaves large areas of the oceans unsampled. Left, all surface temperature and salinity data acquired since the early 1990s by voluntary observations made by ships underway using thermosalinographs (www.ifremer.fr/gosud/) Right, the distribution of 3190 Argo drifters (black dots) as of September 2008. Colours indicate the daily analysis of salinity at an uppermost depth of 10 m. White areas indicate where there remain insufficient data with which to resolve salinity or temperature (www.coriolis.eu.org)

For bare soils, for which the influence of near-surface soil moisture on surface water fluxes is strong, a residual random uncertainty of less than 4% is acceptable, and allows good estimation of the evaporation and soil transfer parameters. To illustrate the challenge, this soil moisture measurement requirement is equivalent to being able to detect less than one spoonful of water mixed in a large handful of dry soil.

The forecasting ability of global atmospheric models can be significantly improved if provided with surface soil moisture fields. To achieve this goal, a 50 km spatial resolution is required. Moreover, this scale will allow hydrological modelling with sufficient detail to capture variability in the world's largest hydrological basins.

Ideally, the diurnal cycle in soil moisture should be monitored with twice daily measurements, but this would require multiple satellites for global mapping. With only one satellite, an interval of 1–3 days between surface soil moisture measurements at a particular location can fulfil the requirement for tracking the drying period after rain has fallen. This gives the ability to deduce the soil hydraulic properties needed to retrieve the root-zone soil-moisture content and the soil moisture available for plant processes. Optimally, a 1–2 day revisit interval would be needed to characterise the quickest drying soils. Thus, the designated 1–3 day repeat interval will successfully cover requirements for most soils all the time, while addressing the more challenging, faster-changing soils most of the time.

According to model simulations, ocean surface salinity variations in regions are typically in the range of 0.05 to 0.5 psu, thus posing an extremely challenging requirement. Stronger variability of up to 2 psu may be observed in the tropical oceans, coastal upwelling regions and large river outflows, and regions of strong mixing and dynamics associated with frontal

collocated wind and temperature data, retrieval experiments have demonstrated that averaging of the accumulated SMOS measurements sufficiently reduces random noise to the point where the 0.1 psu requirement may be met.

To fulfil both sets of scientific requirements there is a common need for the orbit to allow global coverage within a band of latitude from 80° North to 80° South or wider. Though there are several possibilities for the local observation time, early morning at around 06:00 is preferable. This is when ionospheric effects are expected to be least, while surface conditions are expected to be as close as possible to thermal equilibrium (i.e. to avoid measurement biases).

Parameter	Accuracy	Spatial resolution	Revisit interval
Soil moisture	0.04 $m^3 m^{-3}$	< 50 km	≤ 3 days
Ocean salinity	0.2–0.1 psu	200–100 km	10–30 days

Table 2: The primary SMOS mission requirements for soil moisture and ocean salinity.

Principles behind the measurement

The theory behind microwave remote sensing of soil moisture and ocean salinity is based on the significant contrast between the electromagnetic properties of pure liquid water and dry soil, and pure water and saline water respectively. As the proportion of water in the soilwater mixture (or proportion of salt in the saline mixture) increases, this change is detectable by microwave sensors in terms of the emission of microwave energy, called the 'microwave brightness temperature' of the surface. For practical soil moisture and ocean salinity applications, using longer microwave wavelengths offers the

advantage that the atmosphere, or vegetation cover, are more transparent to the upwelling signal from the surface.

The radiation emitted by Earth and observed in the L-band microwave range by SMOS, however, is not only a function of soil moisture and ocean salinity. To ensure that the data derived from the SMOS mission are correctly converted into the appropriate units of moisture and salinity, many other potential perturbation or contamination effects on the signal must be carefully accounted for.

A fundamentally new instrument

For optimum results, SMOS measures the microwave radiation emitted from Earth's surface within the 'L-band', around a central frequency of 1.413 GHz. This microwave frequency is protected from man-made emission and provides the greatest sensitivity to the soil moisture and ocean salinity while minimising the disturbing impact of the weather and atmosphere and the vegetation cover above the surface.

The most challenging requirements for the mission are to be able to achieve good radiometric accuracy and stability, repeated global coverage over a short time interval, coupled with the ability to capture regional details in the quantities of interest. Observations at this frequency and with this spatial resolution would normally require an extremely large antenna (at least 8 m diameter) to achieve the desired results. Unfortunately, this approach would lead to an extremely large payload, too big for the small satellite under consideration. So it was proposed to make use of a technique used in radio astronomy, called 'interferometry' to meet this challenge.

Similar to the very large baseline interferometers (VLBI) used on Earth, the SMOS concept relies on a Y-shaped array of 69 elementary antennas, deployed in space, and equivalent to a classical antenna over 8 m in diameter. What is unique about this instrument is that it will be the first ever twodimensional interferometric radiometer in space.

From a mean altitude of 755 km, SMOS will 'see' a considerable area of Earth's surface at any point along its orbit. The interferometric measurements will result in images from within a hexagon-like field of view about 1000 km across, enabling total coverage of Earth in under three days.

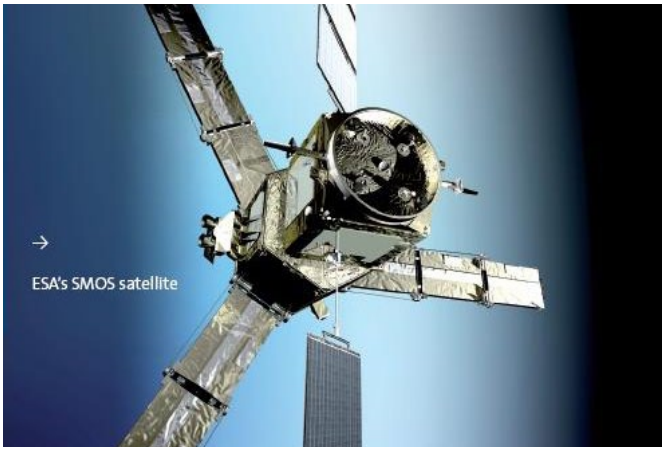
Measuring moisture and salinity from space

SMOS is not the first L-band radiometer in space, and will undoubtedly not be the last. The S-194 instrument on the NASA Skylab space station in 1973/74 provided the first demonstration of the sensitivity of an L-band radiometer to sea-surface salinity, together with the impact of the sea-state and surface temperatures on the measured antenna temperatures.

The Skylab experiment conclusively demonstrated the value of L-band radiometers over the ocean, and in particular paved the way for plans for subsequent instruments.

In addition to SMOS, the Aquarius/ SAC-D mission is currently under joint development by NASA and the Argentinian space agency (CONAE). Aquarius will follow up the successful Skylab demonstration mission and employs a combined L-band real-aperture radiometer with an L-band scatterometer.

The combined measurements will be focused on measurement of global sea-surface salinity. Aquarius recently successfully completed its critical design review and is scheduled for a 2010 launch.



ESA's SMOS satellite

Aquarius will cover the oceans in 8 days with a spatial resolution of 100 km, though its sensitivity to salinity will be better than that of SMOS due to its different design.

The Soil Moisture Active and Passive (SMAP) mission is one of four NASA missions recommended by a US National Research Council Committee on Earth Science and Applications from Space for launch in the 2010-13 timeframe. SMAP will use a combined L-band radiometer and high-resolution radar to measure surface soil moisture and freeze-thaw state. Its measurements will contribute to improving our knowledge of regional and global water cycles, ecosystem productivity and the processes that link the water, energy, and carbon cycles.

Soil moisture and freeze/thaw state information provided by SMAP at high resolution will enable improvements to weather and climate forecasts, flood prediction and drought monitoring, and measurement of net CO2 uptake in forested regions (particularly at high latitudes).

Globally, the SMAP spatio-temporal sampling is the same as that of SMOS, but with the added radar/radiometer synergy to help disaggregate the soil moisture information to 3–10 km scale. However, this advantage is offset by the single view angle, which makes soil moisture retrieval potentially more challenging.

Hopefully, these three missions will overlap in time, so as to enable intercalibration and intercomparison of their respective data. This will help in building longer, seamless soil moisture and ocean salinity time series such as to develop a new fundamental climate data record.

Acknowledgements

ESA would like to acknowledge the important contributions made by members of the SMOS Science Advisory Group and researchers from various institutions and teams around the world during the scientific preparation and development of the mission.

Mark Drinkwater - Directorate of Earth Observation, ESTEC, Noordwijk, The Netherlands
Yann Kerr - CESBIO, Toulouse, France
Jordi Font - SMOS-BEC, Institut de Ciències del Mar, CSIC, Barcelona, Spain
Michael Berger - Directorate of Earth Observation, ESRIN, Frascati, Italy

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SHORT FEATURE: Contrail-free European skies

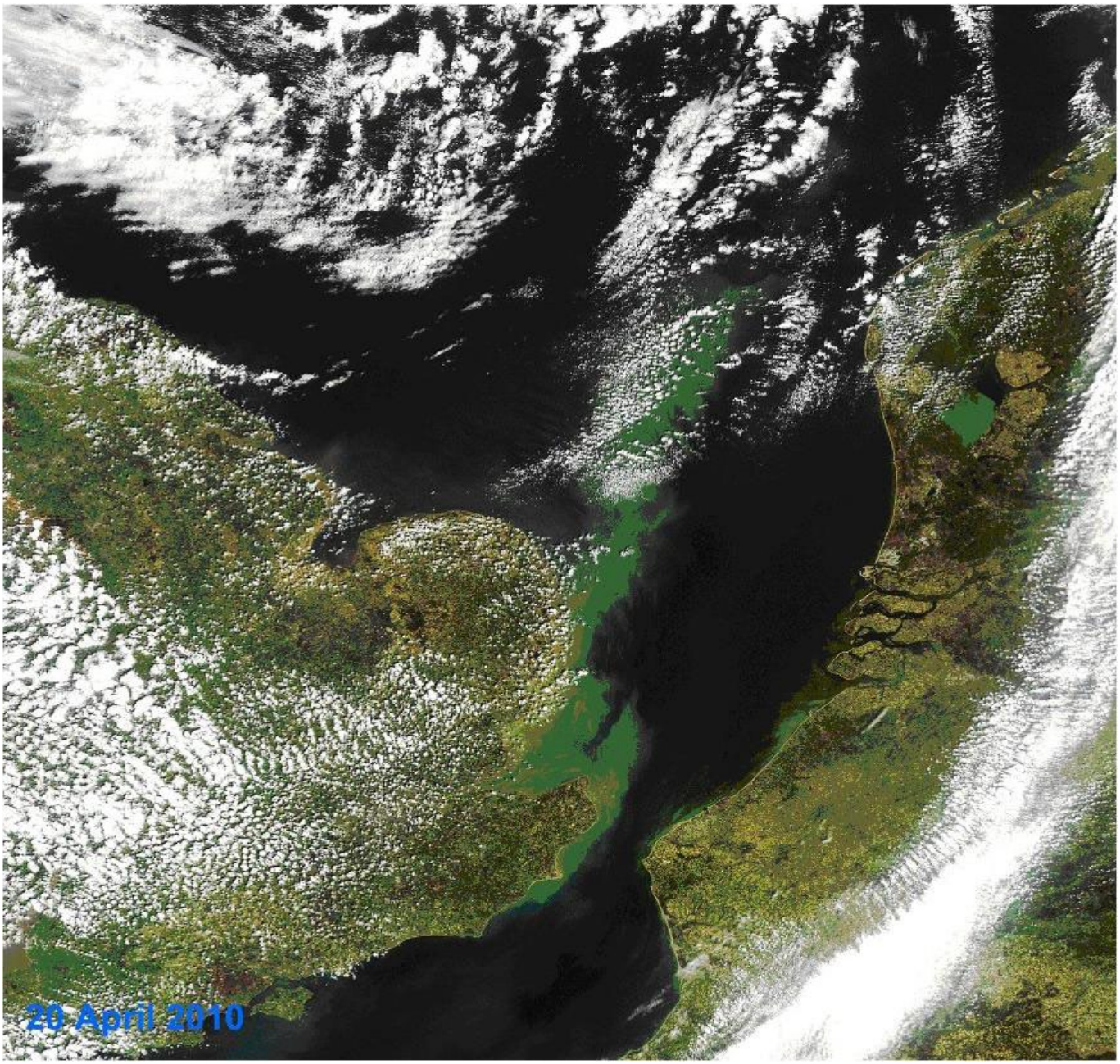
The spring ban on air travel due to the eruption of Eyjafjallajokull in Iceland resulted in contrail-free European skies.

Numerous aircraft condensation trails, image acquired on 21 March 2009, Credits: ESA

23 April 2010.- These two Envisat images over the North Sea illustrate the absence of aircraft over Europe following the ban on air travel enforced due to safety concerns over volcanic ash plumes billowing from the recent eruption in Iceland.

The first image, acquired on 21 March 2009, captures numerous aircraft condensation trails, or 'contrails', while the second image, acquired on 20 April 2010, shows a contrail-free airspace.

Although the formation of contrails depends largely on weather conditions, it was very obvious over Europe (even from the ground) that there were very little contrails visible during the six-day shutdown.



A contrail-free airspace, image acquired on 20 April 2010, Credits: ESA

Exhaust emissions from jet aircraft contain large amounts of water vapour, which, under certain atmospheric states, will condense to form ice crystals.

These act as condensation nuclei around which even more water vapour in the surrounding air condenses. The end result is the formation of an elongated cloud-like condensation trail in the sky.

Also visible in the image are portions of the Netherlands (upper right), Belgium (lower right) and England (left). The various colours of green visible in the sea are due to sediments transported in the water.

The images were acquired by Envisat's Medium Resolution Imaging Spectrometer (MERIS) instrument, working in Full Resolution mode to provide a spatial resolution of 300 m.

Some creative minds are benefitting from the air trraffic restrictions in the most enterprising ways. Ireland's largest bookmaker, Paddy Power, just launched a brand new website, VolcanoBetting.com. Paddy Power's home base of Ireland has been among the hardest hit by flight cancellations.

