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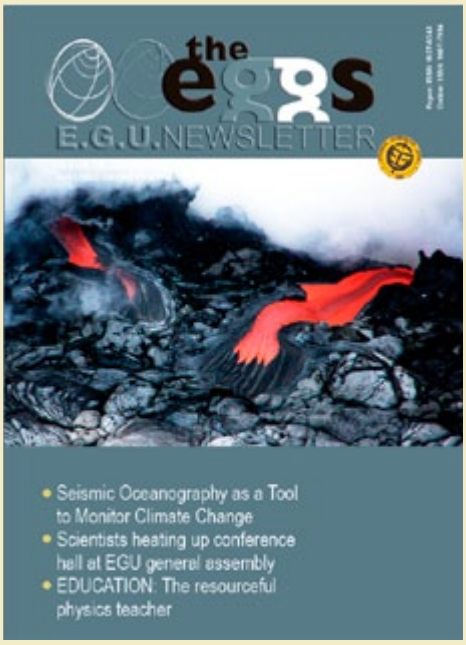

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Cover photo: Lava flow into sea, Image credit: Martin Mergili, BOKU University, Vienna - Austria. Distributed by EGU via www.imaggeo.net

EGU General Assembly 2011

short report

The EGU General Assembly 2011 (Vienna, 3-8 April, 2011) was again a great success with 4,333 oral and 8,439 poster presentations in a dozen union wide and 520 disciplinary sessions.

The scientific programme included Union Symposia, Interdivision Sessions, Educational and Outreach Symposia, as well as oral and poster sessions on disciplinary and interdisciplinary topics covering the full spectrum of the geosciences and the space and planetary sciences. Furthermore, Key Note and Medal Lectures, Great Debates, Short Courses, Union Masterclasses, Townhall Meetings, and Splinter Meetings completed the overall programme.

At the conference 10,725 scientists from 96 countries participated (of which 28% students), 15,000 copies of EGU Today were distributed, the media presence and reporting was again a success, and we had thousands of visits to the webstreams as well as to the EGU 2011 blog.

We thank all of you very much for your attendance and your active contribution to this great event. We would be pleased to welcome you back at the EGU General Assembly 2012, 22–27 April 2012, Vienna, Austria.

EGU Office

Perspectives for the Future of Hydrology in a Changing Environment

short report

The HS 2011 focus session (Wien, 6 April 2011) of the recent General Assembly of EGU was dedicated to the memory of Professor James (Jim) Dooge.

In line with the ideas and vision of Jim Dooge, this focus session was dedicated to hydrological change. At the start of the third millennium, population pressures and changes in weather patterns and climate precipitated a water crisis in various part of the world, with excesses, shortages or pollution of fresh water leading to humanitarian and ecological problems. Management and stewardship of fresh water stocks and fluxes is destined to remain one of the most pressing issues for humanity and hydrology will be increasingly called upon to propose long lasting solutions in the face of climate variability, which is still poorly understood, and changing population dynamics. Improved hydrological understanding and modelling are needed, as well as a pragmatic transfer of new knowledge to policy makers, land and water use authorities, and other stakeholders. This session aimed to bring together visions for the future of hydrology, by discussing new ideas and approaches as well as social and economical impacts.

A short note from Alberto Montanari

James (Jim) Dooge was a former Irish minister of foreign affairs who is very known in EGU as one of the most famous European hydrologists of the previous century. He was one of hydrology's pioneers, and a father of linear theory in hydrology. He defined catchments as "complex systems with some degree of organisation" (Dooge, 1986), and always tried to find the laws behind the simple behaviour that these systems sometimes demonstrate (Dooge, 1997). His last paper was "Bringing it all together" (Dooge, 2005), which was the first paper to be published in the new open-access Hydrology and Earth System Sciences (HESS) (http://www.hydrol-earth-syst-sci.net/9/3/2005/hess-9-3-2005.html).

Jim Dooge was also an active participant in EGU activities. He published his "Linear Theory of Hydrological Systems" (Dooge, 2003) with EGU, was always present at EGU meetings and was a strong supporter of the HESS journal. He received the first Dalton medal of EGU in 1998 and gave his last speech "Bringing it all together" during the EGU general assembly of 2004, which he himself called his "swan song".

Jim Dooge sadly passed away on August 20, 2010, at the age of 88. To commemorate his immense contribution to EGU, a Memorial Session was organised at the 2011 EGU General Assembly in Vienna. The symposium, titled "Perspectives for the Future of Hydrology in a Changing Environment - Memorial Session in Honour of Professor Jim Dooge" was convened by the outgoing president of the Division on Hydrological Sciences of EGU, Alberto Montanari, and the incoming president Gerrit de Rooij. The first part was devoted to scientific talks that were delivered by Tissa Illangasekare (Colorado School of Mines), Michael Roderick (The Australian National University), Suresh Rao (Purdue University) and George Kuczera (University of Newcastle).

The second part of the session was dedicated to the memorial talks that were delivered by close friends of Jim Dooge. The audience included members of the Dooge family, and in particular Dooge's daughter Dara. Conveners were also most honoured to welcome His Excellence Mr. James Brennan, Irish Ambassador to the Republic of Austria. After the welcome to the audience by the EGU President, Don Dingwell, memorial talks were delivered by Philip O'Kane (University College Cork), Ezio Todini (University of Bologna), Arne Richter (former EGU Executive Secretary), Michael Bruen (University College Dublin) and Hubert H.G. Savenije (Editor of HESS and Technical University Delft). Finally the session was closed with touching words by Dara Dooge, who expressed the feeling that Jim Dooge was among the audience during the whole session.

Below the talk by Dr. Arne Richter.

Memorial Session in Honour of Jim Dooge: Jim Dooge and the EGS/EGU

Dear Mrs. Dara Dooge,
Dear Excellence Mr. James Brennan,
Dear Friends and Colleagues,

When I was invited in 1986/87 to organize the European Geophysical Society (EGS), the entire field of hydrology was represented by only one “Open Session on Hydrology” at its General Assemblies. We quickly changed this by adding topical sessions, by upgrading “Hydrology” to a Section and, later on, to a Division, and by launching the journal “Hydrology and Earth System Sciences (HESS)”. However, all this was only possible due to the enthusiastic support of the many well established and sincerely engaged hydrologists - many of them sitting in the audience to-day - and by the good-will of the “gurus in hydrology”, such as Jim Dooge!

Jim attended all General Assemblies of the EGS and EGU up to the end. Some years ago he even committed that he will only continue to attend these and no other meetings. He carefully listened to the talks and enjoyed attending the poster sessions. His main concern was with the work of the younger and more recently established colleagues. He always was listening carefully and with great respect with regard to their opinion, and his discussions were always gentle, reassuring, in partnership and “at eye level”, paired by his warm and sensitive personality. In this way, Jim became a real friend and the role model for a whole generation of hydrologists!

In my personal discussions with Jim about the well-being of our Society he turned out to be a real inspirational entrepreneur - listening very carefully to my arguments and ideas, putting his fingers gently into the sore points, and discussing what was missing and what to be added and how. He was a best pal with regard to establishing a strong European Hydrology represented within the EGS/EGU. In this way I would like to say: “Thank you, Jim, for your active support and long-lasting friendship. You will always be My Star on the “Firmament of Fame of Geosciences”!

Alberto Montanari, Outgoing president of the Division on Hydrological Sciences of EGU,
and
Arne K. Richter, General & Executive Secretary of the EGS/EGU, 1987 - 2009

Seismic Oceanography as a Tool to Monitor Climate Change

G.G. Buffett, R. Carbonell Institute of Earth Sciences
Jaume Almera, CSIC, Barcelona, Spain

Analysis of the abundance of existing and to be acquired seismic reflection data for stratification within the ocean itself (known as seismic oceanography) gives a new perspective on how we can develop models of ocean circulation and therefore climate. Since 2003 seismic oceanography has begun in earnest with many international groups analyzing archived and new seismic data. Seismic oceanography provides approximately 100 times the horizontal resolution as in situ probes, allowing large-scale flow visualization and the quantification of dynamics, temperature and turbulent dissipation rates among other aspects of physical oceanography. Given the large databases of archived marine seismic data recorded by industry and academia and their incidentally recorded ocean stratification (where it exists), great insights could be made into the understanding of ocean circulation, thereby constraining future climate models.

Climate change presents important research challenges and opportunities because it can result in potential catastrophic outcomes that will significantly modify the circumstances under which we inhabit the planet. Not only will a general global warming trend affect (among other prerequisites for civilization) agriculture, but, because the biosphere is an extraordinarily complex system with unpredictable positive feedback mechanisms, many unidentified consequences may result. Since the ocean and atmosphere are coupled, ocean circulation plays a very important role. The ocean, though much less in volume than the atmosphere, carries an equivalent amount of heat due to its high heat capacity. Ocean circulation is driven mainly by the wind and secondarily by tidal forcing. The wind is driven by uneven solar heating of the Earth as it rotates between day and night. The wind in turn, along with density differences, drive ocean circulation. The basic mechanisms of ocean circulation are known, but the details of, for instance, how mixing of water masses and large-scale circulation occur and to what degree, could be further explored and better understood by analyzing the plethora of existing archived seismic data in conjunction with corresponding oceanographic data.

The MCS Method

Multi-channel seismic (MCS) reflection profiling is a common method used by the hydrocarbon industry for exploration of natural resources (Fig 1).

Marine seismic surveys have been conducted over the oceans since the late fifties, incidentally recording the comparatively faint acoustic reflections within the ocean. The method proceeds through the use of a towed impulsive source (an air-gun which releases a known volume of pressurised air) and a streamer, which is a cable filled with numerous highly sensitive pressure sensors called hydrophones. Methodologically, the effectiveness of MCS reflection profiling is in its redundancy of sources and receivers (several of which comprise each channel). As the source and receiver array are being towed, air-gun 'shots' are 'fired' at controlled distances. The receiver array records both the energy directly from the source as well as the less-intense back scattered energy from layers within the ocean and solid Earth. Data are then sorted by common mid-point (the mid-distance between source and receiver), corrected for geometrical spreading energy loss and hyperbolic 'move-out' of traces as a result of the increasing arrival time of reflected energy at longer distances along the streamer (offset). Once data gathers of common-midpoint traces are aligned through this process, the data images can be stacked (or, summed) together to emphasize signal and diminish noise. The result is a two (or three) dimensional section of the subsurface as if independent sources and receivers were co-located and only vertically travelling sound waves were considered (Fig 2).

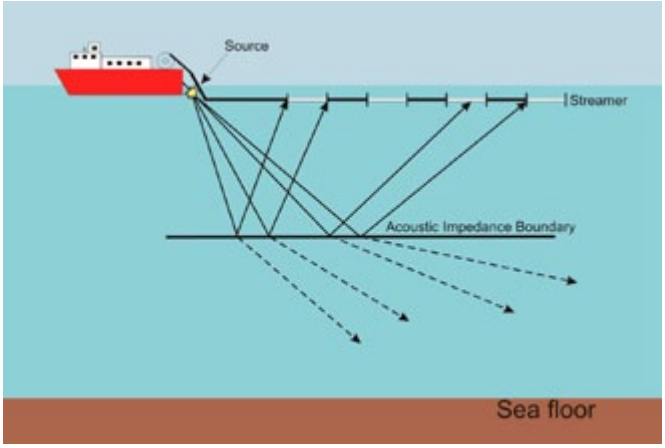

Figure 1 - Marine MCS acquisition showing impulsive source and ray-paths of seismic waves as they reflect and transmit upon encountering an acoustic impedance boundary (approximately equivalent to an isopycnal).

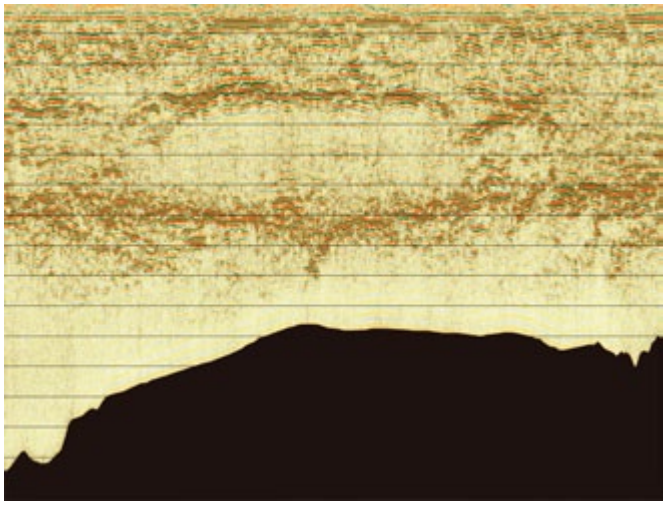

Figure 2 - Two-dimensional vertical seismic slice of the ocean near northern Portugal. The seafloor is shown in black. Intriguing in this image is a large eddy of Mediterranean-type water, called a 'Meddy' . Depth on the vertical axis is about 3 km; horizontal distance is about 60 km. Notice the strongest seismic signal at medium depths, identified as Mediterranean Water emanating from the Strait of Gibraltar and flowing along the coast of the Iberian peninsula. At the deepest levels, the ocean seismically transparent, indicating homogeneity.