"Take the risk out of volcanic ash spoiling your summer holiday. Simply place a bet on your departure airport closing on your travel date due to volcanic ash. We are offering odds on a variety of UK and Irish International airports covering departure dates until the end of the summer. So don't let the volcano cost you cash, hedge your holiday with paddypower.com."

Paddy Power had been offering odds of various volcanoes erupting on its website prior to launching the new venture. They were also offering odds on when Eyjafjallajökull would finally stop erupting.

This feature contains also information released by ESA.

EGU Awards and Medals during the 2010 General Assembly

A series of awards and Medals have been presented during the last EGU General Assembly 2010 in Vienna in recognition of outstanding academic performance and scientific excellence in the Earth and Planetary sciences.

UNION AWARDS

Arthur Holmes Medal: Roland von Huene

Roland von Huene

In addition to being made an Honorary Member of the EGU, Roland von Huene has been awarded the Arthur Holmes Medal for gaining extraordinary international standing in solid earth geosciences. He is a world-class leader in the collection of observational data and has led fundamental new research on the quantification of geological processes such as subduction zones.

Alfred Wegener Medal: Jean-Yves Parlange

In addition to being made an Honorary Member of the EGU, Jean-Yves Parlange has been awarded the Alfred Wegener Medal for his lifetime achievements in fundamentally improving the understanding and description of geophysical aspects of transport in porous media. Many of Parlange's collaborators comment on his fine personality, great enthusiasm and inspiring expertise. Parlange's outstanding contributions and his tireless dedication to scholarship and teaching put him at the very top of his profession.

Jean Dominique Cassini Medal: Gerhard Haerendel

In addition to being made an Honorary Member of the EGU, Gerhard Haerendel has been awarded the Jean Dominique Cassini Medal for his indispensable and prominent role in the European exploration of space. Haerendel has held many prominent scientific positions and has more than thirty years of experience in space research, being a principal investigator of several international rocket and satellite projects.

Gerhard Haerendel

Alexander von Humboldt Medal: Carlos A. Nobre

The Alexander von Humboldt Medal, reserved for outstanding scientists from developing countries, has been awarded to Carlos A. Nobre. He plays a prominent role in Amazonian rainforest research, focusing much of his attention on biosphere-atmosphere interactions. Nobre is one of the most respected and influential South American scientists in atmospheric sciences.

EGU Service Award: Jelle Bijma

Jelle Bijma

Each year the EGU presents a unique award in recognition of an individual's outstanding service and exceptional efforts in the promotion, growth and running of the Union. This year

the EGU wishes to pay tribute to Jelle Bijma, who served as the President of the division on Biogeosciences from 2004-2009 and has been the editor of the EGU open access journal " Biogeosciences" since 2004, as well as serving on the EGU Outreach Committee.

OUTSTANDING YOUNG SCIENTIST AWARDS

Valerio Lucarini

Valerio Lucarini

Valerio Lucarini has been awarded the Outstanding Young Scientist Award for his influential contributions to many facets of meteorology. The 33-year-old Professor is already the author of more than thirty peer-reviewed articles, published in journals ranging from highly theoretical one, those devoted to applying theory and numerical modelling to climate and meteorology, to those concerned with very practical applications. Lucarini already enjoys an international reputation, collaborating with many well-known scientists.

Jasper Vrugt

Jasper Vrugt

The 2010 Outstanding Young Scientist Award has been awarded to Jasper Vrugt in recognition of his outstanding contributions in the field of hydrology. The ability to make hydrological predictions in the context of global change is one of the biggest challenges the hydrology science is facing today and Jasper Vrugt's research on model development, diagnostics and improvement is devoted to this challenge. His accomplishments rank him among the most insightful and influential scientists of his generation.

Alexander Barth

Alexander Barth

In recognition of his already impressive resume, the 31-year-old Alexander Barth received this year's Outstanding Young Scientist Award for his fundamental improvements to data assimilation. He is continually working on new techniques for the improvement of data assimilation. His scientific ideas have lead to an impressive number of presentations and publications in peer-reviewed journals.

YOUNG SCIENTIST OUTSTANDING POSTER PAPER AWARDS

YSOPP laureate for the ERE Division: Alfonso José Lag Brotons

DIVISION MEDALS

Vilhelm Bjerknes Medal: Akio Arakawa

The 2010 Vilhelm Bjerknes Medal has been awarded to Akio Arakawa in recognition of his pioneering and fundamental contributions to atmospheric and oceanic modelling. With his innovative representations and discretisation techniques for airflow and convective clouds, he took the modelling business one step forward.

Vladimir Ivanovich Vernadsky Medal: Donald Canfield

The 2010 Vernadsky Medal has been awarded to Donald Canfield for his outstanding contributions to biogeochemistry, encompassing the Earth as a whole in the perspective of the entire expanse of geological time.

Donald Canfield

Milutin Milankovic Medal: James D. Hays

The Milutin Milankovitch Medal has been awarded to James D. Hays for his pioneering, fundamental and continuous work on the reconstruction of Cenozoic climates and for his Science 1976 seminal paper on the astronomical theory of palaeoclimates.

Hans Oeschger Medal: Françoise Gasse

Françoise Gasse

The Hans Oeschger Medal has been awarded to Françoise Gasse for her contribution to the reconstruction of climate variability during the Holocene from continental archives and for providing a better understanding of climate mechanisms involved during this period.

Louis Agassiz Medal: Hajo Eicken

The Louis Agassiz Medal has been awarded to Hajo Eicken for his outstanding contribution to the study of the physical and biological properties of sea ice through a combination of novel experimental techniques and theory.

Robert Wilhelm Bunsen Medal: Mark S. Ghiorso

Mark S. Ghiorso has been awarded the 2010 Robert Wilhelm Bunsen Medal for his outstanding contribution in the field of multi-component silicate melt thermodynamics. His state-of-the-art computational resources are used worldwide by many scientists in the fields of petrochemistry and volcanology.

Vening Meinesz: Philip Woodworth

The 2010 Vening Meinesz Medal has been awarded to Philip Woodworth in recognition of his outstanding contributions to the field of geodesy. His extensive work on sea level variations serves as the foundation for many research opportunities. He is THE expert in the world on the topic of “historical” sea level variations.

Augustus Love Medal: Philip England

The Augustus Love Medal has been awarded to Philip England for his outstanding contributions to the field of large-scale continental deformation. His method of using applied mathematics in model mountain building became a standard one for many other geoscientists.

Ralph Alger Bagnold Medal: Friedhelm von Blanckenburg

The Ralph Alger Bagnold Medal has been awarded to Friedhelm von Blanckenburg for the innovative nature and breadth of his geomorphological studies using cosmogenic isotopes.

Christian Huygens Medal: Jean-Loup Bertaux

The EGU has awarded the 2010 Christian Huygens Medal to Jean-Loup Bertaux for his significant and innovative achievements in the development of space-borne spectrometers and related instrumentation for investigating the atmospheres of planets and interplanetary medium.

John Dalton Medal: Martinus Th. van Genuchten

Martinus Th. van Genuchten

The John Dalton medal has been awarded to Martinus Th. van Genuchten for outstanding contributions to the understanding of flow and transport processes in the unsaturated zone. Van Genuchten’s contributions have impacted the soil and hydrology professions in major ways throughout the world.

Petrus Peregrinus Medal: Jean-Pierre Valet

The Petrus Peregrinus Medal has been awarded to Jean-Pierre Valet for his outstanding contribution to palaeomagnetic data acquisition from sediments and lavas, which is essential for interpretation of palaeosecular, excursional and transitional regimes of the Earth's magnetic field over the last millions of years.

Plinius Medal: Ira Didenkulova

Ira Didenkulova

The Plinius Medal has been awarded to Ira Didenkulova in recognition of her outstanding contributions to solve complex problems of oceanography and coastal engineering by applying nonlinear wave theory to marine natural hazards, including tsunamis, freak waves and storm waves.

Sergey Soloviev Medal: David Keefer

The 2010 Sergey Soloviev Medal has been awarded to David Keefer for his major scientific contribution to our understanding of the complex system of earthquake-induced landslides and for his innovative methods to assess landslide hazards.

Lewis Fry Richardson Medal: Klaus Fraedrich

The Lewis Fry Richardson Medal has been awarded to Klaus Fraedrich for diverse and lasting contributions to the applications of non-linear and stochastic concepts and methods to the atmospheric and oceanic sciences, and for the development of highly valuable modelling suites of broad use and easy access.

Fridtjof Nansen Medal: Michael J. McPhaden

Michael J. McPhaden

Michael J. McPhaden has been awarded the Fridtjof Nansen Medal for his leadership in developing ocean observing systems for climate research and forecasting and for fundamental contributions to our understanding of the ocean's role in climate.

David Bates Medal: Thérèse Encrenaz

Thérèse Encrenaz has been awarded the David Bates Medal for her outstanding work in Atmospheric Physics, Planetary Sciences, Infrared Molecular Spectroscopy, as well as for her editorial tasks and services for the planetary and space science community.

Runcorn-Florensky Medal: James W. Head III

James W. Head III has been awrded the Runcorn-Florensky Medal for his outstanding work on volcanism and tectonism in planetary sciences and for developing remarkable US-European research collaborations in Earth and planetary sciences.

Louis Néel Medal: Teng-fong Wong

The Louis Néel Medal has been awarded to Teng-fong Wong for his outstanding contributions in rock mechanics and his efforts to promote scientific exchange in the fields of rock mechanics and rock physics.

Beno Gutenberg Medal: Jean Paul Montagner

Jean Paul Montagner

The Beno Gutenberg Medal has been awarded to Jean Paul Montagner for his influential contributions to the study of seismic anisotropy in the earth's mantle and for his services to global seismology.

Philippe Duchaufour Medal: Georges Stoops

The Philippe Duchaufour Medal has been awarded to Georges Stoops for his internationally recognised achievements in the field of soil science, with special emphasis on his contributions to soil micromorphology and for the promotion of soil education and research in developing countries.

Julius Bartels Medal: Karl-Heinz Glassmeier

The Julius Bartels Medal has been awarded to Karl-Heinz Glassmeier for his versatile contributions to the field of solar-terrestrial sciences. He is one of the few scientists worldwide who have worked in all of the sub-fields of geomagnetism, from ground to space, and thus can be called a true 'Geomagnetiker' in the sense of Bartels. His work on magnetic pulsations on Earth and in the magnetospheres of other planets, on magnetic induction below the surface of Earth and other planets, his cometary research and his work on paleo-magnetospheres has received worldwide recognition.

Karl-Heinz Glassmeier

Hannes Alfvén Medal: Donald Farley

The Hannes Alfvén Medal has been awarded to Donald Farley for his pioneering work on the theory of incoherent scattering of radio waves in plasma and the application of incoherent scattering to the study of the ionosphere.

Jean Baptiste Lamarck medal: Felix Gradstein

The Jean Baptiste Lamarck medal has been awarded to Felix Gradstein for his outstanding research in stratigraphy, micropalaeontology and geochronology. He is renowned for coordinating the development of the international geological time scale: over the last 25 years, Gradstein et al.'s Time Scales and most recently the 2004 "Geologic Time Scale" (GTS2004) have become a ubiquitous "gold standard" for all Earth Scientists.

Stephan Mueller Medal: Seth Stein

The 2010 Stephan Mueller Medal has been awarded to Seth Stein in recognition of his outstanding contributions to the study of the kinematics and dynamics of plate boundaries and plate interiors based on innovative applications of seismology and space-geodesy, and for his role in establishing the first Plate Boundary Observatory.

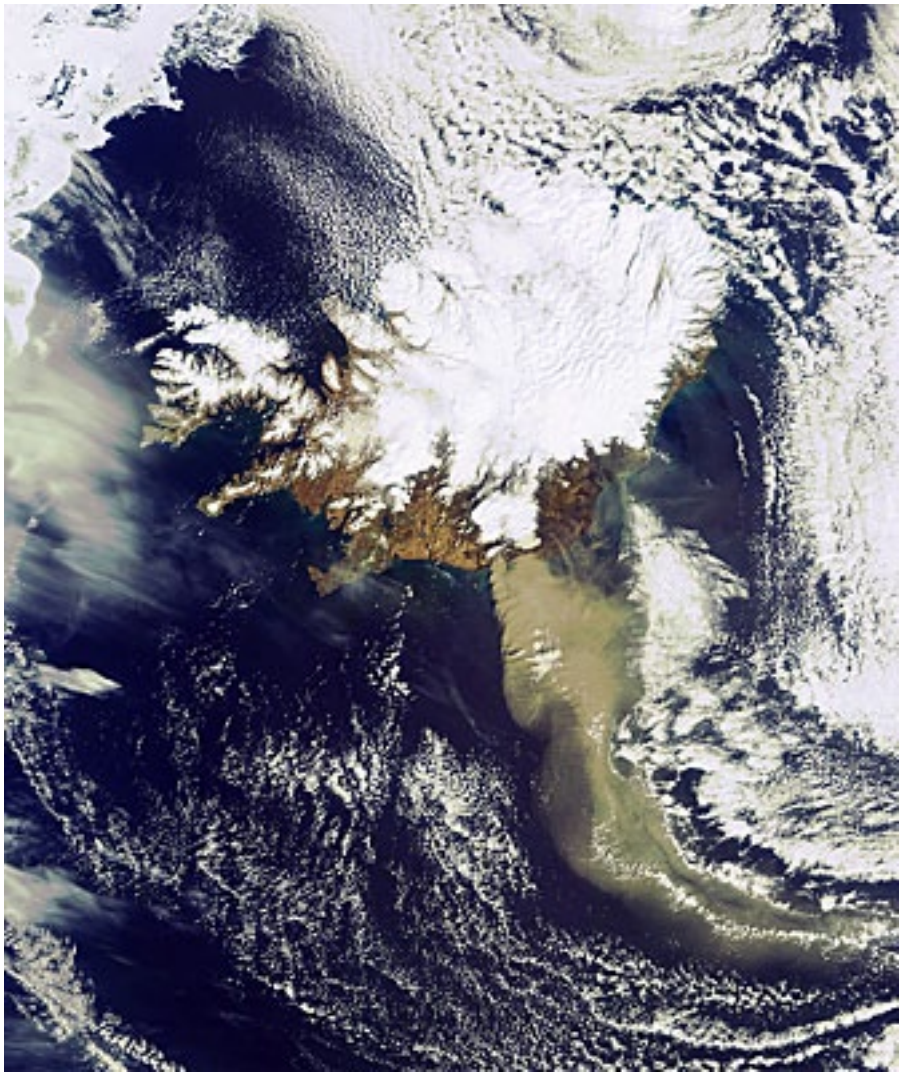
Henry Darcy medal: Renzo Rosso

Renzo Rosso

The Henry Darcy medal has been awarded to Renzo Rosso for his fundamental contributions to hydrology and water resources management. His research has led to better risk assessment and useful hydrological models.