The Ocean - a "nuisance" in seismology?

The majority of marine seismic surveys depict the ocean as an inconvenient nuisance, blurring the imagery of the solid earth, analogous to how the atmosphere impedes the observation of celestial objects seen from ground-based telescopes. The speed of sound only varies between about 1470 m/s and 1530 m/s in the ocean but remarkably, the seismic method is sensitive to these small changes, making detection of internal structures possible. Sound reflects and refracts where there are contrasts in acoustic impedance, which is given by the product of density and sound speed of the media through which it travels. For high contrasts in acoustic impedance (for example, between water in contact with the seafloor), more energy is reflected and less transmitted. In the solid Earth, variations in rock type give rise to acoustic impedance contrasts, whereas within the ocean, thermohaline finestructure (temperature and/or salinity contrasts) is the cause.

The Discovery of Seismic Oceanography

Although acoustic impedance reflections within the water column were noted by other authors as far back as the late 80's and early 90's (notably, Gonella and Michon [1988] and Phillips and Dean [1991]), it was not until the striking images of oceanic thermohaline finestructure by Holbrook et al. [2003] that 'seismic oceanography' became known as a viable tool to explore the oceans. Following upon this research, Nandi et al. [2004] jointly acquired seismic and in situ temperature data by the launching of XBTs (eXpendable BathyThermographs). They found a direct correlation between seismic reflection amplitudes and temperature contrasts as small as 0.03°C. Several other groups worldwide showed interest in the method and acquired new data as well as re-processed archived data. Tsuji et al. [2005] and Nakamura et al. [2006] both analyzed the Kuroshio Extension Front off the western coast of Japan. The latter study found that synthetic seismograms derived from temperature and salinity in situ measurements compared favorably with independent seismic data.

The GO Project

In 2007 acquisition began for the first large-scale joint seismic and oceanography project, GO (Geophysical Oceanography), situated in the Gulf of Cadiz, where Mediterranean Water spills into the Atlantic Ocean via the Strait of Gibraltar (Fig 3). The GO project included participation from eight separate European research institutions in The United Kingdom, France, Spain, Italy, Germany and Portugal. It was carried out with two ships, the British ship RRS Discovery and the German vessel FS Poseidon, conducting high (up to about 200 Hz) and low resolution (20-80 Hz) seismics coincident and simultaneous to the launching of in situ probes, along with Acoustic Doppler Current Profilers and ocean bottom seismometers among other oceanographic tools. From the GO initiative came many technical publications detailing the utility and limits of seismic oceanography.

Mainly, it can be said that seismic oceanography is a form of large-scale flow visualization, allowing the tracking of isopycnals (lines of equal density - approximately corresponding to acoustic impedance stratification) over long horizontal distances. Indeed, one of the main advantages of seismic oceanography is that we can now create horizontally near-continuous images of oceanic layering previously unfeasible with in situ probes (which are typically dropped every 1 km or so). In this way seismic oceanography permits a horizontal resolution some one hundred times better than what is feasible with conventional methods.

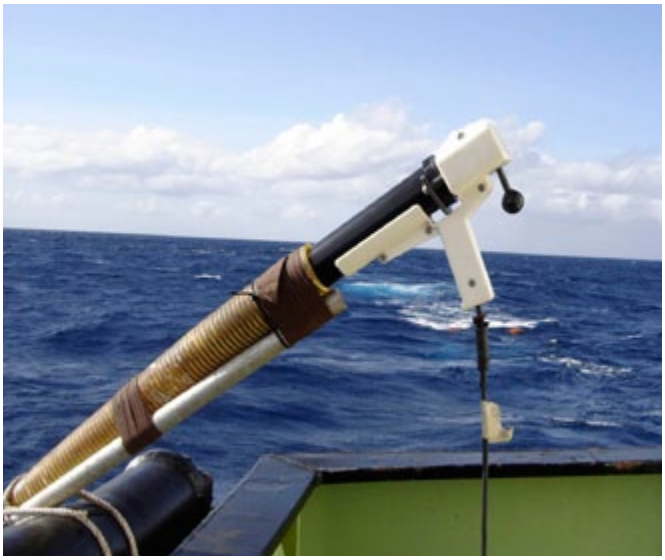

Figure 3 - Seismic oceanography in-action. Foreground shows the deployment of an oceanographic in situ probe (XBT). Background shows surface bubble of seismic airgun source. Photo by the author (G.G. Buffett), Gulf of Cadiz, 2007.

Seismology as a tool to monitor climate change

What if we could look back in the past at what ocean currents were like 10, 20, 30, 40 or 50 years ago? Have circulation patterns changed in lockstep with industrialization and increased greenhouse gas emissions? What might future circulation patterns be? Knowing this information, can we take action to prevent detrimental change? Recent advances in seismic data analysis by various authors have made significant advances in the understanding of physical oceanographic

processes from seismic data alone. Our ability to construct models that represent objective physical reality regarding ocean processes helps build a comprehensive understanding of the ocean's role in the distribution of heat around the planet and thereby, the effect this has on climate. A thorough understanding of the ocean permits a more comprehensive understanding of the role of the global ocean in Earth systems and is therefore essential to a collective understanding of the planet and how society's actions influence it. The following are some of the most recent advances into the understanding of ocean processes via the analysis and interpretation of seismic data.

2008:

• Krahmann et al. [2008] derived horizontal wave number spectra from archived Iberian Atlantic Margin (IAM) seismic profiles, allowing the estimation of internal wave energy.

• Biescas et al. [2008] made the first connection to double-diffusive processes at the margin of meddies.

2009:

• Buffett et al. [2009] analyzed seismic data from along the trajectory of the Mediterranean Undercurrent, observing that the processes responsible for the progressively diminishing seismic amplitudes within the Undercurrent were two-way mixing between water masses.

• Holbrook et al. [2009] imaged internal tides near the Norwegian continental slope.

• Klaeschen et al. [2009] estimated the dynamics of ocean stratification by deriving the optimal geometry necessary to corroborate against simultaneously acquired in situ sound speed estimates.

• MÎ¹nesguen et al. [2009], through numerical simulations, investigated the effect of seismic source bandwidth on rotating, stratified turbulence of an anticyclonic eddy.

• SallarÎ¸s et al. [2009] addressed the relative contribution of temperature and salinity to ocean acoustic reflectivity.

• Sheen et al. [2009] estimated ocean mixing rates from seismic data.

2010:

• Quentel et al. [2010] characterized mesoscale and submesoscale structures in Mediterranean Water.

• Buffett et al. [2010] applied stochastic methods to estimate scale lengths.

• Biescas et al. [2010] and Fer et al. [2010] both imaged thermohaline staircases.

In the meantime, new acquisition is ongoing, in the form of purely seismic oceanography surveys, and so-called 'piggyback' surveys where in situ oceanographic data are acquired alongside already planned seismic surveys for the study of the Earth's crust (either academic or hydrocarbon industry related). While in the case of the latter, acquisition parameters and survey locations cannot be chosen (and hence, optimized by seismic oceanographers), the multitude of seismic surveys being conducted (especially in light of society's thirst for oil) ensures newly acquired data for the foreseeable future. Might it become commonplace that seismic oceanography is a natural addition to all marine seismic surveys?

The SEISSEA project

The Tyrrhenian sea is an semi-enclosed deep basin in the Mediterranean sea surrounded by Italy and the islands of Corsica, Sardinia and Sicily. Circulation within the sea occurs mainly along its circumference confining the deepest, central part of the basin to experience little flux of seawater on seasonal to annual scales, allowing the stable formation of thermohaline staircases. As such, the Tyrrhenian sea is a natural laboratory for the study of these stable structures, which are regular, well-defined, step-wise variations in vertical temperature and salinity gradients, which manifest themselves on seismic data as near horizontal stratification. They are found where turbulent mixing is particularly weak.

The SEISSEA (Seismic Inversion and Stochastic Spectral Analysis of Thermohaline Staircases in the Tyrrhenian sea) project will commence this year at the Leibniz Institute of Marine Sciences at Kiel University (IFM-GEOMAR) with analysis of seismic oceanography data acquired in May and October of 2010. The project will focus on developing the seismic methodologies necessary to optimally image and extract valuable information from thermohaline staircases. This research will help the scientific community better understand internal wave propagation and turbulent mixing and the processes which lead to density stratification, thus contributing to the creation of the best possible models of ocean circulation, and by extension, models of climate change.

A Professional Appeal

Given the excess of marine seismic data acquired over the past fifty or more years, oil corporations and research institutions may be inclined to donate the water column data (the upper samples from seismic traces, until the seafloor) from archived datasets as a public service. While it is understandable that the crustal seismic data may be of proprietary interest, it is unlikely that the incidentally recorded water column data is of any value for example, to the hydrocarbon industry. This exercise would be rather routine (possibly even semi-automated) and would only require the reading of archived analogue or digital data and the truncation of seismic traces and upload to an online server. A useful forum for the dissemination of this data would be websites such as the Virtual Seismic Atlas (http://see-atlas.leeds.ac.uk:8080/home.jsp) which hosts a special section dedicated to seismic oceanography. In this way marine seismic oceanography data could be widely accessible, where it could be tested against publicly available oceanographic data, such as those available on website databases like the World Ocean Database (http://www.nodc.noaa.gov/OC5/SELECT/dbsearch/dbsearch.html).

Many times in science, a tool or methodology has other applications than its originally intended purpose. The serendipitous discovery by Holbrook et al. [2003] of detailed fine structure has raised the bar on what knowledge can be obtained from marine seismic data of the ocean, a new tool that is being called 'seismic oceanography'. Analysis and interpretation of both new and old seismic data presents a unique opportunity to 'see' the ocean in ways not possible with traditional oceanographic techniques, thus providing a complementary tool to understand the oceans and, by extension, the climate system. Paradoxically, the tool that has arguably been the most effective in locating the oil that has contributed substantially to anthropogenic global warming may be used to learn about ocean circulation such that we can then mitigate it.

References and further reading

Biescas, B., V. SallarÎ¸s, J.L. PelegrÎ, F. MachÎn, R. Carbonell, G. Buffett, J.J. DaÏobeitia and A. Calahorrano, 2008. Imaging meddy fine structure using multichannel seismic data, Geophys. Res. Lett., 35, L11609, doi:10.1029/2008GL033971.

Buffett, G.G, B. Biescas, J.L. PelegrÎ, F. MachÎn, V. SallarÎ¸s, R. Carbonell, D. Klaeschen, and R.W. Hobbs, 2009. Seismic reflection along the path of the Mediterranean Undercurrent, Cont. Shelf Res., 29, 1848–1860, doi:10.1016/j.csr.2009.05.017.

Buffett, G.G., C. A. Hurich, E. A. Vsemirnova, R. W. Hobbs, V. SallarÎ¸s, R. Carbonell, D. Klaeschen, and B. Biescas, 2010. Stochastic Heterogeneity Mapping around a Mediterranean salt lens, Ocean Sci., 6, 423–429.

Buffett, G.G., 2011. Seismic Oceanography: A new tool to characterize physical oceanographic structures and processes, Ph.D. thesis, Universitat de Barcelona (http://www.tesisenxarxa.net/TDX-0210111-121223/).

Gonella, J. and D. Michon, 1988. Ondes internes profondes revelees par sismique reflexion au sein des masses d'eau en atlantique-est, Acad. Sci. Paris Ser. II 306, 781.

Holbrook, W.S., P. PÎramo, S. Pearse and R.W. Schmitt, 2003. Thermohaline fine structure in an oceanographic front from seismic reflection profiling, Science, 301, pp.821-824. doi:10.1126/science.1085116.

Holbrook, W.S., I. Fer and R.W. Schmitt, 2009. Images of internal tides near the Norwegian continental slope, Geophys. Res. Lett., 36, L00D10, doi:10.1029/2009GL038909.

Klaeschen, D., R.W. Hobbs, G. Krahmann, C. Papenberg, and E. Vsemirnova, 2009. Estimating movement of reflectors in the water column using Seismic Oceanography, Geophys. Res. Lett., 36, L00D03, doi:10.1029/2009GL038973.

MÎnesguen, C., B. L. Hua, C. Papenberg, D. Klaeschen, L. GÎ¹li, and R.W. Hobbs, 2009. Effect of bandwidth on seismic imaging of rotating stratified turbulence surrounding an anticyclonic eddy from field data and numerical simulations, Geophys. Res. Lett., 36, L00D05, doi: 10.1029/2009GL039951.

Nakamura, Y., T. Noguchi, T. Tsuji, S. Itoh, H. Niino and T. Matsuoka, 2006. Simultaneous seismic reflection and physical oceanographic observations of oceanic fine structure in the Kuroshio extension front, Geophys. Res. Lett., 33, L23605, doi:10.1029/2006GL027437.

Nandi, P., W.S. Holbrook, P. PÎramo, S. Pearse and R.W. Schmitt, 2004. Seismic reflection imaging of water mass boundaries in the Norwegian Sea, Geophys. Res. Lett., 31, L23311, doi:10.1029/2004GL021325.

Phillips, J.D. and D.F. Dean, 1991. Multichannel acoustic reflection profiling of ocean water mass temperature/salinity interfaces, Ocean Variability and Acoustic Propagation, edited by J. Potter and A. Warn-Varnas, pp. 199-214, Springer, New York.

SallarÎ¸s, V., B. Biescas, G. Buffett, R. Carbonell, J.J. DaÏobeitia, and J.L. PelegrÎ, 2009. Relative contribution of temperature and salinity to ocean acoustic reflectivity, Geophys. Res. Lett., 36, L00D06, doi:10.1029/2009GL040187.

Sheen, K.L., N.J White, R.W. Hobbs, 2009. Estimating mixing rates from seismic images of oceanic structure, Geophys. Res. Lett., 36, L00D04, doi:10.1029/2009GL040106.

Tsuji, T., T. Noguchi, H. Niino, T. Matsuoka, Y. Nakamura, H. Tokuyama, S. Kuramoto and N. Bangs, 2005. Two-dimensional mapping of fine structures in the Kuroshio Current using seismic reflection data, Geophys. Res. Lett., 32, L14609, doi:10.1029/2005GL023095.

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Scientists heating up conference hall at EGU general assembly

Temperature measurements in a General Assembly Hall in Vienna

Monday morning, in the Innovative techniques and unintended use of measurement equipment (HS1.5) session, Delft scientist Miriam Gerrits, helped by Stijn de Jong, Jop Jansen en Rolf Hut, set up an eight meter high mast in Hall A of the Assembly building, equipped with a coiled fibre optic cable as a demonstration of the novel setup used to measure the air temperature gradient close to the surface for estimating actual evaporation.

All visitors to the EGU general assembly know that it can get warm while waiting in line for coffee. Delft scientists measured the temperature effect of coffee breaks on local indoor temperature distribution using fibre optic distributed temperature sensing (DTS).

Monday morning, in the "Innovative techniques and unintended use of measurement equipment (HS1.5)" session, Delft scientist Miriam Gerrits, helped by Stijn de Jong, Jop Jansen en Rolf Hut, set up an eight meter high mast equipped with a coiled fibre optic cable as a demonstration of the novel setup used to measure the air temperature gradient close to the surface for estimating actual evaporation. The setup, thought up by Wim Luxemburg and implemented together with Miriam Gerrits and Tanja Euser was successfully tested on the campus of Delft University of Technology. Of course, in Conference hall A of the Vienna Centre, no evaporation was measured, but the vertical temperature profile measured throughout the day still showed interesting features.

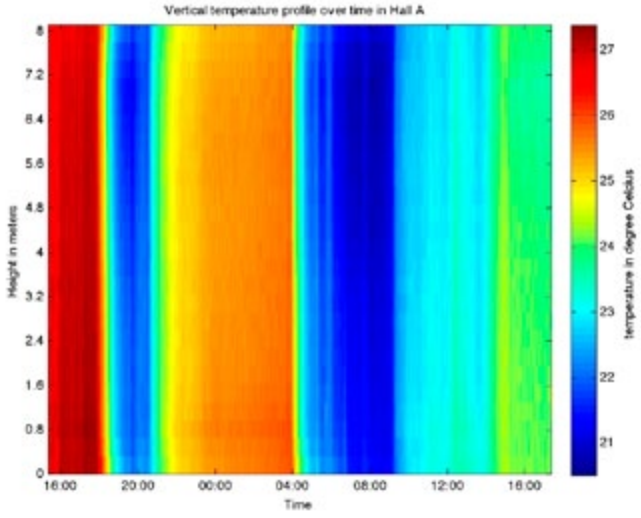

Figure 1: Vertical temperature profile over time in Hall A.

In Figure 2, a close up is provided of the time window around the lunch break. After the end of the morning sessions (noon), some people briefly walked into hall A. This caused a small, but noticeable temperature rise "at floor level". Since the mast was deployed close to one of the air conditioning units in the roof, the cooling is provided from above. This can be seen in the data: the higher parts of the hall are cooled before the lower parts. Finally, at the end of the lunch break, a lot of people visited the poster area, causing a larger increase in temperature.

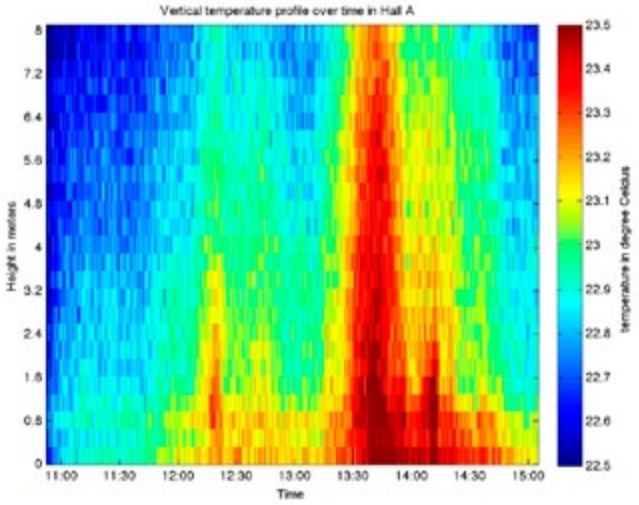

Figure 2: Vertical temperature profile over time in Hall A around the lunch break.

Fibre Optic Distributed Temperature Sensing has become increasingly popular in recent years as a tool in environmental monitoring (see list of articles below). Although the dataset collected during the EGU general assembly has no direct link to the earth sciences, it does show the potential for using DTS as a measurement method. And the heat that scientists bring into a poster hall of course.

References

Hoes, O. A. C., Luxemburg, W. M. J., Westhof, M. C., van de Giesen, N. C., Selker, J., 2009. Identifying seepage in ditches and canals in ploders in the netherlands by distributed temperature sensing. Lowland Technology International 11 (2), 21-26.

Lowry, C. S., Walker, J. F., Hunt, R. J., Anderson, M. P., 2007. Identifying spatial/variability of groundwater discharge in a wetland stream using a distributed temperature sensor. Water Resour. Res. 43 (10), 10408.

Moffett, K. B., Tyler, S. W., Torgersen, T., Menon, M., Selker, J. S., Gorelick, S. M., 2008. Processes controlling the ther-

mal regime of saltmarsh channel beds. Environ. Sci. Technol. 42 (3), 671-676.

Roth, T. R., Westhoff, M. C., Huwald, H., Huff, J. A., Rubin, J. F., Barrenetxea, G., Vetterli, M., Parriaux, A., Selker, J. S., Parlange, M. B., 2010. Stream temperature response to three riparian vegetation scenarios by use of a distributed temperature validated model. Environ. Sci. Technol. 44 (6), 2072-2078.

Selker, J., van de Giesen, N., Westhoff, M., Luxemburg, W., Parlange, M. B., 2006a. Fiber optics opens window on stream dynamics. Geophys. Res. Lett. 33 (24), L24401.

Selker, J. S., Thvenaz, L., Huwald, H., Mallet, A., Luxemburg,W., van de Giesen, N., Stejskal, M., Zeman, J., Westhoff, M., Parlange, M. B., 2006b. Distributed fiber-optic temperature sensing for hydrologic systems. Water Resour. Res. 42 (12), W12202.

Steele-Dunne, S. C., Rutten, M. M., Krzeminska, D. M., Hausner, M., Tyler, S. W., Selker, J., Bogaard, T. A., van de Giesen, N. C., 2010. Feasibility of soil moisture estimation using passive distributed temperature sensing. Water Resour. Res. 46 (3), W03534.

Suarez, F., Aravena, J. E., Hausner, M. B., Childress, A. E., Tyler, S. W., 2011. Assessment of a vertical high-resolution distributed-temperature-sensing system in a shallow thermohaline environment. Hydrol. Earth Syst. Sci. 15 (3), 1081-1093, url http://www.hydrol-earth-syst-sci.net/15/1081/2011/.

Tyler, S. W., Selker, J. S., Hausner, M. B., Hatch, C. E., Torgersen, T., Thodal, C. E., Schladow, S. G., 2009. Environmental temperature sensing using raman spectra dts fiber-optic methods. Water Resour. Res. 45, W00D23.

Westhoff, M. C., Bogaard, T. A., Savenije, H. H. G., 2010. Quantifying the effect of in-stream rock clasts on the retardation of heat along a stream. Adv. Water Resour. 33 (11), 1417-1425.

Westhoff, M. C., Savenije, H. H. G., Luxemburg, W. M. J., Stelling, G. S., van de Giesen, N. C., Selker, J. S., Pfister, L., Uhlenbrook, S., 2007. A distributed stream temperature model using high resolution temperature observations. Hydrol. Earth Syst. Sci. 11 (4), 1469-1480.

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Water Management
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EDUCATION: The resourceful physics teacher

Four interesting demonstrations and teaching ideas

Physics teacher Keith Gibbs shares some of his many demonstrations and experiments for the physics classroom.

During more than 30 years of teaching physics, I have come across many interesting demonstrations and teaching ideas – often suggested by relatives, friends, colleagues and past students. In 2000, I began to gather these ideas together – this was the basis of the Schoolphysics website and CD-ROM collection. Over time, I added more explanation and background for teachers whose specialism was not physics.

Below are four ideas from the collection. I hope that you will find at least one of them new, challenging, informative and fun, and that the ideas go some way towards popularising the subject and making people realise that physics can be interesting and fun.

Boiling water under reduced pressure

Age range: 13-15

This simple experiment demonstrates that the saturated vapour pressure of water depends on the temperature. It is best performed as a teacher demonstration, with a safety screen between the apparatus and the students.

Materials

A round-bottomed flask
A bung with two holes
A glass tube, with an external diameter to fit the hole in the bung
A rubber tube with a diameter to connect to the glass tube
A thermometer to fit the hole in the bung
A Bunsen burner
A retort stand and clamp
A safety screen
A tray
Water

Procedure

Fit the rubber tube onto the end of the glass tube.

Fit the thermometer and glass tube into the holes in the bung, pour cold water into the flask until it is just less than half full. Then seal the flask with the bung.

Fit the clamp onto the rubber tube but do not close the clamp.

Use the Bunsen burner to heat the water to boiling.

Close the clamp and turn off the Bunsen burner.

Invert the flask and pour cold water over it.

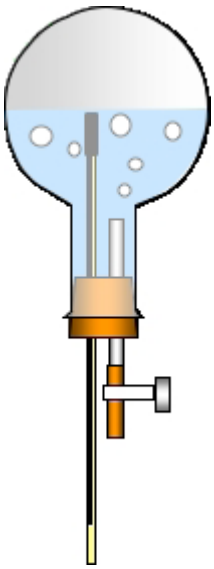
Steam will condense inside the flask, reducing the pressure and allowing the water to start boiling again. When the water stops boiling, pour more water over the flask. How low can you get the temperature and still observe the water boiling? You should be able to get the water to boil at 40 °C – I once observed the water boiling at body temperature (37 °C)!

Safety note: wear safely goggles. Although unlikely, it is possible that the glass flask could shatter, so keep a safety screen between the experiments and the students. If possible, stand behind the screen yourself.

See also the general safety note.

Theory

The explanation is that the saturated vapour pressure of water depends on the temperature: the lower the temperature, the less water vapour the air can hold. When the water condenses, it lowers the pressure in the flask – and this, of course, allows water to boil at less than 100 °C.



credits: Keith Gibbs

An alternative method

A simpler method is to partly fill (about 20%) a syringe with 50-60°C warm water. Then pull on the plunger of the syringe. This lowers the pressure in the syringe, causing the water to boil at well below 100 °C.