EARTH FROM SPACE

Satellite image of ash spewing from Iceland's volcano



Ash spewing from Iceland's volcano, Credits: ESA

19 April 2010.- In this image taken just under two hours ago (14:45 CET) by ESA's Envisat satellite, a heavy plume of ash from the Eyjafjallajoekull Volcano is seen travelling in a roughly southeasterly direction.

The volcano has been emitting steam and ash since its recent eruptions began on 20 March, and as observable, the emissions continue. The plume, visible in brownish-grey, is approximately 400 km long.

Envisat's Medium Resolution Imaging Spectrometer instrument (MERIS) acquired this image on 19 April, while working in Full Resolution Mode to provide a spatial resolution of 300 m.

Envisat will continue to monitor the situation. To see the latest satellite images over the area, simply visit our MIRAVI website. MIRAVI, which is free and requires no registration, generates images from the raw data collected by MERIS and provides them online within two hours.

ESA

Multicellular organisms capable of surviving in oxygen-free environment

the discovery of metazoan life in anoxic environment provides a glimpse of Earth's past ecology

Can animals live without oxygen? New EU-funded research has found they can. Scientists recently discovered the planet's first multicellular organisms capable of surviving and reproducing in a 100% oxygen-free environment. Presented in the journal BioMed Central (BMC) Biology, the results are part of the EU-funded HERMES and HERMIONE projects.

The creatures, found deep on the floor of the Mediterranean Sea, subsist in an environment that has no oxygen but is rich in sulphides. The multicellular organisms, which are members of the Loricifera group, are not only alive, but metabolically active and capable of reproducing.

The team discovered the organisms in the course of 3 oceanographic expeditions carried out over a 10-year period. They were looking for living fauna in the sediment of the Mediterranean's L'Atalante basin, which is around 200 kilometres off the western coast off the Greek island of Crete. This deep-sea hypersaline basin, which is about 3.5 km deep, is for the most part completely anoxic.

'These extreme environments have been thought to be exclusively inhabited by viruses, bacteria and archaea (i.e. single-celled microorganisms),' explained lead author Professor Roberto Danovaro, Director of the Department of Marine Science at the Polytechnic University of Marche in Ancona, Italy. 'The bodies of multicellular animals have previously been discovered, but were thought to have sunk there from upper, oxygenated, waters. Our results indicate that the animals we recovered were alive. Some, in fact, also contained eggs.'

The creature that needs no oxygen © Danovaro

Using electron microscopy, the researchers found that these tiny creatures possess organelles resembling hydrogenosomes, which are found in single-celled organisms living in anaerobic environments.

Commenting on the results of this study, Professor Lisa Levin of the Scripps Institution of Oceanography in the US said: 'The finding by Danovaro et al. offers the tantalising promise of metazoan life in other anoxic settings, for example in the subsurface ocean beneath hydrothermal vents or subduction zones or in other anoxic basins.'

For their part, Drs Marek Mentel and William Martin, respectively from Comenius University in Slovakia and Dusseldorf University in Germany, noted: 'The discovery of metazoan life in a permanently anoxic and sulphidic environment provides a glimpse of what a good part of Earth's past ecology might have been like in 'Canfield ocean' [a sulphidic, partially oxic ocean existing between the Achaean and Ediacaran periods] before the rise of deep marine oxygen levels and the appearance of the first large animals in the fossil record roughly 550–600 million years ago.'

Coordinated by the UK's National Oceanography Centre Southampton, HERMES ('Hot spot ecosystem research on the margins of European seas') targeted the forecasting of biodiversity change in relation to natural and man-made environmental changes by creating the first comprehensive pan-European margin Geographic Information System. The HERMES consortium comprised 50 partners including 9 small and medium-sized enterprises (SMEs) from 17 European countries including Belgium, Germany, Greece, Italy, Norway, Romania, Russia and Ukraine. HERMES ran from 2005 to 2009.

HERMIONE (Hotspot ecosystem research and man's impact on European seas'), the successor to the HERMES project, seeks to advance our knowledge of the functioning of deep-sea ecosystems and their contribution to the production of goods and services. Launched in 2009 and scheduled to end in 2012, HERMIONE is coordinated by the Natural Environment Research Council (NERC) in the UK and brings together 38 partners from across Europe.

Links:
http://www.eu-hermes.net/
http://www.eu-hermione.net/

Research Headlines
http://ec.europa.eu/research/headlines/news/article_10_04_27_en.html

New Swedish secretariat for global environmental and natural resource issues

established at the Royal Swedish Academy of Sciences to help Swedish participation into International Networks

15 June 2010.- In cooperation with several Swedish funders of scientific research, the Royal Swedish Academy of Sciences is establishing a new secretariat – the Swedish Secretariat for Environmental Earth System Sciences (SSEESS) – in order to facilitate Swedish researchers' participation and leadership in relevant international programmes.

The participation of Swedish researchers in these networks has previously been limited due partly to traditional disciplinary and nationally-focused approaches and organization of research and research financing. The purpose of the new secretariat, SSEESS, is to ensure that Swedish research about global environmental and natural resource issues becomes more integrated in international programs. SSEESS also intends to be a source of information for Swedish decision makers.

Kevin Noone (Professor of Chemical Meteorology at Stockholm University) will be directing the new secretariat, and the Executive Board consists of researchers as well representatives from FAS (Swedish Council for Working Life and Social Research), FORMAS (Swedish Research Council for research in the areas Environment, Agricultural Sciences and Spatial Planning), the Swedish Research Council and VINNOVA (Swedish Governmental Agency for Innovation Systems) – all funders of research and partners of the SSEESS. The secretariat is located in recently renovated offices at the Royal Swedish Academy of Sciences.

SSEESS's first initiative will be a campaign to inform Swedish researchers about the international programs as well as informing the programs about the scientific competence that exists in Sweden.

Further information: http://kva.se/sseess

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German radar satellite TanDEM-X launched successfully

will provide global Digital Terrain Elevation Measurements

Germany's second Earth observation satellite, TanDEM-X, was launched successfully on 21 June 2010 at 04:14 Central European Summer Time (CEST, 08:14 local time) from the Baikonur Cosmodrome in Kazakhstan. Credit: DLR

21 June 2010.- Germany's second Earth observation satellite, TanDEM-X, was launched successfully on 21 June 2010 at 04:14 Central European Summer Time from the Baikonur Cosmodrome in Kazakhstan, atop a Russian Dnepr rocket.

The German Aerospace Center (DLR) manages TanDEM-X (TerraSAR-X add-on for Digital Elevation Measurement) via its ground segment, and is responsible for mission operations and for generating and utilising the scientific data. "TanDEM-X is a key German project and will provide us with a homogeneous 3D elevation model of the Earth which will be an indispensable aid for a great many scientific and commercial avenues of enquiry," said DLR Chairman Prof. Dr Johann-Dietrich Wörner at the launch event held in the German Space Operations Center (GSOC) at the DLR site in Oberpfaffenhofen.

Together with its twin satellite TerraSAR-X, in space since 2007, TanDEM-X will survey the entire land surface area of the Earth several times within three years.

Today, for large areas of Earth, there are only approximate, non-standardised or incomplete elevation models, and it is these gaps that the TanDEM-X mission is designed to fill. To accomplish this, TanDEM-X and TerraSAR-X will fly a few hundred metres apart and will constitute the first configurable synthetic aperture radar (SAR) interferometer in space.

With a conventional SAR, the radar on the satellite transmits microwave pulses that are reflected by the surface of the Earth and received back by the radar. The distance between the satellite and the Earth's surface is calculated from the time it takes the signals to return. Since the satellite is moving around the Earth, the radar 'illuminates' a strip along the ground, which gives the radar its synthetic aperture, much larger than its real one.

With SAR interferometry, a geographical area is imaged from two different viewing positions, giving different perspectives. This is similar to the way humans use their two eyes to get an accurate, 3D image. The two 'radar eyes' are on the satellite duo TanDEM-X and TerraSAR-X, and produce an interferogram from the different distances the signals have to cover; elevation data is derived from this.

Triton's Summer Sky of Methane and Carbon Monoxide

the Sun still makes its presence felt on Triton, even from so far away, creating seasons just as on Earth, although they change far more slowly

07 April 2010.- According to the first infrared analysis of the atmosphere of Neptune's moon Triton, summer is in full swing in its southern hemisphere. The European observing team used ESO's Very Large Telescope and discovered carbon monoxide and made the first ground-based detection of methane in Triton's thin atmosphere. These observations revealed that the thin atmosphere varies seasonally, thickening when warmed.

"We have found real evidence that the Sun still makes its presence felt on Triton, even from so far away. This icy moon actually has seasons just as we do on Earth, but they change far more slowly," says Emmanuel Lellouch, the lead author of the paper reporting these results in Astronomy & Astrophysics.

On Triton, where the average surface temperature is about minus 235 degrees Celsius, it is currently summer in the southern hemisphere and winter in the northern. As Triton's southern hemisphere warms up, a thin layer of frozen nitrogen, methane, and carbon monoxide on Triton's surface sublimates into gas, thickening the icy atmosphere as the season progresses during Neptune's 165-year orbit around the Sun. A season on Triton lasts a little over 40 years, and Triton passed the southern summer solstice in 2000.

Based on the amount of gas measured, Lellouch and his colleagues estimate that Triton's atmospheric pressure may have risen by a factor of four compared to the measurements made by Voyager 2 in 1989, when it was still spring on the giant moon. The atmospheric pressure on Triton is now between 40 and 65 microbars — 20 000 times less than on Earth.

Carbon monoxide was known to be present as ice on the surface, but Lellouch and his team discovered that Triton's upper surface layer is enriched with carbon monoxide ice by about a factor of ten compared to the deeper layers, and that it is this upper "film" that feeds the atmosphere. While the majority of Triton's atmosphere is nitrogen (much like on Earth), the methane in the atmosphere, first detected by Voyager 2, and only now confirmed in this study from Earth, plays an important role as well. "Climate and atmospheric models of Triton have to be revisited now, now that we have found carbon monoxide and re-measured the methane," says co-author Catherine de Bergh.

Artist's impression of how Triton, Neptune's largest moon, might look from high above its surface. The distant Sun appears at the upper-left and the blue crescent of Neptune right of centre. Using the CRIRES instrument on ESO's Very Large Telescope, a team of astronomers has been able to see that the summer is in full swing in Triton's southern hemisphere. Credit: ESO/L. Calçada

Of Neptune's 13 moons, Triton is by far the largest, and, at 2700 kilometres in diameter (or three quarters the Earth's Moon), is the seventh largest moon in the whole Solar System. Since its discovery in 1846, Triton has fascinated astronomers thanks to its geologic activity, the many different types of surface ices, such as frozen nitrogen as well as water and dry ice (frozen carbon dioxide), and its unique retrograde motion. Triton is the only large moon in the Solar System with a retrograde motion, which is a motion in the opposite direction to its planet's rotation. This is one of the reasons why Triton is thought to have been captured from the Kuiper Belt, and thus shares many features with the dwarf planets, such as Pluto.

Observing the atmosphere of Triton, which is roughly 30 times further from the Sun than Earth, is not easy. In the 1980s, astronomers theorised that the atmosphere on Neptune's moon might be as thick as that of Mars (7 millibars). It wasn't until Voyager 2 passed the planet in 1989 that the atmosphere of nitrogen and methane, at an actual pressure of 14 microbars, 70 000 times less dense than the atmosphere on Earth, was measured. Since then, ground-based observations have been limited. Observations of stellar occultations (a phenomenon that occurs when a Solar System body passes in front of a star and blocks its light) indicated that Triton's surface pressure was increasing in the 1990's. It took the development of the Cryogenic High-Resolution Infrared Echelle Spectrograph (CRIRES) at the Very Large Telescope (VLT) to provide the team the chance to perform a far more detailed study of Triton's atmosphere. "We needed the sensitivity and capability of CRIRES to take very detailed spectra to look at the very tenuous atmosphere," says co-author Ulli Käufl. The observations are part of a campaign that also includes a study of Pluto [eso0908 - http://www.eso.org/public/news/eso0908/].

Pluto, often considered a cousin of Triton and with similar conditions, is receiving renewed interest in the light of the carbon monoxide discovery, and astronomers are racing to find this chemical on the even more distant dwarf planet.

This is just the first step for astronomers using CRIRES to understand the physics of distant bodies in the Solar System. "We can now start monitoring

the atmosphere and learn a lot about the seasonal evolution of Triton over decades," Lellouch says.

Full bibliographic information:
Astronomy & Astrophysics ("Detection of CO in Triton's atmosphere and the nature of surface-atmosphere interactions", by E. Lellouch et al.), reference DOI : 10.1051/0004-6361/201014339.

Research paper: http://www.eso.org/public/archives/releases/sciencepapers/eso1015/eso1015.pdf

European Southern Observatory - ESO
Reference URL: http://www.eso.org/public/news/eso1015/

StarTiger to eclipse Sun in space

success opens up the prospect of sustained access to inner zones of the Sun's corona

27 April 2010.- The Laboratoire Astrophysique d'Marseille (LAM) served as host to ESA's latest StarTiger project, with the team building a scale-model prototype in a LAM cleanroom.

The prototype demonstrates a way to produce a perpetual eclipse in space: fly two satellites in tight formation so that one casts a continuous shadow across the other.

Considering each satellite would be moving at multiple kilometres per second, the idea presents substantial problems in navigation and control terms. But success opens up the prospect of sustained access to inner zones of the Sun's corona, currently glimpsed from the ground only for a few minutes per year during total solar eclipses.

The two satellites will fly 150 m apart, the first hosting a 'coronagraph' instrument while the second, 'occulter', casts

External coronagraph in space, credits: ESA

a shadow across it with a maximum positioning error of a few millimetres. Photosensors around the coronagraph will monitor the shadow's position while an LED array on the occulter allows optical tracking from the observer satellite.

For the purposes of the scale-model, the simulated Sun, occulter and coronagraph were all on the same optic bench, with light reflected via a distant mirror to mimic the planned operating distance. This setup allowed complete end-to-end modelling of the proposed system.

The StarTiger coronagraph would perform spectral as well as spatial coronal monitoring, incorporating a liquid-crystal-based spectrometer design and a 'smart' active pixel sensor (APS) detector covering the wide dynamic range of coronal light levels. As part of the project's secondary objectives, both elements were also prototyped.

StarTiger, stands for 'Space Technology Advancements' by Resourceful, Targeted and Innovative Groups of Experts and Researchers.

ESA

Marine Methane and Nitrous Oxide

A SOLAS-COST database initiative

The MEMENTO (Marine Methane and Nitrous Oxide) database project has been initiated to work with the research community to bring together global oceanic and atmospheric nitrous oxide (N2O) and methane (CH4) data (see also the attached essay "MEMENTO: A proposal to develop a database of marine nitrous oxide and methane measurements").

MEMENTO is a joint initiative of the International SOLAS (Surface Ocean - Lower Atmosphere Study, www.solas-int.org) and the COST Action 735 of the European Science Foundation (www.cost-735.org), both of which have the express aim of providing best-estimates of global air-sea fluxes.

MEMENTO aims to utilise data collected during numerous hydrographic cruises and from other platforms in order to assemble a global database, which would represent a substantial resource that we will make available to the community. We will publish global surface concentration fields and air-sea fluxes, with all data providers as co-authors. The product is intended for use in global models as validation tool and/or input field.

We encourage you to contribute your data and become a part of MEMENTO. The intention is that the database will eventually be published in a global data centre, accompanied by a publication in the peer-reviewed open access journal Earth System Science Data (www.earth-system-science-data.net). You can either send your data via e-mail to hbange@ifm-geomar.de where it will then be transferred into a common template, or you can submit your data using the template provided on the SOLAS Project Integration web site: www.bodc.ac.uk/solas_integration/implementation_products/group3/

We welcome your questions or comments about MEMENTO. Please feel free to contact me or Dr Tom Bell from the SOLAS Project Integration (thomas.bell@uea.ac.uk) for more information.

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COSPAR Awards 2010

to be presented on 19 July during the 38th COSPAR Scientific Assembly

Committee on Space Research (COSPAR) Awards 2010, to be presented on 19 July during the 38th COSPAR Scientific Assembly, 18 - 25 July 2010, Bremen, Germany

- COSPAR Space Science Award for outstanding contributions to space science:

Günther Hasinger (Germany), MPI for Plasma Physics, Garching and Steven W. Squyres (USA), Department of Astronomy, Cornell University, Ithaca, New York.

- COSPAR International Cooperation Medal for distinguished contributions to space science and work that has contributed significantly to the promotion of international scientific cooperation:

Lee-Lueng Fu (USA) and Yves Ménard (France, posthumous), Jet Propulsion Laboratory, Pasadena, California and CNES, Paris.

- COSPAR William Nordberg Medal commemorating the late William Nordberg and for distinguished contributions to the application of space science in a field covered by COSPAR:

Kuo-Nan Liou (USA), Department of Atmospheric and Oceanic Sciences, University of California, Los Angeles, California.

- COSPAR Distinguished Service Medal for extraordinary services rendered to COSPAR over many years:

Margaret (Peggy) Ann Shea (USA), Air Force Research Lab., Hanscom AFB, Massachusetts.

- Massey Award (a joint award of COSPAR and the Royal Society of London) honoring the memory of Sir Harrie Massey, FRS, for outstanding contributions to the development of space research in which a leadership role is of particular importance:

Harvey Tananbaum (USA), Chandra X-Ray Center (CXC) at the Smithsonian Astrophysical Observatory, Cambridge, Massachusetts.

- Vikram Sarabhai Medal (a joint award of COSPAR and the Indian Space Research Organization) honoring Vikram Sarabhai, one of the architects of modern India, for outstanding contributions to space research in developing countries:

Zuyin Pu (China), School of Earth & Space Sciences, Peking University.

- Jeoujang Jaw Award (a joint award of COSPAR and the Chinese Academy of Sciences) recognizes scientists who have made distinguished pioneering contributions to promoting space research, establishing new space science research branches and founding new exploration programs:

Calvin T. Swift (USA), Department of Electrical and Computer Engineering, Univ. of Massachusetts, Amherst.

- Zeldovich Medals (a joint award of COSPAR and the Russian Academy of Sciences) conferred on young scientists for excellence and achievements, honoring the distinguished astrophysicist Yakov B. Zeldovich. One medal is awarded for each COSPAR Scientific Commission:

* COSPAR Scientific Commission A

Paul I. Palmer (United Kingdom). School of GeoSciences, University of Edinburgh, in recognition of innovative contributions in the modeling of the transport of trace gases in the atmosphere using Earth observation from space.

* COSPAR Scientific Commission B

Anna A. Fedorova (Russia). Space Research Institute, Russian Academy of Sciences, for outstanding spectroscopic studies of water and aerosols in planetary atmospheres, leading to improved understanding of the Martian water cycle, seasonal changes and atmospheric stability.

* COSPAR Scientific Commission C

Jiuhou Lei (China/USA). Department of Aerospace Engineering Sciences, University of Colorado, for his creative modeling and data analysis studies that have elucidated important phenomena in the ionosphere and thermosphere.

* COSPAR Scientific Commission D

Yasuhito Narita (Japan/Germany). Institute of Geophysics and Extraterrestrial Physics, Technical University of Braunschweig, for very significant discoveries and studies in the field of magnetospheric plasma waves and solar wind plasma turbulence.

* COSPAR Scientific Commission E

Vito Sguera (Italy). Space Astrophysics and Cosmic Physics Institute, Bologna, for his research on the new class of soft gamma-ray sources, Super Giant Fast X-Ray Transients, of seminal importance for high energy astrophysical studies.

* COSPAR Scientific Commission F

Oleg A. Gusev (Russia/Japan). National Institute of Agrobiological Sciences, Tsukuba, in recognition of his outstanding contributions to the study of the effect of the space environment on embryogenesis and for the establishment of a Russian-Japanese program for the study of plants and invertebrates.

* COSPAR Scientific Commission G

Junichiro Shiomi (Japan). Department of Mechanical Engineering, University of Tokyo, in recognition of his scholarly contributions to the development of control methods to suppress spontaneous instabilities in interfacial fluid flows.

* COSPAR Scientific Commission H

John W. Conklin (USA). W.W. Hansen Experimental Physics Laboratory, Stanford University, in recognition of his innovative experimental work of exquisite precision in the calibration of fundamental physics payloads.

CITATIONS

- COSPAR Space Science Award: Günther Hasinger (Germany)

Professor Hasinger, recipient of this year's COSPAR Space Science Award, is the Director of the Max-Planck-Institute for Plasma Physics, in Garching and Greifswald. Following his PhD in Astronomy in Munich and Garching, he went to the Max-Planck-Institute for Extraterrestrial Physics (MPE), was then Director of the Astrophysikalisches Institut in Potsdam and, in 2007, Director of MPE for two years.

Professor Hasinger started his career with the analysis of EXOSAT data concerning low-mass X-ray binaries. With ROSAT he resolved the diffuse cosmic X-ray background radiation into discrete objects, which turned out to be essentially massive black holes. Over the last few years, with the modern X-ray observatories Chandra and XMM-Newton, he showed that the cosmic evolution of black holes goes hand in hand with the evolution of their host.

He also led the development of future X-ray observatories such as eROS-

ITA and XEUS/IXO, which should answer questions concerning dark energy and dark matter, as well as the history of black hole and galaxy formation in the early Universe.

Professor Hasinger has also concerned himself with science policy. In 2005, he succeeded in obtaining a major increase in the German space science programme budget.

Professor Hasinger belongs to the ESA High-level Science Policy Advisory Committee and is Chair of the European Fusion Development Agreement Steering Committee. He also belonged to the ESA Astronomy Working Group, and he has chaired various European panels and committees.

He is now the well-deserving recipient of the COSPAR Space Science Award.

Steven W. Squyres (USA)

Professor Steve Squyres has had scientific discoveries and achievements in an unusually broad range of planetary research areas covering numerous solar system bodies, including Mars, Venus, Europa, Ganymede, Callisto, Lapetus, Enceladus, Titan and several asteroids and comets. His early work involved using measurements and innovative models of tectonic and volcanic structures to understand the thermal history of the icy satellites including the possibility of a subsurface ocean on Europa. He has made extensive contributions to understanding the geology and tectonism of Venus, particularly concerning the enigmatic coronae. In addition, he has been a key contributor to understanding the geology of Mars, particularly as it relates to the history of water, ground ice and ice-rich debris, and ancient environments.

Professor Squyres is best known for his groundbreaking successes related to the Mars Exploration Rovers, for which he is the Principal Investigator. He was largely responsible for the conception and execution of the Athena science investigation, as well as leading the interpretation and communication of the scientific results from the two rovers. His work has revolutionized our view of early Mars. He and his rover science team have studied the geology and mineralogy of the Meridiani and Gusev landing sites revealing an early Mars in which water was a ubiquitous agent of geologic alteration, providing evidence for a much more clement and habitable environment than is present today. At Meridiani the rocks were found to be evaporitic sulfate sandstones formed by evaporation of saline lakes and incorporation in sand dunes or sand sheets, which were extensively soaked by ground water after deposition. The study of Gusev crater has revealed the extensive presence of ground water alteration, including the discovery of silica-rich deposits, which is likely related to ancient hydrothermal activity.

Professor Squyres' involvement in a multitude of flight projects for over 30 years, and his significant scientific contributions across all of them, demonstrates his outstanding contribution to space science.

- COSPAR International Cooperation Medal:

Lee-Lueng Fu (USA) and Yves Ménard (France, posthumous)

The COSPAR International Cooperation Medal is awarded to a scientist who has made distinguished contributions to space and Earth science and whose work has contributed significantly to the promotion of international scientific cooperation. The 2010 Medal is jointly awarded to Dr. Lee-Lueng Fu and Dr. Yves Ménard.

Dr. Fu is an exceptional oceanographer who has been an international leader of space-based precision radar altimetry and the shepherd of the now iconic time series of globally-averaged sea level rise measurements. As the NASA Project Scientist for the TOPEX/Poseidon (T/P), Jason-1, and OSTM missions, Dr. Fu co-led the Sea Surface Topography Science Teams from the late 1980s until recently, implementing a complex set of missions involving multiple international partners. As a result of Dr. Fu's leadership, the high quality and longevity of the data record from T/P, Jason and OSTM have revolutionized our understanding of important scientific problems that include the sea level rise associated with global warming, the characteristics of the 1997-1998 El Nino, one of the largest climate events in the past 100 years, and the important influence of ocean tides on the mixing of heat, salt and momentum throughout the World Ocean. Following the development of the Jason-1 mission, Dr. Fu was a key advocate for broadening satellite altimetry measurements from research to operations. Through his sustained efforts, the OSTM mission became a shining example of this transition, with the increased involvement of U.S. and European operational agencies. Dr. Fu has also catalyzed international collaboration on planning the future of interferometric radar altimetry. His efforts at gathering a broad international team of scientists have succeeded in defining the next generation of wide swath capable altimeters and convincing U.S. and European agencies to pursue an interferometric altimeter mission in the upcoming decade.

Dr. Yves Ménard (deceased, October 2008) was the CNES Jason-1 Project Scientist; he worked in a long and fruitful partnership with Dr. Fu, the NASA Project Scientist. Dr. Ménard was also in charge of the CNES CalVal activities. He was instrumental in setting up the CNES calibration sites, first in Lampedusa (Italian island near Tunisia), and then in Corsica. After the launch of Jason-1 in 2001, Dr. Ménard was very active in the preparation of the Jason-2 mission and was a key factor in the process that ultimately led to the involvement of EUMETSAT as a partner in this new mission, explaining the potential benefits of altimetry for improved weather forecast and better climate monitoring to the various National Meteorological Services in Europe. Yves Ménard was a pioneer in satellite altimetry and a mentor for an entire generation of young space oceanographers. He was passionately involved in developing, enhancing, and promoting scientific applications of satellite altimetry and as such was one of the pillars of the satellite oceanography community. He was also involved in developing new altimetric research applications in subjects ranging from coastal altimetry applications to GPS validation across Drake Passage.

Yves Ménard and Lee-Lueng Fu jointly and gently led an international team of scientists from the US, France, Germany, the UK, Italy, Australia, Japan and other countries to develop the science and applications of nadir radar altimetry. They maintained their vision and enthusiasm for what precise altimetry could achieve, and coupled with their diplomacy and generosity of spirit, they guided the smooth advancement of precise nadir radar altimetry for climate and applications. It is for these reasons, in particular, that Drs. Fu and Ménard are well-deserving recipients of the 2010 COSPAR International Cooperation Medal.

- COSPAR William Nordberg Medal:

Kuo-Nan Liou (USA)

For the past 40 years through personal research, teaching and professional commitment, Professor Kuo-Nan Liou has been an unrivaled and truly peerless intellectual leader in improving the theory and application of the Earth's remote sensing from space, the concomitant radiative transport in the atmosphere and its interaction with clouds. Starting in the early seventies, he originated the theoretical foundation of backscattering depolarization from nonspherical ice crystals, a powerful lidar technique for distinguishing between ice and water clouds and for determining ice crystal orientation. Dr. Liou was the first to deduce the theoretical basis and numerical feasibility of inversions leading to the retrieval of atmospheric heating rates using the rotational band of water vapor directly from satellite measurements and demonstrated effectively how surface radiative fluxes can be inferred directly from radiation observations. Following these theoretical advances, along with his associates he developed novel techniques for detection of the thickness, optical depth and composition, such as nonspherical ice crystal size, of ubiquitous cirrus clouds from satellites, which even today form the baseline design for the NPOESS' VIIRS cloud remote sensing program. In addition, Dr. Liou's insight into 3-D radiative transfer led him to pioneer a remote sensing approach for the mapping and imaging of 3-D inhomogeneous clouds, critical to analysis of the atmospheric heating profile for weather and climate models. Finally, in a broader context and for the first time in this field, Professor Liou has incorporated the subject of remote sensing into a reference and textbook (1980, 2002), in which he unified it and made it an integral part of all other aspects of the fundamentals of atmospheric radiation.