Electromagnetic separator

Age range: 16-18

This is a small-scale simulation of the type of electromagnetic separator that is used industrially to separate non-ferrous metals from other non-metallic scrap, and is suitable as a teacher demonstration.

Materials

A U-shaped electromagnet with an iron core to give a high field intensity
An AC (alternating current) power supply
Aluminium scraps (e.g. kitchen foil)
A piece of thin card
Some scraps of paper

Procedure

Place the card on top of one arm of the electromagnet and put a few scraps of aluminium and paper onto the card.

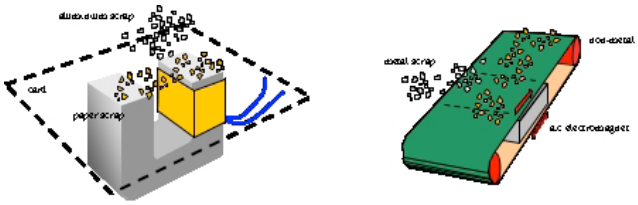
Connect the electromagnet to an AC supply and turn on the

current. The aluminium scraps will be ejected from the magnetic field.

Theory

The AC electromagnet induces eddy currents within the aluminium scraps. These turn the scraps into tiny electromagnets that are then repelled by the large electromagnet and so fly off the card. With non-metallic scraps there are no induced currents and so these scraps remain on the card.

In a moving-belt version of this experiment, mixed metal and non-metal scraps are passed along a belt over an AC electromagnet. This induces eddy currents in the metal scraps, which are then repelled by the field and fly off sideways while the remaining non-metal scraps continue along the belt. Schools might be able to construct such a version for demonstration use, using a mixture of paper and aluminium.



credits: Keith Gibbs

A floating block in a falling jar

Age range: 11-18, depending on the treatment of the theory.

This is a very useful demonstration of one of the ideas of general relativity, using a wooden block floating in a jar of water that is suspended from a spring.

Materials

A helical spring tied with string to a plastic jar

A wooden block or straw loaded with modelling clay (e.g. Plasticine?)

Water

Procedure

Half fill the jar with water, add the wooden block or straw, and suspend the apparatus from the spring.

Support the jar, then let it fall, suspended from the spring. The jar and contents will then oscillate in a vertical plane (up and down) but the water level will stay at the same position in the jar, and the block or straw will float at the same level in the water as it falls and rises.

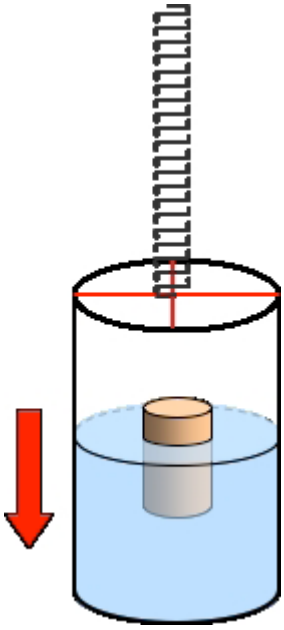
Theory

The depth at which the wooden block or straw floats depends on both its weight (not its mass) and the upthrust on it. The upthrust depends on the weight of water displaced. Thus, as the acceleration of the jar and the block changes, the weight of the block and the upthrust on it change in direct proportion to each other; as a result, the depth at which the block floats remains unchanged as the apparatus oscillates.

Objects undergoing acceleration behave in the same way as they would in a gravitational field. As the jar and its contents oscillate, they have an acceleration that is due to both the constant gravitational field of Earth and the simple harmonic motion of the oscillation.

As the jar moves upwards, its net acceleration is greater than that of Earth's gravitational field and as it falls, its acceleration is less than that of Earth's field. On the downward part of the motion, it is as if the jar were on the Moon, where the gravitational acceleration is less than on Earth.

This is a very useful demonstration of the equivalence of gravitational and inertial fields.



credits: Keith Gibbs

Acknowledgements

The editors of Science in School would like to thank Catherine Cutajar and Gerd Vogt for their help in selecting the experiments to include in this article.

Web reference

w1 – To view more (free) teaching material collected by Keith Gibbs or to purchase the CD-ROMs, see: www.school-physics.co.uk

After graduating from University College London, UK, with a degree in physics, Keith Gibbs took a PGCE teacher training course at Cambridge University, UK. He subsequently taught physics in four different schools across the UK for 36 years, retiring in 2002.

The ideas in this article are just a few of more than 700 ideas and experiments that Keith Gibbs has collected and devised over the years, available on CD-ROM (currently £10). These, as well as explanations suitable for 11- to 19-year-old students, animations, lesson plans, images and much more, are available on a further CD-ROM which, once bought (currently £35), can be copied within the school and made available via the school's intranet. See the Schoolphysics websitew1.

Keith has written and contributed to a number of physics textbooks. Recently, he has worked with Pearson Education on animations for advanced-level physics courses, and practical projects for younger physics students.

Keith also travels extensively, demonstrating his collection of experiments. If you are interested in a visit, contact him via the Schoolphysics websitew1.

Keith Gibbs

This article first appeared in Issue 18 of Science in School, the European journal for science teachers (www.sciencein-school.org) and is reproduced with permission.

COMMENT and RESPONSE TO COMMENT

on Sensationalism and the short memory of science journalism

David Hosansky and Carl Drews comment on the article by D. Nof and N. Paldor

Comment on Sensationalism and the short memory of science journalism (published in The EGGS No. 34 at http://www.the-eggs.org/articles.php?id=146)

We were surprised to read the article in your 8 March 2011 Newsletter No. 34 (http://www.the-eggs.org/articles.php?id=146) in which Drs. Nof and Paldor characterize our recent press release on the parting of the Red Sea as sensationalizing the science. Our intent was to popularize work in this area and make it accessible to the public. We certainly did not mean to imply that Drews and Han were the first to do scientific research on the subject. In fact, Paldor and Nof are explicitly acknowledged in the release, as are subsequent researchers. The attention the release received demonstrates how inherently appealing this topic is. The subsequent media coverage should elevate the visibility of everyoneÂ's work in this area.

David Hosansky, Head of Media Relations, NCAR / University Corporation for Atmospheric Research

and

Carl Drews, Atmospheric Chemistry Division, National Center for Atmospheric Research

Response to comment

We appreciate Hosansky and Drew's helpful and useful comments. We have several things to say about them, however.

To begin with, our original EGGS article was not about the NCAR media office sensationalizing science per-se but rather about that office sensationalizing the science done at NCAR. In that context we note that referencing an earlier article in passing does not give the quoting authors permission to claim the earlier work as their own, which is essentially what was done in the NCAR press release. Had the press release stated that more than 50% of its content (and indeed its most important conclusions) were made earlier in our 1992 article, then there would have been no issue. But then, there would have been no need for the press release in the first place.

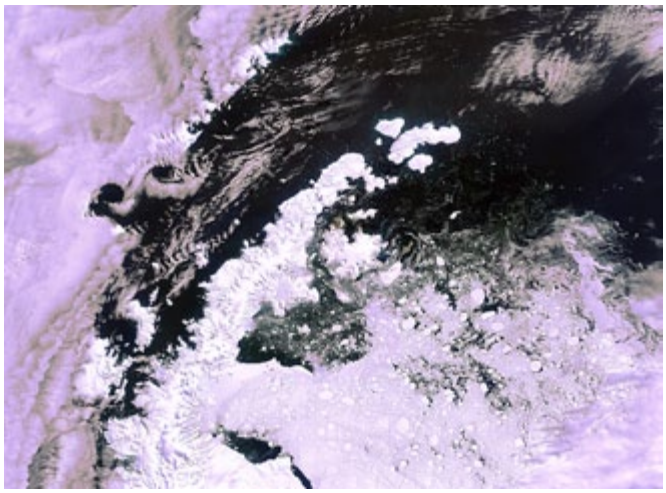
Hosansky and Drew claim that the press release (to be distinguished from the PLOSone article) original intent was merely to "popularize science", not popularize the work done in NCAR. It is hard to believe that journalists, whose business is writing, cannot make their intentions clear in the first place. It seems to us that this "intention" was identified after the fact as a means of responding to our EGGS article without publishing at least a partial retraction (which would have been more appropriate in this case). We realize that the original press release was not done in malice. Rather, the NCAR media office was probably simply not familiar with what appeared before in both the scientific and popular literature. Namely, this is just another case of recycled news.

The message here to the scientific community at large is perhaps best summarized by a (slightly edited) quote from my colleague Dr. David Mountain (University of Arizona): "With funds getting tighter-and-tighter the competition will continue to expand from focusing merely on the quality of the science to focusing on the public image, name brand, and colorful packaging of the institution. A new, additional challenge emerges for researchers--to have integrity not only in their science but also in the spin that is sent out about it by the public relations representatives of their institutions".

D. Nof and N. Paldor

EARTH FROM SPACE

Antarctic Peninsula



This Envisat image features the northern part of the Antarctic Peninsula. Credits: ESA

25 February 2011.- This Envisat image features the northern part of the Antarctic Peninsula, which stretches beyond the Antarctic Circle to within 1050 km to the southern tip of South America.

The 1000-km-long arm of the mountainous peninsula is situated between the Bellingshausen Sea on the west and the Weddell Sea on the east.

Along the peninsula, ice shelves are nourished by glaciers streaming down from the central ice sheet plateau, which extends as a narrow spine along the central part of the peninsula.

These ice shelves are important indicators for on-going climate change because they are sandwiched by rising surface air temperatures and a warming ocean.

Exceptional atmospheric warming of around 2.5°C over the past 60 years has triggered the retreat and break-up of several of the shelves. In the past 20 years seven ice shelves along the peninsula have retreated or disintegrated, including Larsen (on the east) and Wilkins (located farther south on the west).

Within days of its launch in March 2002, Envisat captured the spectacular disintegration of Larsen B.

Long-term monitoring over Antarctica is important because it provides authoritative evidence of trends.

This image was acquired by Envisat's Medium Resolution Imaging Spectrometer on 5 February at a resolution of 300 m.

ESA

Sark becomes World's First Dark Sky Island

recognised by the International Dark-sky Association (IDA)

31 January 2011.- The Channel Island of Sark has been recognised for the quality of its night sky by the International Dark-sky Association (IDA), who have designated it the world's first dark sky island, the latest in a select group of dark sky places around the world.

Sark has no public street lighting, there are no paved roads and cars, so it does not suffer from the effects of light pollution. This means that the night sky is very dark, with the Milky Way stretching from horizon to horizon, meteors streaking overhead, and countless stars on display.

The announcement was hailed as a great success by astronomers. Prof Roger Davies, president of the Royal Astronomical Society, said: "This is a great achievement for Sark. People around the world are become increasingly fascinated by astronomy as we discover more about our universe, and the creation of the world's first dark sky island in the British Isles can only help to increase that appetite. I hope this leads to many more people experiencing the wonders of a truly dark sky".

Sark becomes World's First Dark Sky Island

The award follows a long process of community consultation, which included the assessment of the sky darkness and an audit of all the external lights on Sark. A comprehensive lighting management plan was created by Jim Patterson of the Institute of Lighting Engineers, and many local residents and businesses have altered their lighting to make them more dark sky friendly, ensuring that as little light as possible spills upwards where it can drown out starlight.

Royal Astronomical Society (RAS)

The Milky Way above the Seigneur's Mill on Sark. Credit: Martin Morgan-Taylor

Pluto has carbon monoxide in its atmosphere

according to results presented at National Astronomy Meeting, UK

15 April 2011.- A British-based team of astronomers has discovered carbon monoxide gas in the atmosphere of Pluto. Team leader Dr Jane Greaves of the University of St Andrews presented the new discovery in her talk on Wednesday 20 April at the National Astronomy Meeting in Venue Cymru, Llandudno, Wales.

Pluto was discovered in 1930 and then considered as the Sun's smallest and most distant planet. Since 2006 it has been regarded by astronomers as a 'dwarf planet', one of a handful of such bodies with sizes of hundreds of kilometres that orbit in the distant reaches of the Solar System, out beyond Neptune. Pluto is the only dwarf planet known to have an atmosphere, found in 1988 when it dimmed the light of a distant star before Pluto passed in front of it.

The new results, obtained at the 15-metre James Clerk Maxwell Telescope in Hawaii, show a strong signal of carbon monoxide gas. Previously the atmosphere was known to be over a hundred kilometres thick, but the new data raise this height to more than 3000 kilometres - a quarter of the way out to Pluto's largest moon, Charon. The gas is extremely cold, about -220 degrees Centigrade. A big surprise for the team was that the signal is more than twice as strong as an upper limit obtained by another group, who used the IRAM 30-metre telescope in Spain in 2000.