For these distinguished contributions to the application of space science, it is a pleasure to award the COSPAR Nordberg Medal to Dr. Liou.

- COSPAR Distinguished Service Medal:

Margaret (Peggy) Ann Shea (USA)

Margaret (Peggy) Ann Shea almost needs no introduction. Anybody who has published in Advances in Space Research has had to deal with her at some time or another! She has also been a highly active and productive scientist for over forty years. Her research career started as a graduate student at the University of New Hampshire, where she was the first woman to receive an advanced degree in physics, in spite of the efforts of the Dean of the College of Technology to convince her early on to transfer to Liberal Arts, more appropriate for a young lady! Shortly after graduation she joined the Air Force Cambridge Research Laboratories in Hanscom, Massachusetts where she worked until her retirement. She now has an emeritus position at the Air Force Research Laboratory and is Adjunct Professor at the University of Alabama in Huntsville.

Peggy's scientific career mostly relates to the broad topic of solar-terrestrial relations covering both fundamental science as well as applications of this science to technical space and terrestrial systems. Her work on variations of the geomagnetic field and their effect on cosmic radiation was of fundamental nature for the interpretation of early space observations. Her work on long-term data bases of solar activity, ground level cosmic ray events and solar cycle studies is recognized worldwide. Her publication record is extensive, over 300 papers starting in the mid-sixties or earlier. She has edited numerous books and reports.

Peggy's specific merits related to COSPAR lie in her highly dedicated and long-term work for the Committee as Editor-in-Chief of COSPAR's flagship journal Advances of Space Research. Without Peggy's dedication, hard work and unselfish efforts since her appointment in 1994 the journal could not have evolved as it did. Peggy's knowledge of the relevant scientific communities, her thorough, persuasive and persistent role as Chief Editor and her tireless efforts throughout the years were crucial for COSPAR's good standing in the international space science community. The continuity and evolution of Advances of Space Research from conference proceedings to a fully refereed open journal would be unthinkable without Peggy's perpetual enthusiasm and feeling of responsibility. Whenever necessary (and this happened frequently) she additionally burdened herself by substituting for failing guest editors or referees. To be fair, without the continuous moral and technical support of Don Smart, Peggy would not have been able to accomplish as much as she has, undeniably, achieved.

Through this award COSPAR recognizes her tireless efforts on behalf of this Committee and its worldwide space science community over many years. Peggy Shea is a most deserving recipient of the 2010 COSPAR Distinguished Service Medal.

- Massey Award:

Harvey Tananbaum (USA)

Dr. Harvey Tananbaum received his B.A. in physics and mathematics from Yale University and his Ph.D. in physics from MIT in 1968. He began his career at American Science and Engineering and has been an astrophysicist at the Smithsonian Astrophysical Observatory (SAO) since 1973. Dr. Tananbaum has been involved with pioneering X-ray astronomy missions including UHURU and the Einstein Observatory, the first non-solar imaging X-ray telescope. Beginning in 1976, Dr. Tananbaum and Dr. Riccardo Giacconi led the team which proposed to NASA to study and design a large X-ray telescope which was launched 23 years later, in 1999, as the Chandra X-ray Observatory. Dr. Tananbaum now serves as the Director of the Chandra X-ray Center.

Throughout his career, Dr. Tananbaum has been dedicated to advancing high energy astrophysics from space. His contributions significantly increased our understanding of compact objects and brought powerful new space missions to fruition, enabling X-ray studies of comets and planets, super massive black holes and clusters of galaxies as well as precise measurements of fundamental cosmological parameters.

- Vikram Sarabhai Medal:

Zuyin Pu (China)

Professor Zuyin Pu played a crucial role in formulating the Double Star Mission and planning coordinated measurements of Double Star / TC-1 with the Cluster constellation. Professor Pu's suggestion to extend TC-1 apogee from 8 Re to 10-12 Re enabled the making of coordinated measurements with Cluster on the day side magnetosphere and plasma sheet. Professor Pu and his team provided strong evidence for magnetic null and its reconnection near the sub-solar point of the magnetopause. They also provided evidence for the co-existence component and anti-parallel reconnection in the magnetopause at low and high latitudes under similar solar wind conditions. In association with Dr. C.J. Xiao and Prof. X.G. Wang, Professor Pu provided strong evidence for the occurrence of magnetic null and reconnection configuration with neigh-

bouring 3D field structures, which is considered by ESA as the major scientific achievement of the Cluster mission. In association with Professor M. Kivelson, Professor Pu demonstrated that compressional K-H waves at the magnetopause lead to energy transport from the solar wind to the magnetosphere, large enough for generating micro-pulsations in the magnetosphere. This result has important significance in the study of solar wind-magnetosphere coupling, magnetospheric pulsation and the study of comets and astrophysical jets.

Professor Zuyin Pu has published over 200 papers in various refereed journals. COSPAR and ISRO are honoured to award the prestigious 2010 Vikram Sarabhai Medal to Professor Zuyin Pu for his outstanding research in the area of magnetospheric physics.

- Jeoujang Jaw Award: Calvin T. Swift (USA)

The Jeoujang Jaw Award recognizes scientists who have made distinguished pioneering contributions to promoting space research, establishing new space science research branches and founding new exploration programs. The 2010 Medal is awarded to Dr. Calvin T. Swift.

Dr. Swift received his Bachelor of Science degree from the Massachusetts Institute of Technology and his Ph.D. degree from the College of William and Mary. Besides the numerous contributions to the field of earth observation of soil moisture and ocean salinity, he is the pioneer of interferometric radiometer techniques for remote sensing, as demonstrated by the Electronically Steered Thinned Array Radiometer (ESTAR) in the late 80's. This technology opened a new window for passive microwave remote sensing that increased the spatial resolution beyond traditional antenna physical aperture limitation. Since his pioneering work this technology has been implemented in many airborne and space missions in Europe, China, and the US. In particular, the SMOS space mission launched last November by ESA which uses this technology has shown the very important future for this new type of instrument. Therefore, Dr. Swift's pioneering work and early contributions in this field are of significant importance.

Further information on COSPAR is available at: http://cosparhq.cnes.fr

COSPAR

The role of tectonic uplift, climate, and vegetation in the long-term terrestrial phosphorous cycle

A model helps describe how, with limited uplift and atmospheric input, as in the case of the Amazon Basin, ecosystems must rely on mechanisms that enhance P-availability and retention.

Phosphorus (P) is a crucial element for life and therefore for maintaining ecosystem productivity. Its local availability to the terrestrial biosphere results from the interaction between climate, tectonic uplift, atmospheric transport, and biotic cycling.

Here the authors present a mathematical model that describes the terrestrial P-cycle in a simple but comprehensive way. The resulting dynamical system can be solved analytically for steady-state conditions, allowing them to test the sensitivity of the P-availability to the key parameters and processes. Given constant inputs, they find that humid ecosystems exhibit lower P availability due to higher runoff and losses, and that tectonic uplift is a fundamental constraint. In particular, they find that in humid ecosystems the biotic cycling seem essential to maintain long-term P-availability. The time-dependent P dynamics for the Franz Josef and Hawaii chronosequences show how tectonic uplift is an important constraint on ecosystem productivity, while hydroclimatic conditions control the P-losses and speed towards steady-state. The model also helps describe how, with limited uplift and atmospheric input, as in the case of the Amazon Basin, ecosystems must rely on mechanisms that enhance P-availability and retention. Their novel model has a limited number of parameters and can be easily integrated into global climate models to provide a representation of the response of the terrestrial biosphere to global change.

The full paper is available free of charge at http://www.biogeosciences.net/7/2025/2010/bg-7-2025-2010.html

Buendía, C., Kleidon, A., and Porporato, A.: The role of tectonic uplift, climate, and vegetation in the long-term terrestrial phosphorous cycle, Biogeosciences, 7, 2025-2038, doi:10.5194/bg-7-2025-2010, 2010.

Special Issue in NPG

on Nonlinear Processes in Oceanic and Atmospheric Flows

Nonlinear phenomena are essential ingredients in many oceanic and atmospheric processes, and successful understanding of them benefits from multidisciplinary collaboration between oceanographers, meteorologists, physicists and mathematicians. A Special Issue on Nonlinear Processes in Oceanic and Atmospheric Flows contains selected contributions from attendants to the workshop which, in the above spirit, was held in Castro Urdiales, Spain, in July 2008. The preface at the link below summarizes the Special Issue contributions, which include papers on the characterization of ocean transport in the Lagrangian and in the Eulerian frameworks, generation and variability of jets and waves, interactions of fluid flow with plankton dynamics or heavy drops, scaling in meteorological fields, and statistical properties of El Niño Southern Oscillation.

The preface of the special issue and the other papers are available free of charge at http://www.nonlin-processes-geophys.net/17/283/2010/npg-17-283-2010.html

Mancho, A. M., Wiggins, S., Turiel, A., Hernández-García, E., López, C., and García-Ladona, E.: Preface "Nonlinear processes in oceanic and atmospheric flows", Nonlin. Processes Geophys., 17, 283-285, doi:10.5194/npg-17-283-2010, 2010.

Overview of areal changes of the ice shelves on the Antarctic Peninsula over the past 50 years

a new dataset containing up-to-date and consistent area calculations for each of the twelve ice shelves on the AP over the past five decades

In recent decades, seven out of twelve ice shelves around the Antarctic Peninsula (AP) have either retreated significantly or have been almost entirely lost. At least some of these retreats have been shown to be unusual within the context of the Holocene and have been widely attributed to recent atmospheric and oceanic changes. To date, measurements of the area of ice shelves on the AP have either been approximated, or calculated for individual shelves over dissimilar time intervals.

Here the authors present a new dataset containing up-to-date and consistent area calculations for each of the twelve ice shelves on the AP over the past five decades. The results reveal an overall reduction in total ice-shelf area by over 28 000 km2 since the beginning of the period. Individual ice shelves

show different rates of retreat, ranging from slow but progressive retreat to abrupt collapse. They discuss the pertinent features of each ice shelf and also broad spatial and temporal patterns in the timing and rate of retreat. They believe that an understanding of this diversity and what it implies about the underlying dynamics and control will provide the best foundation for developing a reliable predictive skill for ice-shelf change.

The full paper is available free of charge at http://www.the-cryosphere.net/4/77/2010/tc-4-77-2010.html

Cook, A. J. and Vaughan, D. G.: Overview of areal changes of the ice shelves on the Antarctic Peninsula over the past 50 years, The Cryosphere, 4, 77-98, doi:10.5194/tc-4-77-2010, 2010.

Ionospheric transients observed at mid-latitudes prior to earthquake activity in Central Italy

Acoustic gravity waves are suggested as one of the possible sources of transients observed in the ionosphere before the EQ shock

Ionograms from Rome and Sofia ionospheric stations during earthquake (EQ) activity with magnitude (M) between 5 and 6 in Central Italy are analyzed. It is found that several ionospheric disturbances occur in the intermediate E-F region before the EQ shock. In fact, besides sporadic E (Es) layer development (of type h) of short duration (transients), fmin increase, trace gaps near the critical frequencies, and E region trace disappearance are also observed within one to three hours before the EQ shock. Before the EQ shocks the authors find that the F2 region parameters are practically undisturbed. The only exception is the so-called fork trace that appears mostly near the critical frequency of the F2 region. Acoustic gravity waves (AGW) are suggested as one of the possible sources of transients observed in the ionosphere before the EQ shock.

The full paper is available free of charge at http://www.nat-hazards-earth-syst-sci.net/10/1197/2010/nhess-10-1197-2010.html

Nenovski, P., Spassov, Ch., Pezzopane, M., Villante, U., Vellante, M., and Serafimova, M.: Ionospheric transients observed at mid-latitudes prior to earthquake activity in Central Italy, Nat. Hazards Earth Syst. Sci., 10, 1197-1208, doi:10.5194/nhess-10-1197-2010, 2010.

First images and orientation of fine structure from a 3-D seismic oceanography data set

Work demonstrates the viability of imaging oceanic fine structure in 3-D and obtaining quantitative information such as the spatial orientation of fronts and solitons from 3-D seismic images

The authors present 3-D images of ocean fine structure from a unique industry-collected 3-D multichannel seismic dataset from the Gulf of Mexico that includes expendable bathythermograph casts for both swaths. 2-D processing reveals strong laterally continuous reflections throughout the upper ~800 m as well as a few weaker but still distinct reflections as deep as ~1100 m. The reflections might be caused by reversible fine structure from internal wave strains. Two bright reflections are traced across the 225-m-wide swath to produce reflection surface images that illustrate the 3-D nature of ocean fine structure. The orientation of linear features in a reflection can be obtained by calculating the orientations of contours of reflection relief, or more robustly, by fitting a sinusoidal surface to the reflection. Preliminary 3-D processing further illustrates the potential of 3-D seismic data in interpreting images of oceanic features such as internal wave strains. This work demonstrates the viability of imaging oceanic fine structure in 3-D and shows that, beyond simply providing a way visualize oceanic fine structure, quantitative information such as the spatial orientation of features like fronts and solitons can be obtained from 3-D seismic images. They expect complete, optimized 3-D processing to improve both the signal to noise ratio and spatial resolution of our images resulting in increased options for analysis and interpretation.

The full paper is available free of charge at http://www.ocean-sci.net/6/431/2010/os-6-431-2010.html

Blacic, T. M. and Holbrook, W. S.: First images and orientation of fine structure from a 3-D seismic oceanography data set, Ocean Sci., 6, 431-439, doi:10.5194/os-6-431-2010, 2010.