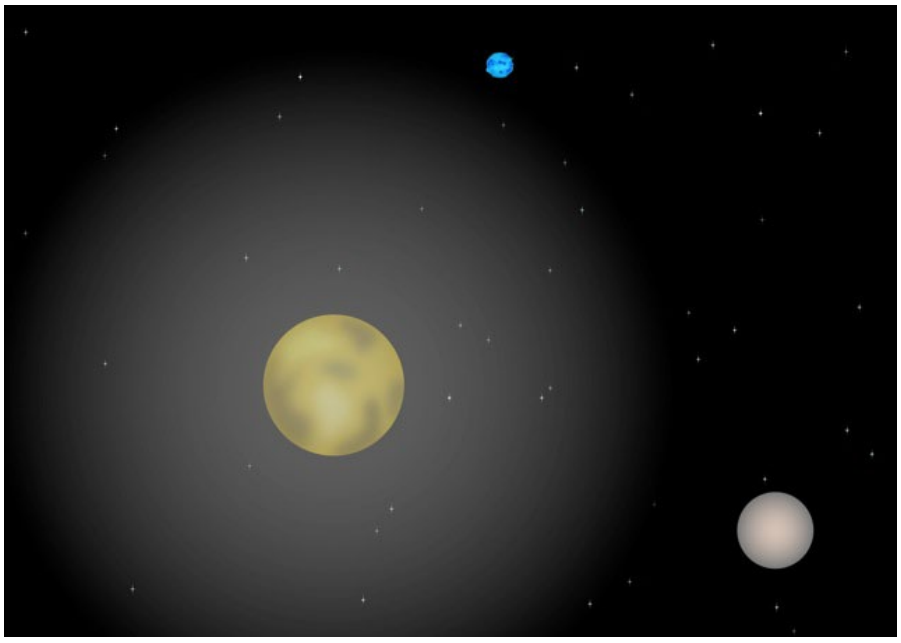
"It was thrilling to see the signal gradually emerge as we added in many nights of data", said Dr Jane Greaves, the team leader from the University of St Andrews, "The change in brightness over the last decade is startling. We think the atmosphere may have grown in size, or the carbon monoxide abundance may have been boosted". Such changes have been seen before but only in the lower atmosphere, where methane - the only other gas ever positively identified - has also been seen to vary.

In 1989 Pluto made its closest approach to the Sun, a comparatively recent event given that it takes 248 years to complete each orbit. The gases probably result from solar heating of surface ice, which evaporates as a consequence of the slightly higher temperatures during this period. The resulting atmosphere is probably the most fragile in the Solar System, with the top layers blowing away into space.

"The height to which we see the carbon monoxide agrees well with models of how the solar wind strips Pluto's atmosphere" commented team member Dr Christiane Helling, also of the University of St Andrews.

Unlike the greenhouse gas carbon dioxide, carbon monoxide acts as a coolant, while methane absorbs sunlight and so produces heating. The balance between the two gases, which are just trace elements in what is thought to be a nitrogen-dominated atmosphere, is critical for its fate during the many-decades long seasons. The newly discovered carbon monoxide may hold the key to slowing loss of the atmosphere - but if the chilling effect is too great, it could result in nitrogen snowfalls and all the gases freezing out onto the ground. "Seeing such an example of extra-terrestrial climate-change is fascinating", says Dr Greaves. "This cold simple atmosphere that is strongly driven by the heat from the Sun could give us important clues to how some of the basic physics works, and act as a contrasting test-bed to help us better understand the Earth's atmosphere".

The data were obtained with the JCMT's 'receiver A', an instrument that has been in regular operation since the 1990s. Dr Per Friberg, who designed new observing modes and data analysis procedures for the team, commented "This shows how we can make the best use of telescopes and keep making unexpected discoveries". The JCMT is operated jointly by the UK, Canada and the Netherlands and is approaching its twenty-fifth anniversary. The team have another Pluto observing run scheduled at the JCMT for the end of April, and in the long-term, they hope to continue tracking the changes in the atmosphere at least up to the fly-by of NASA's New Horizons space probe in 2015.



Artist's impression of Pluto's huge atmosphere of carbon monoxide. The source of this gas is erratic evaporation from the mottled icy surface of the dwarf planet. The Sun appears at the top, as seen in the ultra-violet radiation that is thought to force some of the dramatic atmospheric changes. Pluto's largest moon, Charon, is seen to the lower right. Credit: P.A.S. Cruickshank.

Reference

The results will appear in "Discovery of carbon monoxide in the upper atmosphere of Pluto", Greaves J. S., Helling Ch., Friberg P. A, Monthly Notices of the Royal Astronomical Society, in press.

Royal Astronomical Society
RAS PR 11/29 (NAM 18)

EUROHORCs and the European Science Foundation to continue discussions regarding ScienceEurope

ESF member organisations have not reached an agreement on the next steps needed to merge the two organisations.

European Science Foundation member organisations have not reached an agreement on the next steps needed to merge the two organisations. On Wednesday 4 May at a Special Meeting of the European Science Foundation (ESF) Assembly held in Frankfurt, ESF member organisations voted on the two options which were presented:

1) Creating a new organisation in Brussels, based on the principles of ESF and EUROHORCs, while winding down ESF and closing EUROHORCs

2) Transforming the current ESF and closing EUROHORCs, forming a new organisation that retains an office in Strasbourg and opens an office in Brussels.

Option 1 missed the 2/3 majority, which was needed in order to make a decision to wind down ESF, by a few votes. Option 2 did not receive a majority vote.

At the earlier General Assembly of EUROHORCs on 14 April in Istanbul, Option 1 had received a clear majority.

Although discussions of the merger of the two organisations have not yet been resolved, existing commitments will be unaffected, and both organisations are committed to continuing, uninterrupted, their joint work in pursuit of the EUROHORCs and ESF Vision on a Globally Competitive ERA and their Road Map for Actions, as they have throughout the merger process.

Both organisations will now discuss next steps. In the meantime, if you have any questions or comments, please feel free to contact me or our Head of Communications, Shira Tabachnikoff.

Marja Makarow
Chief Executive

Call for Conference Proposals

The European Science Foundation invites researchers to submit proposals for research conferences

The European Science Foundation invites researchers to submit proposals for research conferences to take place in 2013. The call covers Molecular Biology, Physics/Biophysics, Environmental Sciences, Social Sciences and Humanities. Successful proposals will be organised within the framework of the ESF Research Conferences Scheme and will be awarded a conference grant of up to EUR 40.000.

Scheme Objectives

The ESF Research Conferences Scheme brings together researchers from different nationalities, backgrounds and disciplines, and at different career stages to jointly discuss the latest developments in new and emerging fields of research. ESF Research Conferences promote free discussion and exchange of information, and aim to create long-term networks between participants. Participation is open to researchers from academia, industry, society and politics worldwide.

Conference Format

The conferences last 4-5 days and take place at predefined venues across Europe. Attendance is limited to a maximum of 150 participants (including invited speakers). Young and early-stage researchers are encouraged to attend and to present a short talk or a poster; some of them will receive financial support.

Funding Criteria and Assessment Process

Proposals must be interdisciplinary and demonstrate a high relevance to the scientific community in terms of novelty, originality and timeliness. Proposals are evaluated through international peer review and selected by review panels composed of members of the ESF Scientific Committees and scientists nominated by the Partner Organisations. The international peer review takes place between October and December 2011. The review panel meetings take place in early 2012. Decisions are communicated at the end of March 2012.

Terms of the Award

Successful proponents will be responsible for the scientific programme and quality of the conference as well as the allocation of grants. All administrative and logistical aspects of the conference organisation will be handled by the ESF Conferences Unit. The selected proposals will be awarded a grant of up to EUR 40.000, to be used for the support of invited speakers and young and early stage researchers.

Further Information

Submission Deadline: 15 September 2011.

Further information can be found at: www.esf.org/conferences/call

ESF

Pollution with antibiotics leads to resistant bacteria

bacteria residing in Indian rivers are full of resistance genes protecting them from otherwise effective antibiotics

21 February 2011.- Many of the substances in our most common medicines are manufactured in India. Some of these factories release huge quantities of drugs to the environment. Swedish scientists now show that bacteria in polluted rivers become resistant to a range of antibiotics. International experts fear that this may contribute to the development of untreatable infectious diseases world-wide.

Using a novel method, based on large-scale DNA sequencing, the Swedish scientists show that bacteria residing in Indian rivers are full of resistance genes, protecting them from otherwise effective antibiotics.

"Since we buy medicines from India, we share moral responsibility to reduce the pollution, says Joakim Larsson", associate professor at the Sahlgrenska Academy, University of Gothenburg, one of the scientists behind the study.

"If the pollution contributes to resistance development in clinically important bacteria, it becomes our problem also in a very direct way", he says.

"We have combined large-scale DNA sequencing with novel ways to analyze data to be able to search for thousands of different antibiotic resistance genes in parallel", says Erik Kristiansson, assistant professor at Chalmers University of Technology.

"Such an approach may become useful also in hospitals in the future", he points out.

Several international experts, interviewed by the journal Nature, describe the results as worrying.

"Even if the bacteria found are not dangerous to humans or other animals in the area, they may transfer their resistance genes to bacteria that are", says Dave Ussery, a microbiologist at the Technical University of Denmark.

David Graham at Newcastle University, UK, describes the Indian site.

"In a way, it's sort of like a beaker experiment that tests the worst-case scenario, only this is in a natural system".

Björn Olsen, an infectious-disease specialist at Uppsala University in Sweden compares the resistance with volcano-ash.

"The cloud is going to drop down somewhere else, not just around the sewage plant".

The study was carried out at the Sahlgrenska Academy, University of Gothenburg in collaboration with Chalmers University of Technology and Umeå University, Sweden http://dx.plos.org/10.1371/journal.pone.0017038

Full bibliographic information:

Journal: PLoS ONE

Title of article: Pyrosequencing of antibiotic-contaminated river sediments reveals high levels of resistance and gene transfer elements

Authors: Erik Kristiansson, Jerker Fick, Anders Janzon, Roman Grabic, Carolin Rutgersson, Birgitta Weijdegård, Hanna Söderström, D G Joakim Larsson.

University of Gothenburg

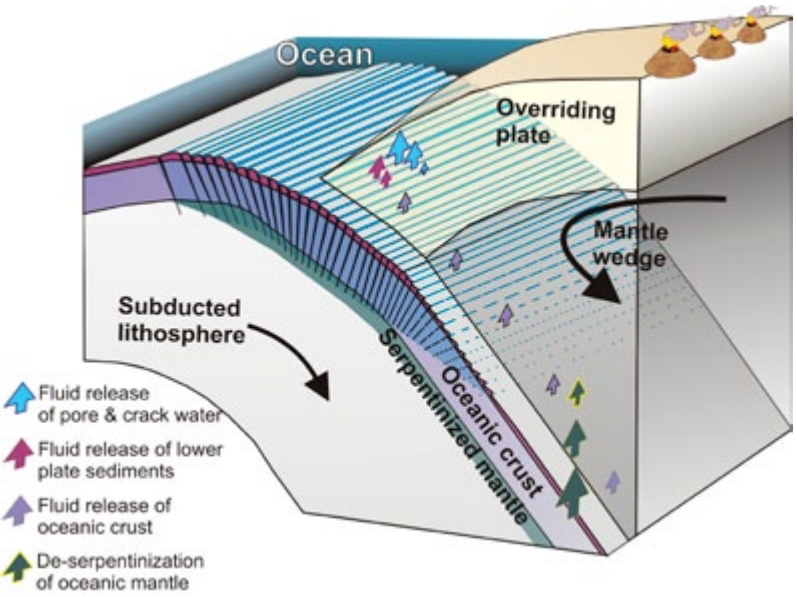
Water pathways from the deep-sea to volcanoes

fluid cycle studied in the Costa Rican subduction zone

20 December 2010.- Oceanic plates take up a lot of water when submerged into the Earths' interior at continental margins. This water plays a central role in plate boundary volcanism. A team of the Collaborative Research Centre (SFB) 574 "Fluids and Volatiles in Subduction Zones" in Kiel (Germany) has tracked the pathway of the water up to 120 kilometre depth. This is an important piece in the puzzle to understand the highly active volcanoes in Pacific "ring of fire". The study has recently been published in Nature Geoscience.

Many volcanoes need water for their eruption. In the upper mantle, water lowers the melting temperature of the rocks. As a consequence, it melts faster and can ascend in form of magma to the Earth's surface.

In areas where an oceanic plate is pushed underneath a continent by plate tectonics processes, large quantities of water reach the interior of the



Water pathways at subduction zones: through large cracks formed during the subduction process of the oceanic plates water penetrates, is partly captured and transported in the mantle. There, high pressure and temperatures squeeze it out of the subducting plate and the water ascends back to the surface. graphic: Worzewski

Earth. Such a region, called subduction zone, can be found at the west coast of Latin and South America. Through large cracks formed during the subduction process of the oceanic plates water penetrates, is partly captured and transported in the mantle. There, high pressure and temperatures squeeze it out of the subducting plate and the water ascends back to the surface. On the way back it supports the formation of magma. Therefore all subduction zones are characterized by volcanoes at the continental margin. "So far we knew that the entrainment of water into the Earth's mantle in the area of subductions zones is substantial and that it is released again by volcanic process. Nevertheless, the exact path of the water down to the mantle and back to the surface had so far not been shown in one unifying context", explains Tamara Worzewski, geophysicist in the Collaborative Research Centre (SFB) 574 "Fluids and Volatiles in Subduction Zones – Climate Feedback and Trigger Mechanisms for Natural Hazards" who has investigated these processes. Together with colleagues she was able to show for the first time the complete water path from the seafloor down to 120 kilometre depth and back to the surface using the magnetotelluric method to measure changes in the Earths' electromagnetic field from which the distribution of the conductivity of the ground can be derived.

"Measurements at greater depths are simply much more difficult", explains Dr. Marion Jegen, co-author of the study and supervisor of Worzewski's PhD study. Dr. Jegen is also heading a working group on magnetotelluric at SFB 574 and established the method for marine applications in Germany. In 2007 and 2008, a continuous chain of instruments was distributed across the subduction zone off the coast of Coast Rica. It extended from 200 kilometres off the coast to 160 kilometres on land beyond the volcanic chain in Costa Rica.

Reference

Worzewski, T., M. Jegen, H. Kopp, H. Brasse and W.T. Castillo, 2010, Magnetotelluric image of the fluid cycle in the Costa Rican subduction zone, Nature Geocience, http://dx.doi.org/10.1038/NGEO1041.

SFB 574

Volcanic ash

from Iceland's Grímsvötn volcano

27 May 2011.- This Envisat image shows a large cloud of ash north-east of Scotland that has been carried by winds from Iceland's Grímsvötn volcano about 1000 km away.

The Grímsvötn volcano, located in southeast Iceland about 200 km east of Reykjavik, began erupting on 21 May for the first time since 2004.

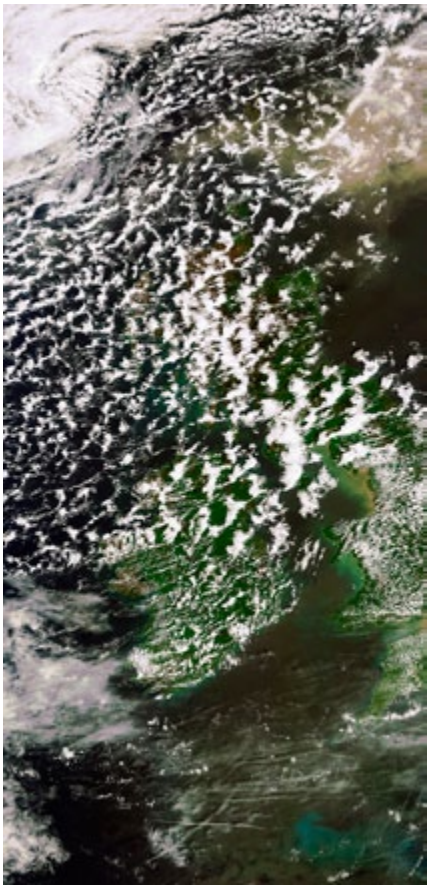
Despite being larger than the Eyjafjallajoekull eruption that reeked havoc on air traffic last year, the Grímsvötn eruption is not expected to be as impactful.

Still as winds pushed the ash cloud toward the UK, major airline carriers grounded flights on Wednesday that were due to fly in and out of Scotland and Ireland.

Volcanic eruptions eject large amounts of ash and trace gases such as sulphur dioxide into the atmosphere, often reaching the altitudes of scheduled flights.

When flying through a volcanic ash cloud, ash particles enter the jet engines and can result in engine failure. The ash can also severely damage the material of the aircraft.

Ensuring these hazards are addressed, the Volcanic Ash Advisory Centres (VAACs) were established in 1995 to gather information regarding volcanic ash clouds and to assess the possible hazard to aviation.



Cloud of ash north-east of Scotland that has been carried by winds from Iceland's Grímsvötn volcano. Credits: ESA

Satellite measurements offer an excellent means to follow the spread, extension, concentration and movement of volcanic plumes. To this end, ESA has developed dedicated services to provide fast alerts on volcanic eruptions to support VAACs within the Support to Aviation Control Service project.

Interestingly, numerous aircraft condensation trails, or 'contrails', are visible south of Ireland, about 800 km south of the ash cloud. 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.

This image was acquired on 24 May by Envisat's Medium Resolution Imaging Spectrometer at a resolution of 300 m.

ESA

Workshop on Glacial Erosion Modelling

Modelling glacial erosion: processes and uncertainties

Deeply incised valleys are common features in the Alps and their foreland. These valleys are of large practical and scientific interest, influencing the dynamics and hydrology of ice masses, presenting opportunities for glacial and climate reconstruction, and raising management issues related to aggregate, groundwater and hydrocarbon resources and radioactive waste disposal in deep geological repositories. Although the principles of glacial erosion are generally known, the formation of deeply incised valleys in the foreland of the Alps, referred to as deep glacial erosion, remains incompletely understood. In particular, the question as to when, where, and how future glaciations can lead to deep glacial erosion is relevant for the siting and long-term safety of radioactive waste repositories in northern Switzerland.

A workshop organized by the National Cooperative for the Disposal of Radioactive Waste (Nagra) in collaboration with the University of Zürich and held in Unterägeri, Switzerland in April 2010 was aimed at evaluating the state-of-the-art of modelling glacial erosion as a means for developing a better understanding of the subglacial processes governing landscape evolution in the Alpine foreland of northern Switzerland in past as well as future cold environments. An international group of leading experts was invited to contribute to an assessment on what quantitative information glacial erosion modelling can provide in view of safety aspects related to radioactive waste repositories in Switzerland.

The workshop was organised around a suite of presentations and discussions about observations and measurements related to glacial erosion as well as possibilities and challenges of glacial erosion modelling in view of future ice ages. The presentations were short introductions with the idea to acquaint all participants with the current state of research in the different areas of expertise. The discussions were structured in a way that led to answers to key questions.

The participants suggested that the deformation and thermomechanics of glacier ice are reasonably well understood and ice cover extent and ice flow paths can be modelled with good confidence. In contrast, basal processes including glacier hydrology, ice-bed interaction, sliding, sediment transport and interactions with permafrost are comparatively poorly understood and require considerable additional model development to be usefully incorporated into comprehensive coupled models. In this respect, glacier hydrology was particularly acknowledged as being important for realistic simulations of ice dynamics and erosional processes.

The participants generally agreed that prognostic modelling is beyond our present capabilities and not recommended because of substantial uncertainties in the quantification of basal processes and the relevant climate forcing for future glacial cycles. Instead, they suggested that diagnostic modelling has potential value for understanding processes and quantifying uncertainties and for testing sensitivities and process parameterizations.

According to the participants, modelling strategies that hold promise include ensemble modelling to explore the range of outcomes over the entire range of uncertainty in variables and extremal (end-member) modelling to bracket best and worst cases. These approaches can lead to the identification of potentially important processes and parameters and thus the component models needed (e.g. glacier hydrology, glacial sedimentary processes) for comprehensive coupled models.

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Bird-centric solutions to avian collisions

bird mortality caused by collisions from office block windows to power lines and wind turbines is the largest unintended human cause of avian fatalities worldwide

Ever been startled by a sudden thud on the window, only to see some poor bird fly away half-dazed? A study published in Ibis, the International Journal of Avian Science, sheds new light on why some species of bird are prone to colliding with large man—made objects, many of which seem easily avoidable to human eyes.

'From a human perspective it appears very odd that birds so often collide with large objects as if they don't see them', commented Professor Graham Martin from Birmingham University in the UK. It is widely held that flight in birds is controlled primarily by vision, but birds see different from humans.

To get a better understanding of how birds view the world Prof. Martin turned to sensory ecology, a field of study which investigates how sensory information underlies an animal's behaviour and its interactions with the environment. Until now, it has been a matter of finding a solution to bird collision problems based upon making the perceived hazard more conspicuous to humans, not birds.

The research revealed that a set of interrelationships exists between a bird's visual capacities, the interpretation of sensory information, and the behaviour of birds when flying in open airspace. 'When in flight, birds may turn their heads to look down, either with the binocular field or with the lateral part of an eye's visual field', explained Professor Martin. 'Such behaviour results in certain species being at least temporarily blind in the direction of travel'.

Professor Martin also explored how avian frontal vision is tuned for the detection of movement, rather than spatial detail. When a bird is hunting detecting movement may be more important than simply looking ahead into open

airspace. In addition, birds have a restricted range of flight speeds; for many birds it is simply impossible for them to fly slowly, making it difficult to adjust the rate of information they gain if visibility is reduced by rain, mist or low level lights.

The problem of bird collisions is a serious concern for conservationists. Research suggests that bird mortality caused by collisions with human artefacts — from office block windows to power lines and wind turbines — is the largest unintended human cause of avian fatalities worldwide. In Europe, it is estimated that over a 16—year period approximately 25 per cent of juvenile and 6 per cent of adult White Storks (Ciconia ciconia) died annually from power line collisions and electrocutions.

Prof. Martin said that 'while solutions may have to be considered on a species by species basis, where collision incidents are high it may be more effective to divert or distract birds from their flight path rather than attempt to make the hazard more conspicuous'.

Reference:

Graham R. Martin, April 2011, Understanding bird collisions with man-made objects: a sensory ecology approach, The International Journal of Avian Science, Volume 153, Issue 2, pages 239–254.

Chemical structure of fossils

fossils dating from the Palaeozoic era contained the polysaccharide chitin and structural protein, materials easily degraded by microorganisms.

24/02/2011.- The team included Professor George Cody from the Geophysical Laboratory at the Carnegie Institution for Science in Washington in the US and Professor Andrew C. Scott from the Department of Earth Sciences at Royal Holloway, University of London in the UK.

The oldest molecular signature of chitin-protein complex was previously discovered in 25-million-year-old Cenozoic fossils, while remnants of structural protein were found in 80 million-year-old Mesozoic fossils. But in this latest study, scientists found relicts of protein-chitin complex in fossils of arthropods from the Palaeozoic era — a finding that no one would have ever imagined.

Among other common features, arthropods have exoskeletons or cuticles. The outer portions of these cuticles are made up of a composite of chitin fibres that are embedded in a protein matrix. As chitin and structural protein are easily degraded by microorganisms, scientists presumed they would only be present in more recent fossils. While studying the fossil remains of a 310-million-year-old scorpion cuticle from the US state of Illinois and a 417-million-year-old eurypterid — an extinct scorpion-like arthropod, possibly related to horseshoe crabs — from Ontario in Canada, Professor Cody and his team discovered it wasn't true.

Using sophisticated analytical instrument at the Advanced Light Source facility in the US, the researchers measured the absorption spectra of low-energy X-rays by carbon, nitrogen and oxygen in the fossils. These measurements were taken at a resolution in the order of 25 nanometres. The researchers showed that the majority of carbon, nitrogen and oxygen found in these fossils from the Palaeozoic era came from a protein-chitin complex.

'This study shows that fossil arthropod cuticle exists as a nanoscale composite of waxes and degraded, but still nitrogen-rich, chitin-protein complex', the authors wrote.

Not surprisingly, the protein-chitin material was somewhat degraded, either by chemical processes or partial bacterial degradation, according to the scientists.

'It is clear that the fossil macromolecule differs considerably from the initial chitin-protein composite of the modern cuticle', the authors write. 'These differences can be interpreted as a result of extensive (but not complete) bacterial degradation and possibly subsequent diagenetic alteration', they add.

'Extensive degradation of ester, amide, and glycosidic bonds likely destroyed much of the chitin-protein complex and freed fatty acids', while 'water elimination from chitin yielded unsaturated carbon that increases absorption intensity in the aromatic and/or olefinic region'.