A remote sensing technique for global monitoring of power plant CO2 emissions from space

and related applications

Carbon dioxide (CO2) is the most important anthropogenic greenhouse gas (GHG) causing global warming. The atmospheric CO2 concentration increased by more than 30% since pre-industrial times – primarily due to burning of fossil fuels – and still continues to increase. Reporting of CO2 emissions is required by the Kyoto protocol.

Independent verification of reported emissions, which are typially not directly measured, by methods such as inverse modeling of measured atmospheric CO2 concentrations is currently not possible globally due to lack of appropriate observations. Existing satellite instruments such as SCIAMACHY/ENVISAT and TANSO/GOSAT focus on advancing our understanding of natural CO2 sources and sinks. The obvious next step for future generation satellites is to also constrain anthropogenic CO2 emissions.

Here the authors present a promising satellite remote sensing concept based on spectroscopic measurements of reflected solar radiation and show, using power plants as an example, that strong localized CO2 point sources can be detected and their emissions quantified. This requires mapping the atmospheric CO2 column distribution at a spatial resolution of 2×2 km2 with a precision of 0.5% (2 ppm) or better. they indicate that this can be achieved with existing technology. For a single satellite in sun-synchronous orbit with a swath width of 500 km, each power plant (PP) is overflown every 6 days or more frequent. Based on the MODIS cloud mask data product we conservatively estimate that typically 20 sufficiently cloud free overpasses per PP can be achieved every year. For typical wind speeds in the range of 2–6 m/s the statistical uncertainty of the retrieved PP CO2 emission due to instrument noise is in the range 1.6–4.8 MtCO2/yr for single overpasses. This corresponds to 12–36% of the emission of a mid-size PP (13 MtCO2/yr). The emission error depends linearly on wind speed, i.e., a 10% wind speed error results in a 10% emission error, and that neglecting enhanced aerosol concentrations in the PP plume may result in errors in the range 0.2–2.5 MtCO2/yr, depending on PP aerosol emission. The discussed concept has the potential to contribute to an independent verification of reported anthropogenic CO2 emissions and therefore could be an important component of a future global anthropogenic GHG emission monitoring system. This is of relevance in the context of Kyoto protocol follow-on agreements but also allows detection and monitoring of a variety of other strong natural and anthropogenic CO2 and CH4 emitters. The investigated instrument is not limited to these applications as it has been specified to also deliver the data needed for global regional-scale CO2 and CH4 surface flux inverse modeling.

The full paper is available free of charge at http://www.atmos-meas-tech.net/3/781/2010/amt-3-781-2010.html

Bovensmann, H., Buchwitz, M., Burrows, J. P., Reuter, M., Krings, T., Gerilowski, K., Schneising, O., Heymann, J., Tretner, A., and Erzinger, J.: A remote sensing technique for global monitoring of power plant CO2 emissions from space and related applications, Atmos. Meas. Tech., 3, 781-811, doi:10.5194/amt-3-781-2010, 2010.

Pliocene Model Intercomparison Project (PlioMIP)

experimental design and boundary conditions

In 2008 the temporal focus of the Palaeoclimate Modelling Intercomparison Project was expanded to include a model intercomparison for the mid-Pliocene warm period (3.29–2.97 million years ago). This project is referred to as PlioMIP (Pliocene Model Intercomparison Project). Two experiments have been agreed upon and comprise phase 1 of PlioMIP. The first (Experiment 1) will be performed with atmosphere-only climate models. The second (Experiment 2) will utilise fully coupled ocean-atmosphere climate models. The aim of this paper is to provide a detailed model intercomparison project description which documents the experimental design in a more detailed way than has previously been done in the literature. Specifically, this paper describes the experimental design and boundary conditions that will be utilised for Experiment 1 of PlioMIP.

The full paper is available free of charge at http://www.geosci-model-dev.net/3/227/2010/gmd-3-227-2010.html

Haywood, A. M., Dowsett, H. J., Otto-Bliesner, B., Chandler, M. A., Dolan, A. M., Hill, D. J., Lunt, D. J., Robinson, M. M., Rosenbloom, N., Salzmann, U., and Sohl, L. E.: Pliocene Model Intercomparison Project (PlioMIP): experimental design and boundary conditions (Experiment 1), Geosci. Model Dev., 3, 227-242, doi:10.5194/gmd-3-227-2010, 2010.

Brief Communication: Ikaite (CaCO3·6H2O) discovered in Arctic sea ice

finding demonstrates that the precipitation of calcium carbonate during the freezing of sea ice is not restricted to the Antarctic

The authors report for the first time the discovery of calcium carbonate crystals as ikaite (CaCO3·6H2O) in sea ice from the Arctic (Kongsfjorden, Svalbard) as confirmed by morphology and indirectly by X-ray diffraction as well as XANES spectroscopy of its amorophous decomposition product. This finding demonstrates that the precipitation of calcium carbonate during the freezing of sea ice is not restricted to the Antarctic, where it was observed for the first time in 2008. This observation is an important step in the quest to quantify its impact on the sea ice driven carbon cycle.

The full paper is available free of charge at http://www.the-cryosphere.net/4/227/2010/tc-4-227-2010.html

Dieckmann, G. S., Nehrke, G., Uhlig, C., Göttlicher, J., Gerland, S., Granskog, M. A., and Thomas, D. N.: Brief Communication: Ikaite (CaCO3·6H2O) discovered in Arctic sea ice, The Cryosphere, 4, 227-230, doi:10.5194/tc-4-227-2010, 2010.

Estimating drizzle drop size and precipitation rate using two-colour lidar measurements

The method exploits the differential absorption of infrared light by liquid water at 905 nm and 1.5 ìm

A method to estimate the size and liquid water content of drizzle drops using lidar measurements at two wavelengths is described. The method exploits the differential absorption of infrared light by liquid water at 905 nm and 1.5 ìm, which leads to a different backscatter cross section for water drops larger than ≈50 ìm. The ratio of backscatter measured from drizzle samples below cloud base at these two wavelengths (the colour ratio) provides a measure of the median volume drop diameter D0. This is a strong effect: for D0=200 ìm, a colour ratio of ≈6 dB is predicted. Once D0 is known, the measured backscatter at 905 nm can be used to calculate the liquid water content (LWC) and other moments of the drizzle drop distribution.

The method is applied to observations of drizzle falling from stratocumulus and stratus clouds. High resolution (32 s, 36 m) profiles of D0, LWC and precipitation rate R are derived. The main sources of error in the technique are the need to assume a value for the dispersion parameter ì in the drop size spectrum (leading to at most a 35% error in R) and the influence of aerosol returns on the retrieval (≈10% error in R for the cases considered here). Radar reflectivities are also computed from the lidar data, and compared to independent measurements from a colocated cloud radar, offering independent validation of the derived drop size distributions.

The full paper is available free of charge at http://www.atmos-meas-tech.net/3/671/2010/amt-3-671-2010.html

Westbrook, C. D., Hogan, R. J., O'Connor, E. J., and Illingworth, A. J.: Estimating drizzle drop size and precipitation rate using two-colour lidar measurements, Atmos. Meas. Tech., 3, 671-681, doi:10.5194/amt-3-671-2010, 2010.

The relationship between subsurface hydrology and dissolved carbon fluxes

for a sub-arctic catchment

In recent years, there has been increased interest in carbon cycling in natural systems due to its role in a changing climate. Northern latitude systems are especially important as they may serve as a potentially large source or sink of terrestrial carbon. There are, however, a limited number of investigations reporting on actual flux rates of carbon moving from the subsurface landscape to surface water systems in northern latitudes.

In this study, the authors determined dissolved organic carbon (DOC) and dissolved inorganic carbon (DIC) fluxes from the subsurface landscape for a sub-arctic catchment located in northern Sweden. These are based on observed annual flux-averaged concentrations of DOC and DIC for the 566 km2 Abiskojokken catchment. They demonstrate the importance to correctly represent the spatial distribution of the advective solute travel times along the various flow and transport pathways. The fluxes of DOC and DIC from the subsurface landscape to the surface water system were comparable in magnitude. This balance could shift under future climatic changes that influence the hydrological and biogeochemical system.

The full paper is available free of charge at http://www.hydrol-earth-syst-sci.net/14/941/2010/hess-14-941-2010.html

Lyon, S. W., Mörth, M., Humborg, C., Giesler, R., and Destouni, G.: The relationship between subsurface hydrology and dissolved carbon fluxes for a sub-arctic catchment, Hydrol. Earth Syst. Sci., 14, 941-950, doi:10.5194/hess-14-941-2010, 2010.

Geoscience Information For Teachers (GIFT) workshops 2010

A short Report on the GIFT workshops organised this year by the EGU Committee on Education

The main objective of the GIFT workshops is to spread first-hand scientific information to science teachers of primary and secondary schools, significantly shortening the time between discovery and textbook, and to provide the teachers with material that can be directly transported to the classroom. In addition, the full immersion of science teachers in a truly scientific context (the EGU General assemblies) and the direct contact with world leader geo-scientists are expected to stimulate curiosity towards scientific research that the teachers will transmit to their pupils.

This year the Committee on Education has organized two workshops for teachers:

The first one took place in Merida (State of Yucatan, Mexico) on March 17-19, in connection with the Alexander von Humboldt Topical Conference on “Climate Change, Natural Hazards and Societies”.

The workshop was attended by 42 teachers, about half from Yucatan and half from the rest of Mexico. Keynote speeches illustrated the research and the methodologies of large international research projects with high societal impact, such as: the Earth Observation and Educational programs of ESA, with practical applications to Central and South America; the study of the Chixilub bolide impact; and an analysis on the influence of climate change and long-lasting draughts on the Mayan culture. Mexican speakers participated to the workshop, presenting research on volcanoes and their impacts on societies, on high resolution paleoclimatic records, on promotion of geoscience interest of youngsters and on the hydrology of Yucatan. The success of this initiative is demonstrated by the support given in person by the Secretary of Education of the State of Yucatan, Mr. Raùl Gody Montanez, who promised to provide additional support for the participation of two Mexican teachers to the GIFT workshop in Vienna in 2011.

The second one took place from May 2 to 5 2010, during the EGU General Assembly 2010. The traditional General Assembly 3.5-day long GIFT workshop has been offered by the EGU Committee on Education to 80 high school science teachers not only from Europe but also from the USA, Japan, and China.

Thanks to the increasing support from EGU and from other sponsors, the number of teachers attending the EGU GIFT Workshop has increased over the years. The activity of the workshop has been diversified and enriched progressively in order to offer the participants a set of opportunities to upgrade their knowledge and skills, to interact and exchange information with scientists and with other teachers, and to set up links between high-schools across the continent.

The package of activities begun with the traditional visit to the Natural History Museum of Vienna on Sunday evening, which included an ice-breaker party in the Museum.

Thematic conferences during the next three days dealt this year with Energy and Sustainable Development. Eight top-level scientists and representatives of the private enterprises

Participants and organizers of the GIFT Workshop 2010 in front of the Natural History Museum of Vienna, on Sunday May 2nd 2010 (Photo by Paul Schlechtriemen).

illustrated in a clear and effective way the state of the art on renewable and non-renewable energy resources, spanning from hydrocarbons to nuclear fission and fusion, touching wind and solar energy, and the controversy on bio-fuels. The workshop has included for the first time a round-table discussion among speakers and teachers. Teacher to teacher communications, hands-on activities, a visit to the United Nations Office For Outer Space Affairs (UNOOSA) headquarters adjacent to the Austria Center, and a field trip in the vicinity of Vienna have completed the program.

Also new of this year, has been the opportunity offered to the GIFT Workshop teachers to submit abstracts to an Educational Session convened by members of the Committee on Education: “Science in the Classroom of Tomorrow”. This initiative has been very much appreciated by teachers, who found a suitable time and friendly environment to illustrate their work in the classroom to their colleagues and exchange ideas and opinions.

Like in 2009, a selection of the conferences offered by speakers have been video and audio recorded and will be mounted for consultation via internet by the teachers with their alumns in the classroom (http://www.egu.eu/webtv).

The Gift Workshops program and presentations can be viewed and downloaded at: http://www.egu.eu/media-outreach/gift/gift-symposia.

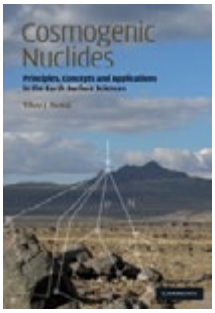
The Committe on Education wishes to outline that the activity towards high school teachers is organized bearing in mind the principles of Education for Sustainable Development (EDS) promoted by UNESCO.

Building Safer Communities. Risk Governance, Spatial Planning and Responses to Natural Hazards

Authors: U. Fra Paleo
Publisher: IOS Press
ISBN: 978-1-60750-046-9
YEAR : 2009
EDITION : Volume 58 NATO Science for Peace & Security Series
PAGES : 280
PRICE : 135.00 €
Hardback

This book is a collection of essays, bringing together seventeen contributions from different disciplines, with various but complementary points of view, to discuss the directions and key components of risk governance. Some of the many issues of interest to risk scholars addressed in this work include: the analysis of proactive approaches to the governance of risk from natural hazards; approaches to broaden the scope of public policies related to the management of risks from natural hazards, including emergency and environmental management, community development and spatial planning. The texts further explore how spatial planning can contribute to risk governance by influencing the occupation of hazard-prone areas, and review the central role of emergency management in risk policy. This work will contribute significantly to the augmentation of the conceptual framework of risk governance and increase the awareness of practitioners and decision-makers to the need to adopt proactive policies, leading to a more integrated, participative, and adaptive governance that can respond more efficiently to the increasing uncertainty resulting from escalating risk exposure and global environmental change.