Professor Scott says the research would 'aid our understanding of the fossilisation process and this new technique allows us to reveal the chemical nature of the fossil without total destruction'.

The vestigial protein-chitin complex may play a 'critical role in organic fossil preservation by providing a substrate protected from total degradation by a coating waxy substances that protect the arthropods from desiccation,' he says.

EUROPA : Research Information Centre. Original URL: http://ec.europa.eu/research/headlines/news/article_11_02_24_en.html

Artefacts shed light on modern human journey

artefacts recently unearthed in the United Arab Emirates suggest that humans could have arrived on the Arabian Peninsula directly from Africa as early as 125 000 years ago

02/07/2011.- Researchers led by Hans-Peter Uerpmann from Eberhard Karls Universität Tübingen in Germany and Simon Armitage from Royal Holloway, University of London in the UK questioned traditional thinking on the arrival of Africans on the Arabian Peninsula after discovering an ancient human toolkit at the Jebel Faya archaeological site in the UAE. They said the toolkit resembled technology used by early humans in east Africa, but not the craftsmanship that emerged from the Middle East.

The toolkit, which includes relatively primitive hand-axes along with a variety of scrapers and perforators, suggested that technological innovation was not necessary for early humans to migrate onto the Arabian Peninsula, according to Dr Armitage. He and his team calculated the age of the stone tools using luminescence dating.

This is a relatively new method of dating archaeological sites and materials by measuring the amount of light energy trapped in mineral crystals. They determined that the artefacts were about 100.000 to 125.000 years old, concluding that humans could have arrived on the Arabian Peninsula as early as 125.000 years ago — directly from Africa rather than via the Nile Valley or the Near East, as researchers suggested in past studies.

'These anatomically modern humans — like you and me — had evolved in Africa about 200.000 years ago and subsequently populated the rest of the world', Dr Armitage says, adding that the findings 'should stimulate a re-evaluation of the means by which we modern humans became a global species'. The passage of modern humans from Africa to the Arabian Peninsula would most likely have been as part of a migration spreading across Europe, Asia and Australia.

Dr Uerpmann and his team also analysed sea-level and climate-change records for the region during the last interglacial period, approximately 130.000 years ago. They determined that the Bab al-Mandab Strait, which separates Arabia from the Horn of Africa, would have narrowed due to lower sea-levels, allowing safe passage prior to and at the beginning of the last interglacial period. At that time, the Arabian Peninsula was much wetter than today with greater vegetation cover and a network of lakes and rivers. Such a landscape would have allowed early humans access into Arabia and then into the Fertile Crescent region in Western Asia and India, according to the researchers.

'Archaeology without ages is like a jigsaw with the interlocking edges removed — you have lots of individual pieces of information but you can't fit them together to produce the big picture', Dr Armitage explains. 'At Jebel Faya, the ages reveal a fascinating picture in which modern humans migrated out of Africa much earlier than previously thought, helped by global fluctuations in sea-level and climate change in the Arabian Peninsula'.

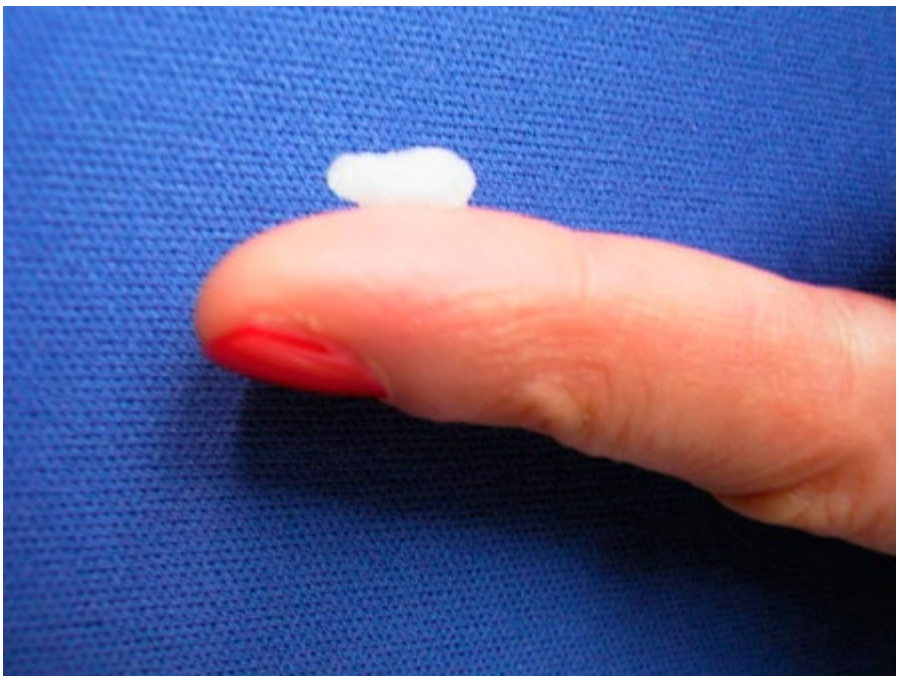
Source: Research Headlines.
Original URL: http://ec.europa.eu/research/headlines/news/article_11_02_07_en.html

Gas-phase Carbonic Acid Isolated

carbonic acid vapor is composed of at least three different species in the gas-phase

11 January 2011.- A team of chemists headed by Thomas Loerting from the University of Innsbruck and Hinrich Grothe from the Vienna University of Technology (TU Wien) have prepared and isolated gas-phase carbonic acid and have succeeded in characterizing the gas-phase molecules by using infrared spectroscopy. The results are published in the journal Angewandte Chemie International Edition.

Widespread belief still prevails that stable carbonic acid cannot be produced in pure form and is practically non-existent as it immediately decomposes to carbon dioxide and water. However, Innsbruck chemists headed by Erwin Mayer (Institute of General, Inorganic and Theoretical Chemistry) refuted this persistent dogma in chemistry several years ago. In an international first, the scientists have now produced gas-phase carbonic acid and, together with a research group headed by Hinrich Grothe at the Vienna University of Technology, they have also succeeded in proofing the existence of these molecules. Carbonic acid vapor is composed of at least three different species in the gas-phase: a cyclic dimer consisting of two molecules and two different types of monomers.



Innsbruck scientists were first in producing two types of carbonic acid crystals. (Photo: Uni Innsbruck).

For this experiment the researchers prepared carbonic acid in the laboratory in Innsbruck. It was then stored in liquid nitrogen and transported to Vienna by PhD student Jürgen Bernard. At the Institute of Materials Chemistry at the TU Wien the solid carbonic acid was warmed to minus 30 degrees Celsius. "During this process the carbonic acid molecules entered the gas-phase", says Loerting. This is a surprising result because many experts in the field

believed that carbonic acid immediately decomposes to carbon dioxide and water. The Austrian scientists trapped the carbonic acid vapor in a solid matrix of the inert gas argon and cooled it down. "This produced a frozen image of the carbonic acid vapor, which we analyzed by using high-resolution infrared spectroscopy at the TU Wien", says Hinrich Grothe. "The spectrum we produced is extremely precise and we were able to assign the spectral bands to the vibration of each single molecule". For more than a decade, the chemists have been supported in their experimental research by Klaus Liedl from the Institute of Theoretical Chemistry in Innsbruck. His team has helped to interpret the experimental data with computational models. Additional calculations have been performed by Oscar Galvez from CSIC Madrid (Spanish National Research Council).

This experiment not only is of high importance for basic research but also for astronomy. The identification of gas-phase carbonic acid in the atmosphere of celestial bodies may be facilitated by the detailed spectra of gas-phase carbonic acid described in this study. "Conditions in space environments suggest that gas-phase carbonic acid may be found in the coma of comets or the poles of Mars", says Thomas Loerting. "However, infrared spectra currently measured in extraterrestrial environments are still too imprecise to be comparable to the results produced in our laboratory".

Reference

Spectroscopic Observation of Gas-Phase Carbonic Acid Isolated in Matrix. Jürgen Bernard, Markus Seidl, Ingrid Kohl, Klaus Liedl, Erwin Mayer, Oscar Gálvez, Hinrich Grothe, Thomas Loerting. Angewandte Chemie International Edition. DOI: 10.1002/anie.201004729.

Reference url:
http://www.uibk.ac.at/

Dr Monica Dietl starts as COST Office Director

31 March 2011.- Dr Monica Dietl is joining the European Cooperation in Science and Technology (COST) as its new COST Office Director. COST is one of the longest running intergovernmental programmes supporting collaboration between scientists and researchers in Europe and beyond. The COST Office is provided by the European Science Foundation (ESF) through a European Commission contract.

COST provides a platform for European scientists to cooperate on a particular project and exchange expertise. These projects, called COST Actions, increase the mobility of researchers across Europe and foster the establishment of scientific excellence in the nine key domains.

As Director, Dr Dietl will support the COST Committee of Senior Officials (CSO), the decision-making body of the programme with representatives from the 36 COST countries, with the implementation of new research networks (called COST Actions) as well as strategic matters. She will also support the ESF in its capacity of implementing agent of COST activities.

Dr Dietl joins COST from the French National Research Centre (CNRS), where she was representative and Director of its Brussels office. Previously she worked as policy officer at the European Commission, Directorate General for Research, where she contributed to the preparation of the 7th Framework Programme for Research and Technological Development (FP7) "Ideas" programme and to the setting up of the European Research Council. Prior to that she was responsible for European and industrial partnerships in the CNRS life sciences department.

"COST plays an important role in the European Research Area and I am excited to be joining the organisation", said Dr Dietl. "As a researcher with experience in and with private and public institutions, I believe that its bottom-up approach gives COST a unique experience in linking research and innovation through scientific, often interdisciplinary, research performance which is of significant added value in shaping the European research landscape".

"Dr Dietl does indeed join us at a very important time for the programme", adds Dr Ángeles Rodríguez-Peña, COST CSO President. "For COST, 2011 is not only the halfway point of FP7 but also the year to highlight our 40 years of existence with an eye towards defining our contribution to the Europe 2020 strategy. The COST Office is the backbone of COST's structure and I am glad to have been able to attract someone of her calibre to the important role of COST Office Director".

Dr Dietl is a biologist specialising in neuroscience. She has carried out research at Université Paris VI 'Pierre et Marie Curie', the Lainz Hospital in Vienna, Sandoz in Basel, and the Collège de France in Paris. She has lived and worked in a wide range countries and multicultural environments, in both the private and public sector.

ESF

Study on planet's inner core

show it moving much slower than previously believed

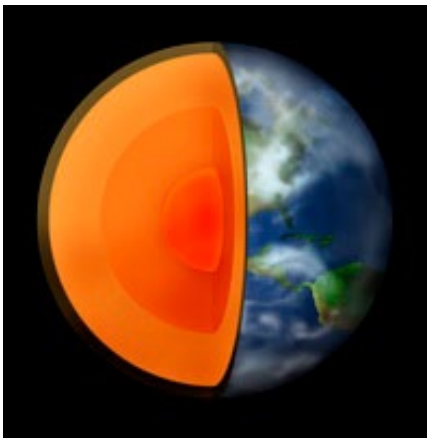
New EU-funded research offers the world an accurate estimate of the rotating speed of the Earth's core, suggesting it is a lot slower than was previously believed. However, the core continues to turn at faster rates than the rest of the planet. Presented in the journal Nature Geoscience, the findings are an outcome of the EARTH CORE STRUCTURE ('Thermal and compositional state of the Earth's inner core from seismic free oscillations') project, which was funded with a European Research Council (ERC) Starting Grant worth EUR 1.2 million under the Seventh Framework Programme (FP7). This information will allow the correction of the values usually used in models, which were previously considered to be higher rates of rotation movements of the core. If the models were based on wrong assumptions, all the previous calculations would need to be corrected on the basis of this new knowledge and data.

Researchers from the University of Cambridge, UK say earlier estimates that the core is rotating one degree a year faster than the rest of the planet were really off the mark. Based on their data, the core is actually moving at around one degree faster every million years. The team calculated the rotation rate from the shift of the core boundaries and the growth rate of the inner core.

Research leader Lauren Waszek, a PhD student from the Department of Earth Sciences at Cambridge, said: 'The faster rotation rates are incompatible with the observed hemispheres in the inner core because it would not allow enough time for the differences to freeze into the structure. This has previously been a major problem, as the two properties cannot co-exist. However, we derived the rotation rates from the evolution of the hemispherical structure, and thus our study is the first in which the hemispheres and rotation are inherently compatible'.