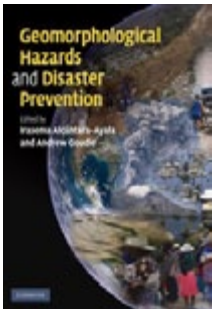
Cosmogenic Nuclides



Authors: Tibor J. Dunai
Publisher: Cambridge University Press
ISBN: 9780521873802
YEAR : 2010
EDITION : 1st
PAGES : 187
PRICE : 42.00 €
Hardback

This is the first book to provide a comprehensive and state-of-the-art introduction to the novel and fast-evolving topic of in-situ produced cosmogenic nuclides. It presents an accessible introduction to the theoretical foundations, with explanations of the relevant concepts, starting at a basic level and then building in sophistication. It incorporates, and draws on, methodological discussions and advances achieved within the international CRONUS (Cosmic-Ray Produced Nuclide Systematics) networks. Practical aspects, such as sampling, analytical methods and data interpretation are discussed in detail and an essential sampling checklist is provided. The full range of cosmogenic isotopes is covered and a wide spectrum of in-situ applications are then described and illustrated with specific and generic examples of exposure dating, burial dating, erosion and uplift rates, and process model verification. Graduate students and practitioners will find this book a vital source of information on the background concepts and practical applications in geomorphology, geography, soil science and geology.

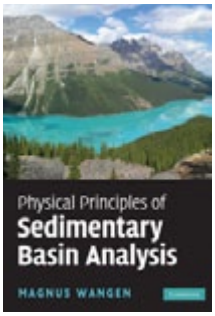
Geomorphological Hazards and Disaster Prevention



Authors: Irasema Alcántara-Ayala and Andrew S. Goudie
Publisher: Cambridge University Press
ISBN: 9780521769259
YEAR : 2010
EDITION : 1st
PAGES : 291
PRICE : 54.00 €
Hardback

Human activities have had a huge impact on the environment and landscape, through industrialisation and land-use change, leading to climate change, deforestation, desertification, land degradation, air and water pollution. These impacts are strongly linked to the occurrence of geomorphological hazards, such as floods, landslides, snow avalanches, soil erosion, and others. Geomorphological work includes not only the understanding but the mapping and modelling of Earth's surface processes, many of which directly affect human societies. In addition, geomorphologists are becoming increasingly involved with the dimensions of societal problem solving, through vulnerability analysis, hazard and risk assessment and management. The work of geomorphologists is therefore of prime importance for disaster prevention. An international team of geomorphologists have contributed their expertise to this volume, making this a scientifically rigorous work for a wide audience of geomorphologists and other Earth scientists, including those involved in environmental science, hazard and risk assessment, management and policy. Readers can find an up-to-date assessment of how geomorphology can inform vulnerability and risk analysis, disaster prevention and sustainability. This book links the work carried out by geomorphologists to the study of the likely impacts of climatic change and global environmental change and demonstrates the significance of current technology (GIS) to hazard and risk assessment and management.

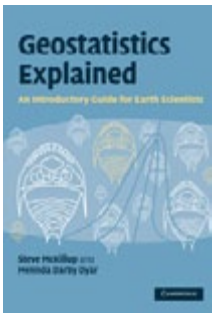
Physical Principles of Sedimentary Basin Analysis



Authors: Magnus Wangen
Publisher: Cambridge University Press
ISBN: 9780521761253
YEAR : 2010
EDITION : 1st
PAGES : 527
PRICE : 96.00 €
Hardback

Presenting a rigorous treatment of the physical and mechanical basis for the modelling of sedimentary basins, this book supplies geoscientists with practical tools for creating their own models. It begins with a thorough grounding in properties of porous media, linear elasticity, continuum mechanics and rock compressibility. Chapters on heat flow, subsidence, rheology, flexure and gravity consider sedimentary basins in the context of the Earth's lithosphere, and the book concludes with coverage of pore space cementation, compaction and fluid flow. The volume introduces basic, state-of-the-art models and demonstrates how to reproduce results using tools like MATLAB and Octave. Main equations are derived from first principles, and their basic solutions obtained and then applied. Separate notes sections supply more technical details, and the text is illustrated throughout with real-world examples, applications and test exercises. This is an accessible introduction to quantitative modelling of basins for graduate students, researchers and oil industry professionals.

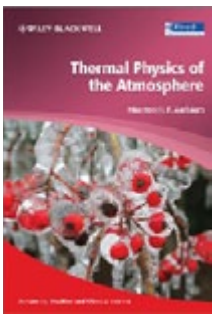
Geostatistics Explained



Authors: Steve McKillup and Melinda Darby Dyar
Publisher: Cambridge University Press
ISBN: 9780521746564
YEAR : 2010
EDITION : 1st
PAGES : 396
PRICE : 35.00 €
Paperback

This reader-friendly introduction to geostatistics provides a lifeline for students and researchers across the Earth and environmental sciences who until now have struggled with statistics. Using simple and clear explanations for both introductory and advanced material, it demystifies complex concepts and makes formulas and statistical tests easy to understand and apply. The book begins with a discussion and critical evaluation of experimental and sampling design before moving on to explain essential concepts of probability, statistical significance and Type 1 and Type 2 error. Tests for one and two samples are presented, followed by an accessible graphical explanation of analysis of variance (ANOVA). More advanced ANOVA designs, correlation and regression, and non-parametric tests including chi-square, are then considered. Finally, it introduces the essentials of multivariate techniques such as principal components analysis, multidimensional scaling and cluster analysis, analysis of sequences (especially autocorrelation and simple regression models) and concepts of spatial analysis, including the semivariogram and its application in Kriging. Illustrated with wide-ranging and interesting examples from topics across the Earth and environmental sciences, Geostatistics Explained provides a solid grounding in the basic methods, as well as serving as a bridge to more specialized and advanced analytical techniques. It can be used for an undergraduate course or for self-study and reference. Worked examples at the end of each chapter help reinforce a clear understanding of the statistical tests and their applications.

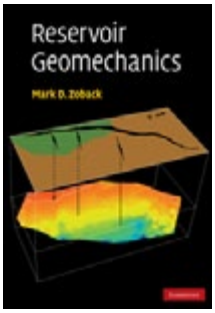
Thermal Physics of the Atmosphere



Authors: Maarten Ambaum
Publisher: Wiley-Blackwell
ISBN: 978-0-470-74515-1
YEAR : 2010
EDITION : 1st
PAGES : 256
PRICE : 51.80 €
Hardback

Thermal Physics of the Atmosphere offers a concise and thorough introduction on how basic thermodynamics naturally leads on to advanced topics in atmospheric physics. The book starts by covering the basics of thermodynamics and its applications in atmospheric science. The later chapters describe major applications, specific to more specialized areas of atmospheric physics, including vertical structure and stability, cloud formation, and radiative processes. The book concludes with a discussion of non-equilibrium thermodynamics as applied to the atmosphere. This book provides a thorough introduction and invaluable grounding for specialised literature on the subject. * Introduces a wide range of areas associated with atmospheric physics * Starts from basic level thermal physics * Ideally suited for readers with a general physics background * Self-assessment questions included for each chapter * Supplementary website to accompany the book

Reservoir Geomechanics

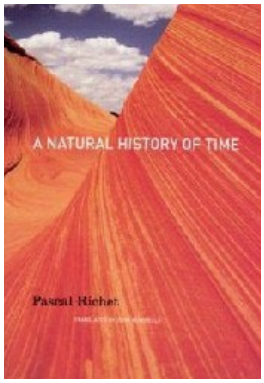


Authors: Mark D. Zoback
Publisher: Cambridge University Press
ISBN: 9780521146197
YEAR : 2010
EDITION : 2nd
PAGES : 449
PRICE : 52.50 €
Paperback

This interdisciplinary book encompasses the fields of rock mechanics, structural geology, and petroleum engineering to address a wide range of geomechanical problems that arise during the exploitation of oil and gas reservoirs. Covering the exploration, assessment, and production phases of petroleum reservoir development, the book considers key practical issues such as prediction of pore pressure; estimation of hydrocarbon column heights and fault seal potential; determination of optimally stable well trajectories; casing set points and mud weights; changes in reservoir performance during depletion; and production-induced faulting and subsidence. The first part of the book establishes the basic principles of geomechanics in a way that allows readers from different disciplinary backgrounds to understand the key concepts. It then goes on to introduce practical measurement and experimental techniques before illustrating their successful application, through case studies taken from oil and gas fields around the world, to improve recovery and reduce exploitation costs. Reservoir Geomechanics is a practical reference for geoscientists and engineers in the petroleum and geothermal industries, and for research scientists interested in stress measurements and their application to problems of faulting and fluid flow in the crust.

The Committee on Radio Astronomy Frequencies (CRAF) published recently this 3rd edition

A Natural History of Time



Pascal Richet, translated from French (L'age du monde: a la decouverte de l'immensite du temps, Paris, Editions du Seuil, 1999) by John Venerella.
Published by: The University of Chicago Press
ISBN: 978-0226712888
YEAR : 2010
EDITION : 1st
#PAGES : 481
PRICE : 18.00 €

This excellent book must now be regarded as the preferred starting point for anyone wishing to understand the history of efforts to know the earth's age.

This excellent book must now be regarded as the preferred starting point for anyone wishing to understand the history of efforts to know the earth's age. In graphic prose it traces the pathways by which scientists arrived, in the second half of the twentieth century, at a confident determination that our planet is close to 4.55 billion years old.

As this characterization suggests, the story told by Pascal Richet has a directional quality: this is a discursive record of remarkable advances in knowledge. It is a richly amplified and well-documented excursion through a long and complex

series of reflections and researches by which the question of the earth's age was pursued, from ancient times to the later part of the last century. Needless to say, a remarkable variety of answers to this question came forth with changing times. But the principal end toward which Richet's narrative flows is a picture of how we came to the present understanding of the matter. One of the great merits of this account, therefore, is that it is much more than a triumphal affirmation of scientific progress. The tale is related here with a subtle awareness of cyclic repetitions underlying some of the ideas and events of which it consists. The scientific enterprise is shown, more than once, to stumble. Moreover, Richet's discussion is refreshingly devoid of condescension toward those in the dramatis personae whose ideas some readers might be tempted to ridicule or dismiss as unworthy of serious attention. It is pervaded instead with respect for and sympathetic comprehension of the actors, many of whom – especially in the story's early stages – lived and worked in cultural circumstances far from familiar to most of us.

While any attempt to distill Richet's argument must necessarily oversimplify and distort, nonetheless it may be helpful to observe that much of the exposition is built around four main themes in four broad and overlapping periods. The first of these concerns mythical, religious, and philosophical approaches to the fundamental nature of time, change, and history, along with the establishment of astronomy as a foundation for basic timekeeping. Here we have our first encounter with a sustained interplay between, on one hand, the notion of time as cyclic or endlessly repeating (as enunciated especially clearly by Aristotle, and broadly supported by what the ancients knew of astronomy), and on the other the contrasting conception of time as irreversibly directional (authoritatively sanctioned in the sacred documents of Judaism and Christianity). The most conspicuous theme in this portion of the book is the protracted undertaking to harmonize reasoned understanding of the natural world with the tenets of religious belief – a project of conciliation especially familiar in the Scholasticism of late medieval Christianity. An important kind of corollary within this project, one that continued its cultural exertions well into the modern period, was erudite chronology. This rested on the nearly universal acceptance of Scriptural authority in the sphere of historical knowledge, thus ratifying the congruence of nature's history with that of human beings. This in turn warranted determination of the date of the world's beginnings through calculations drawn out of Biblical chronology. Richet shows how much Newton occupied himself with refinement of this sort of knowledge.

A second theme involves a series of efforts to come to grips analytically with varied objects and processes of nature – fossils, sedimentation, ocean salinization, and cometary recurrences, to name a few examples – where investigators tended to view the need of reconciling their results with Scripture as a secondary concern. This is not to say that very many of the protagonists in these sorts of scientific endeavors were indifferent regarding the agreement of their conclusions with religious tenets. Certainly any such unconcern ill fits Steno or Leibniz, for example, nor would it really apply to Descartes.

But on the whole they were inclined to assume such consistency as uncontested, or felt that their own duty to demonstrate it receded in comparison with the task of developing rational procedures to understand nature's operations and its past. If there is a single culminating figure for this phase of the argument, it must be Buffon, whose manner of setting himself apart from most contemporaries included an uncommonly clear nonchalance regarding accommodationism. His notorious public declaration of a terrestrial time scale incompatible

with Mosaic chronology, supported by his engagement at his own foundry with quantified experiments on rates of cooling in hot iron balls, emerges here as a significant turning point.

The third leading thread of Richet's narrative has to do with the extension during the ensuing century of the hypothesis (advocated by Buffon among others) of an irreversibly cooling earth. Heat and its dissipation became a central problem in physics for much of the nineteenth century. Richet provides a fine discussion of the origins and development of thermodynamics and its application to the question of the earth's age, from Sadi Carnot and Joseph Fourier through William Thomson's (Lord Kelvin's) contentious campaign, politely civil though it may have been, to rein in profligate estimates of the earth's age on the part of geologists and evolutionists. Indeed, in a book involving a large number of characters – many of whom are deftly brought to life through finely condensed portrayals, frequently with bracing touches of humor – probably no single figure rivals Kelvin's recurring presence.

Finally, a fourth stage begins with the startling fin de siecle innovations in physics inaugurated by Rontgen, Becquerel, the Curies, and others, leading in short order to the founding of nuclear physics and the advent of radiometric methods for age determination. By no means the least interesting development here is the ironic spectacle of physicists now set on a reversed path, preaching an enormous enlargement of the geological time scale to often suspicious earth scientists, many of whom were understandably reluctant to concede to the dictates of physics a second time so soon after disclosure of its error the previous time around. For this last phase of the story it is not easy to identify a single commanding scientific character, but certainly among the best candidates are Rutherford and Holmes, even if the story is capped off with the "unspeakable delight" of Clair Patterson upon his resolution of the controversy the book addresses.

One of this book's strengths is how skillfully it depicts interactions within and between multiple spheres of science, the ease with which it allows readers to follow work passing over boundaries between scientific disciplines. We are shown, for example, how approaches to the central problem through studies of sedimentation and erosion rates eventually converged with others through chemical periodicity or spectral analysis. This book illustrates with great clarity how a big scientific question was pursued over a long period through an ever-changing series of cross-disciplinary efforts, sometimes generating unexpected new methods. It takes into account sweeping historical shifts of perspective on what the sciences are for and how they should go about their business. It even acknowledges occasional effects of ephemeral intellectual fashions within the sciences: for instance, two pages are devoted to the "Mars craze" fostered through the work of Schiaparelli, Flammarion, and Lowell, among others, as a significant part of the disorienting landscape within which to consider the scientific reception of spectacular new discoveries like X-rays and radioactive elements.

A Natural History of Time is accessible to – and has much to offer to – a broad range of readers. Only modest levels of scientific and historical knowledge are assumed. At certain junctures there are lengthy interludes or summaries of developments in or between the sciences of physics, chemistry, biology, and geology, as background and introduction to major episodes in the quest for reliable knowledge of the earth's age. No doubt such interludes will be more useful to some than to others, but at no point is the reader patronized. Himself a geophysicist of impressive cultural breadth, Richet evidently intends his book to be read by "a knowledgeable public" – an expression he uses when speaking of Leibniz's purpose in writing Protogaea. In short, this is a valuable study that will stimulate further historical research, and that deserves to be widely read.

John Venerella's translation is very well done. It succeeds in capturing the vitality of the original French version. Among the modest number of mistakes or dubious choices I encountered in the translation, very few are likely to throw the reader off. The volume's back matter has been expanded and reorganized for this English edition. For example, it now includes a series of references, and a general bibliography, rather than bunching most of the sources within an index of characters. Short synopses have been added at the head of each chapter. In several places, the author has taken the opportunity to insert textual material that had been cut from the original French edition because of the publisher's limitations on length.

This review is reproduced from History of Geo- and Space Sciences, 1, 43–44, 2010, www.hist-geo-space-sci.net/1/43/2010/

K. L. Taylor, (ktaylor@ou.edu), Department of the History of Science, University of Oklahoma, Norman, OK 73019, USA

Inter-Regional Training Workshop on Urban Climatology - (Course)

06/09/2010 - 10/09/2010 - Pune, India

The World Meteorological Organisation (WMO) through its Commission for Climatology (CCl) and Climate Information and Prediction Services (CLIPS) project, and in collaboration with the WMO Regional Training Centre of the India Meteorological Department (IMD), is organising an Inter-Regional Training Workshop on Urban Climatology. The workshop will be hosted at Pune, India, by the IMD from 6-10 September 2010. This is the first such workshop organised by the WMO and represents a significant step in the recognition of this field of study. The workshop is five days long and is designed to cover the scope of urban climate research. Information on the event is available at http://www.wmo.int/pages/prog/wcp/wcasp/UrbanClimate.html.

We would like to encourage as wide an audience as possible to apply for the above workshop. Please circulate this message among your contacts to ensure its success.

Applications close on 30 June 2010. No fee for the workshop, but participants are expected to cover costs of travel and stay. Limited support available.

For more information and submission of applications, please contact: Dr Rupa Kumar Kolli (RKolli@wmo.int), Chief, World Climate Applications & Services Division.

Who should attend?

Ideally the workshop would draw upon those that provide climate information products and services in all the six WMO Regions, preferably professional staff of National Meteorological and Hydrological Services (NMHSs), and a range of professionals working on urban management and design issues where weather and climate data is relevant. The latter group includes engineers, architects and urban planners that have interests in global and local climate changes and their implications for urban areas and their inhabitants.

World Meteorological Organisation

http://www.wmo.int/pages/prog/wcp/wcasp/UrbanClimate.html.

Geographical Research and Cross-Border Cooperation within the Lower Basin of the Danube. - (Meeting)

23/09/2010 - 26/09/2010 - Craiova, Romania

This International Scientific Conference is the first Romanian - Bulgarian - Hungarian - Serbian Conference referring to the lower basin of the Danube and welcomes presentations on the geographic research and cross border cooperation within the Danube lower basin.

The event targets a broad spectrum of participants, recognising the multidisciplinarity of research in geography and other related disciplines.

The conference aims to:

• present the status of scientific approaches within the Danube lower basin

• bring together scientists, academics, practitioners with a view to strengthening and promoting the cross-border cooperation

• discuss the role of geographical research in cross-border issues

• establish a working group that should meet every year to address this issue.

The paper submission deadline is set for 30 June 2010. For further information, please contact the organizing team.

Conference Secretariat

Address: Str. Al.I.Cuza, nr. 13, cod 200585, Craiova, Dolj, Romania

Phone: ++40.757034340; Fax: ++40.251.418515

e-mail: popescu.liliana.ucv@gmail.com

Organized by the Geography Department of the University of Craiova, West University from Timisoara and Institute of Geography Bucharest.

http://forumgeografic.ro/events/

Arctic Frontiers 2011 - (Meeting)

23/01/2011 - 29/01/2011 - Tromsø, Norway

Arctic Frontiers (AFT) holds its 5th annual conference in Tromsø from 23-29 January 2011, Norway, with the title “Arctic Tipping Points”. AFT comprises a policy section and a scientific section. This call for papers addresses the scientific section.

The scientific section of AFT 2011 takes place from 26-28 January 2011, and is given the title: “The Arctic in the Earth System perspective: the role of tipping points“

The scientific section is divided into 3 parts:

1. A joint and multi disciplinary first day with 10 invited speakers ending with a panel and plenum debate;

2. Four parallel sessions (included a poster session) on the second and third day;

3. A summary session ending with a plenum debate

The parallel sessions address 4 connected, interwoven and interdisciplinary themes:

• Sea ice and oceanographic perspectives

• Marine ecosystems and fisheries

• Socioeconomic and institutional perspectives

• People of the North

Interested scientists are invited to submit abstracts to one of these four sessions for both oral and poster presentations.

For more information download the complete Call for Papers on the AFT homepage www.arcticfrontiers.com.

9th European Geoparks Conference - (Meeting)

01/10/2010 - 05/10/2010 - Lesvos, Greece

GEOPARKS: Learning from the Past - Building a Sustainable Future

Celebrating 10 Years of Innovation under the auspices of UNESCO

The 9th European Geoparks Conference will be held on the Greek island of Lesvos for the celebration of the 10th Anniversary of the foundation of the European Geoparks Network.

Lesvos, located in the North Eastern Aegean sea, hosts the Lesvos Petrified Forest Geopark which is a founding member of the EGN.

The 9th European Geoparks Conference, which will take place at the Municipal Theatre of Mytilene, the capital city of Lesvos, will comprise general sessions and thematic oral sessions with invited speakers as well as selected oral presentations and poster sessions related to the main objectives.

Aims:

* To exchange ideas on various issues related to geopark management, geo-promotion and geoconservation.

* To reflect on growth and achievements of the European Geoparks Network and to foster continuing innovations in the many geoparks across Europe as they work to address the interconnectedness of environmental and human needs.

* To develop new trends on geoconservation and sustainable management of geological heritage and abiotic nature.

IMPORTANT DATES

Deadline extended for abstract submissions: June 30, 2010

Submission of full manuscripts: August 1, 2010

The 9th European Geoparks Conference will be organized by the Natural History Museum of the Lesvos Petrified Forest in cooperation with the University of the Aegean / Department of Geography.

http://www.petrifiedforest.gr/lesvos2010/

Carbon Footprint of Nations website wins recognition

http://carbonfootprintofnations.com/index.php

How much carbon does your country emit - and where does it come from? Norwegian University of Science and Technology (NTNU) Professor Edgar Hertwich and colleague Glen Peters wanted to know the answer to that question - and created a website to do so. Now, the article describing this website has won an Editor's Choice Award from the journal Environmental Science and Technology.

Hertwich, who is head of NTNU's Industrial Ecology Programme in the Department of Energy and Process Engineering, co-authored the paper "Carbon Footprint of Nations: A Global, Trade-Linked Analysis" with Peters, (Centre for International Climate and Environment Research (CICERO), Oslo).

The paper describes "Carbon Footprint of Nations", the website created by Hertwich and Peters, where users can check the importance of different consumption categories for their nations, particularly for imports and exports. The paper was published in the June 15 edition of Environmental Science and Technology and details the greenhouse gas emissions associated with the final consumption of goods from 73 nations and 14 world regions.

The site also describes how emissions vary with consumption, and the consumption categories that are responsible. The picture that emerges is that there is a clear relationship between emissions and overall consumer spending, and that greenhouse gas emissions rise about 70% with each doubling of consumer spending. Increased consumption increases the share of emissions from transport and consumer goods and decreases the proportion of emissions that can be attributed to food. The study also shows that the emissions related to production of goods that we import are important. "This illustrates the danger of shifting emissions related to our own consumption from in-country to the developing world," Hertwich notes.

Hertwich and Peter's paper was selected as the best policy paper published by ES&T in 2009.

Reference:

"Carbon Footprint of Nations: A Global, Trade-Linked Analysis", Edgar G. Hertwich and Glen P. Peters,Environ. Sci. Technol., 2009, 43 (16), pp 6414–6420, DOI: 10.1021/es803496a

The website described in this article can be found at: http://carbonfootprintofnations.com/index.php

Some interesting pages on volcanos

http://ec.europa.eu/research/index.cfm?pg=volcanoes

The pages refer to research projects, some completed and some ongoing, and is for general interest.

* Research in volcanoes and their wider impact funded by the European Research Council, special feature published in April 2010 (http://erc.europa.eu/index.cfm?fuseaction=page.display&topicID=505)

* GMES support for volcanic emergency response (http://ec.europa.eu/enterprise/newsroom/cf/itemlongdetail.cfm?item_id=4210&tpa_id=1004&lang=en). GMES is the European Earth Observation Programme.

* MACC Iceland Volcanic Eruption page (http://www.gmes-atmosphere.eu/news/volcanic_ash/background/). MACC is a Collaborative Project (2009-2011) funded by the European Union under the 7th Framework Programme. You can also find five-day volcanic ash charts on the UK's Met Office web site, though these are not related to EU-funded research (http://www.metoffice.gov.uk/corporate/pressoffice/2010/volcano/ashconcentration/fiveday.html).

* Research infrastructures related to volcanoes

  o EARLINET-ASOS: A European Aerosol Research Lidar Network to Establish an Aerosol Climatology (http://www.earlinet.org/index.php?id=earlinet_asos)

  o EUFAR: EUropean Facility for Airborne Research (http://www.eufar.net/)

* Natural hazards research, including volcanoes (http://ec.europa.eu/research/environment/index_en.cfm?pg=hazards)

  o Natural hazards projects page (http://ec.europa.eu/research/environment/index_en.cfm?pg=projects&area=hazards)

  o Specific projects on volcanoes

    + VOLUME and VOLUME TTC: Volcanoes: Understanding sub-surface mass movement and Extension (http://www.volume-project.net/)

    + MIAVITA: Mitigate and Assess risk from Volcanic Impact on Terrain and human Activities (http://miavita.brgm.fr/)

    + NOVAC and NOVAC TTC: Network for Observation of Volcanic and Atmospheric Change and Extension (http://www.novac-project.eu/)

* Research Information Centre - Hot Topics - Volcanoes: short videos and articles (http://ec.europa.eu/research/infocentre/theme_en.cfm?item=Hot%20topics&subitem=Volcanoes)

* CRYSTAL2PLATE. How does plate tectonics work: from crystal-scale processes to mantle convection with self-consistent plates. (http://www.dstu.univ-montp2.fr/CRYSTAL2PLATE/intro.html). CRYSTAL2PLATE is a training and career-development platform for scientists in Geodynamics, Geochemistry, Petrology, Fluid Mechanics and Seismology.

Imaggeo is the online open access geosciences image repository of the European Geosciences Union. Every geoscientist who is an amateur photographer (but also other people) can submit their images to this repository.

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www.imaggeo.net

Biogeosciences-Academic

Two PostDoc Positions within Microseismic Monitoring

CCompany: LSCE (Laboratoire des Sciences du Climat et de l'Environnement)
Location: France-Gif sur Yvette, near Paris
Date Posted: 22/04/2010
[show details...]

Hydrological Sciences-Academic

Tenure-Track Cold Regions Hydrology Position

Company: McMaster University
Location: Canada-Hamilton, Ontario
Date Posted: 23/04/2010
[show details...]

Climate-Academic

Tenure-track faculty position in theoretical or computational earth, climate, or environmental science and engineering

Company: Harvard School of Engineering and Applied Sciences
Location: United States-Cambridge, MA
Date Posted: 30/04/2010
[show details...]

Ocean Sciences-Academic

PhD Position: Design and application of integrated methane gas detection systems for marine environmental applications

Company: MARUM, University of Bremen
Location: Germany-Bremen
Date Posted: 25/05/20100
[show details...]

Ocean Sciences-Academic

PhD Position: Surface-enhanced Raman sensor development for marine environmental applications

Company: Technical University Berlin
Location: Germany-Berlin
Date Posted: 25/05/2010
[show details...]

Atmospheric Sciences-Academic

Postdoc Opening: Aerosol Measurements at Washington State University

Company: Washington State University
Location: USA-Washington
Date Posted: 28/06/2010
[show details...]

General-Academic

Director of the School of Marine Science and Policy

Company: University of Delaware
Location: United States-Lewis, Delaware
Date Posted: 30/06/2010
[show details...]

Geodynamics and Seismology-Academic

Postdoctoral researcher in Theoretical and computational seismology

Company: Institute of Geophysics
Location: Czech Republic-Prague
Date Posted: 13/07/2010
[show details...]

Climate-Government

Senior Climate Research Scientist - Research Program Leader

Company: CSIRO (Commonwealth Scientific and Industrial Research Organisation)
Location: Australia-Aspendale, Victoria
Date Posted: 28/06/2010
[show details...]

Atmospheric Sciences-Government

ICOS Research engineer at CEA, France, atmospheric GHG monitoring network

Company: LSCE (Laboratoire des Sciences du Climat et de l'Environnement)
Location: France-Gif sur Yvette, near Paris
Date Posted: 15/07/2010
[show details...]

Solar-Terrestrial Sciences-Studenship/Graduate

Ph.D. studentships

Company: Max Planck Institute for Solar System Research
Location: Germany-Katlenburg-Lindau
Date Posted: 15/06/2010
[show details...]

Hydrological Sciences-Studenship/Graduate

PhD studentship - Heterogeneity and connectivity in riverine and riparian ecosystems – implications for climate change

Company: University of Aberdeen
Location: United Kingdom-Aberdeen
Date Posted: 11/07/2010
[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.