Scientists know that the inner core grows as material from the fluid outer core solidifies onto its surface. When this happens, say the researchers, an east-west hemispherical difference in velocity is frozen into the inner core's structure.

Using seismic body waves that pass through the inner core, the team evaluated the difference between the time it took those waves to travel with waves that reflect from the planet's inner core surface. This helped them determine the velocity structure of the uppermost 90 kilometres of the inner core. They used this information to establish the velocity for the inner core's east and west hemispheres.



Earth and its inner core. Credit: Shutterstock

'The Earth's solid core was first discovered by the observation of PKiKP, a seismic wave that travels through the mantle and outer core before reflecting from the sharp inner core boundary', the authors write. Composed mostly of iron, the inner core grows thanks to the solidification of outer core material onto the inner core boundary surface as the planet cools. The outcome is an older deeper structure.

'Although the thermal history of the inner core is debated, its uppermost structure results from processes occurring in the recent past, of which we have greatest understanding', the researchers write. 'This resulting time depth variation of the upper inner core is key to investigating any changing environment at the inner core boundary region associated with inner core super-rotation'.

Positioned at 5.200 kilometres beneath the surface of the Earth, the inner core plays a huge role in the surface of the planet. Heat released during the solidification — as the inner core grows — fuels convection in the outer core's fluid. This convection is responsible for producing the planet's geomagnetic field, which in turn keeps us safe from solar radiation and ultimately ensures life on Earth.

'This result is the first observation of such a slow inner core rotation rate', said Ms Waszek says. 'It therefore provides a confirmed value which can now be used in simulations to model the convection of Earth's fluid outer core, giving us additional insight into the evolution of our magnetic field'.

Source: Research Headlines, Original URL: http://ec.europa.eu/research/headlines/news/article_11_03_03_en.html

Data from the Korean Geostationary GOCI Sensor

GOCI RGB and Level-1B full resolution images now Available

Data from the Korean Geostationary Ocean Color Imager (GOCI) is now freely available. The Korea Ocean Satellite Centre (KOSC) started distributing GOCI data on 20 April 2011. They are currently producing GOCI RGB and Level-1B full resolution images. You will need to be a registered user to download the data from the KOSC home page (http://kosc.kordi.re.kr/index.kosc?lang=eng). To register, click the "Join" button on the KOSC home page and enter your personal details as well as a short proposal (Introduction) outlining your planned research using GOCI data.

Currently GOCI data is available for three time periods per day (11h, 12h, 13h local time) and will be extended to the full service of 8 times per day in due course.

The GOCI Data Processing System (GDPS) is not yet available but the software can nevertheless be downloaded and used as viewing software.

KORDI would very much appreciate receiving your feedback on their data service e.g. data download speed, ease of navigation on the homepage etc. Please send your comments and suggestions to: Mr. Hee-Jeong Han (Email: han77@kordi.re.kr).

New form of sulfur discovered in geological fluids

S3(-) ion

25 February 2011.- Sulfur is the sixth most abundant element on Earth and plays a key role in many geological and biological processes. A French-German team has identified, on the basis of laboratory measurements, a novel form of sulfur present in geological fluids: the S3(-) ion. The discovery calls existing theories about the geological transport of sulfur into question. The findings are published in the 25 February 2011 issue of the journal Science.

Until now, it was believed that inside the Earth, only two forms of molecules contained sulfur: sulfides (based on H2S or S(2-)) and sulfates (based on H2SO4 or SO4(2-)). The French-German team first created fluids similar to those in the Earth's crust and mantle, i.e. aqueous solutions containing elementary sulfur (S) and thiosulfates (molecules containing the S2O3(2−) ion). They then used a diamond anvil cell to bring the fluids to the temperatures and pressures found at depths of several kilometers.

The researchers used Raman spectroscopy to identify the chemical species, and they discovered not two, but three forms of sulfur, the third being the trisulfur ion S3(-). Although S3(-) was already known to chemists (it is found in sulfur-containing silicate glass and ultramarine pigments for instance), it had never been observed in an aqueous solution.

The detection of S3(-) during these experiments means that sulfur must be considerably more mobile in hydrothermal fluids in the Earth's crust than was previously thought. This is because, unlike sulfides and sulfates, which attach to minerals as soon as they appear in fluids, S3(-) proves to be extremely stable in the aqueous phase. This chemical species may therefore be the main metal transporting agent in two major types of gold and copper deposits: Archaean greenstone belts and subduction zone magmas.

The presence of S3(-) in hydrothermal fluids could affect sulfur isotope fractionation models, which until now have taken no account of this chemical species.

Reference:

The S3(-) Ion Is Stable in Geological Fluids at Elevated Temperatures and Pressures. Gleb S. Pokrovski and Leonid S. Dubrovinsky. Science. 25 February 2011.

Predicting tsunamis in Europe

TRANSFER and SAFER projects

A tsunami could happen on Europe's coasts, with the eastern Mediterranean being particularly vulnerable. The Mediterranean region has already been a victim of tsunamis in the past and there is every reason to believe that others will occur in the future. The TRANSFER and SAFER projects, supported by the European Commission under the Sixth Framework Programme for Research & Development, aim to contribute to understanding of tsunami processes in the Mediterranean and to develop an early warning system similar to the one used for the Pacific.

TRANSFER simulates tsunamis and develops programmes to analyse the risks to vulnerable coastal areas. The simulations give insight into the strength of waves and consequently allow predictions as to which coastal buildings and infrastructures might be able to stand up to them.

The SAFER project aims to develop an early warning system to guarantee the protection of civil populations. Indeed, timely warnings enable people to take shelter and might even help prevent a devastating death toll.

Research on tsunamis is still immature. Although seismic activity has been taking place for thousands of years, observation of these phenomena has only been in place for around a century.

Documentation

* The TRANSFER Project (http://www.transferproject.eu/)
* The SAFER project (http://www.saferproject.net/)

Pathway for mercury to enter the atmosphere

through bromine induced oxidation

27/2/2011.- Prof. Menachem Luria from the Fredy and Nadine Herrmann Institute of Earth Sciences at the Hebrew University and Dr. Daniel Obrist of the University of Nevada, found that "passive" mercury normally found in the atmosphere is converted into an "active", oxidized form in the presence of bromine.

The air over the Dead Sea was chosen for the experiments on mercury oxidation – even though it does not contain any fish – since it has unusually high levels of bromine that is emitted from the surface into the atmosphere, converting the mercury there into the oxidized mercury.

"In the world generally, the amount of oxidized mercury in the atmosphere constitutes about one percent of all the mercury in the atmosphere", said Prof. Luria, "while above the Dead Sea the oxidized mercury often amounts up to about 50 percent".

In fact, the bromine in the air over the Dead Sea is 200 times greater than over other bodies of water, say the researchers, due not only to the high level of bromine present on the surface but also to the high rate of its evaporation into the atmosphere because of the very high temperatures there.

Although health officials in the world have issued warnings from time to time about the danger of mercury found in fish, the process by which the inactive mercury is converted into the active, oxidized form was previously unknown. The current research has now revealed how this occurs, with the resultant introduction of this dangerous, active form of mercury into the fish food chain and ultimately into humans through the consumption of sea food.

Reference

1.Bromine-induced oxidation of mercury in the mid-latitude atmosphere. Daniel Obrist, Eran Tas, Mordechai Peleg, Valeri Matveev, Xavier Faïn, David Asaf, Menachem Luria. Nature Geoscience 4, 22-26 (28 November 2010) doi:10.1038/ngeo1018 Letter

Global fungal spore emissions

review and synthesis of literature data

The present paper summarizes fungal spore emission fluxes in different biomes. A literature study has been conducted and emission fluxes have been calculated based on 35 fungal spore concentration datasets. Biome area data has been derived from the World Resource Institute. Several assumptions and simplifications needed to be adopted while aggregating the data: results from different measurement methods have been treated equally, while diurnal and seasonal cycles have been neglected. Moreover flux data were aggregated to very coarse biome areas due to scarcity of data. Results show number fluxes per square meter and second of 194 for tropical and subtropical forests, 203 for all other forests, 1203 for shrub, 2509 for crop, 8 for tundra, and 165 for grassland. No data were found for land ice. The annual mean global fluxes amount to 1.69 × 10–11 kg m−2 s−1 as the best estimates, and 9.01 × 10–12 kg m−2 s−1 and 3.28 × 10–11 kg m−2 s−1 as the low and high estimate, respectively.

The full paper is available free of charge at http://www.biogeosciences.net/8/1181/2011/bg-8-1181-2011.pdf

Sesartic, A. and Dallafior, T. N.: Global fungal spore emissions, review and synthesis of literature data, Biogeosciences, 8, 1181-1192, doi:10.5194/bg-8-1181-2011, 2011.

Worldwide trend of atmospheric mercury since 1995

substantial reduction of the atmospheric mercury burden since 1996 at odds with the current mercury emission inventories

Concern about the adverse effects of mercury on human health and ecosystems has led to tightening emission controls since the mid 1980s. But the resulting mercury emissions reductions in many parts of the world are believed to be offset or even surpassed by the increasing emissions in rapidly industrializing countries. Consequently, concentrations of atmospheric mercury are expected to remain roughly constant.

Here the authors show that the worldwide atmospheric mercury concentrations have decreased by about 20 to 38 % since 1996 as indicated by long-term monitoring at stations in the Southern and Northern Hemispheres combined with intermittent measurements of latitudinal distribution over the Atlantic Ocean. The total reduction of the atmospheric mercury burden of this magnitude within 14 years is unusually large among most atmospheric trace gases and is at odds with the current mercury emission inventories with nearly constant anthropogenic emissions over this period. This suggests a major shift in the biogeochemical cycle of mercury including oceans and soil reservoirs. Decreasing reemissions from the legacy of historical mercury emissions are the most likely explanation for this decline since the hypothesis of an accelerated oxidation rate of elemental mercury in the atmosphere is not supported by the observed trends of other trace gases. Acidification of oceans, climate change, excess nutrient input and pollution may also contribute by their impact on the biogeochemistry of ocean and soils. Consequently, models of the atmospheric mercury cycle have to include soil and ocean mercury pools and their dynamics to be able to make projections of future trends.

The full paper is available free of charge at http://www.atmos-chem-phys.net/11/4779/2011/acp-11-4779-2011.pdf

Slemr, F., Brunke, E.-G., Ebinghaus, R., and Kuss, J.: Worldwide trend of atmospheric mercury since 1995, Atmos. Chem. Phys., 11, 4779-4787, doi:10.5194/acp-11-4779-2011, 2011.

Resurrecting the dead-water phenomenon

described in the PhD thesis of Ekman in 1904

The authors revisit experimental studies performed by Ekman on dead-water (Ekman, 1904) using modern techniques in order to present new insights on this phenomenon. For sailors, the dead-water phenomenon is a well-known peculiar phenomenon, when a boat evolving on a two-layer fluid feels an extra drag due to waves being generated at the interface between the two layers whereas the free surface remains still.

The authors extend its description to more general situations such as a three-layer fluid or a linearly stratified fluid in presence of a pycnocline, showing the robustness of dead-water phenomenon. They observe large amplitude nonlinear internal waves which are coupled to the boat dynamics, and they emphasize that the modeling of the wave-induced drag requires more analysis, taking into account nonlinear effects.

The full paper is available free of charge at http://www.nonlin-processes-geophys.net/18/193/2011/npg-18-193-2011.pdf

Reference

Ekman, V. W.: On dead water, Norw. N. Polar Exped. 1893–1896: Sci. Results, XV, Christiana, Ph.D. thesis, 1904.

Mercier, M. J., Vasseur, R., and Dauxois, T.: Resurrecting dead-water phenomenon, Nonlin. Processes Geophys., 18, 193-208, doi:10.5194/npg-18-193-2011, 2011.

Thermodynamic dissipation theory for the origin of life

mechanism is proposed for the reproduction of RNA and DNA promoted through UV light dissipation and diurnal temperature cycling without the need for enzymes

Understanding the thermodynamic function of life may shed light on its origin. Life, as are all irreversible processes, is contingent on entropy production. Entropy production is a measure of the rate of the tendency of Nature to explore available microstates. The most important irreversible process generating entropy in the biosphere and, thus, facilitating this exploration, is the absorption and transformation of sunlight into heat.

Here the authors hypothesize that life began, and persists today, as a catalyst for the absorption and dissipation of sunlight on the surface of Archean seas. The resulting heat could then be efficiently harvested by other irreversible processes such as the water cycle, hurricanes, and ocean and wind currents. RNA and DNA are the most efficient of all known molecules for absorbing the intense ultraviolet light that penetrated the dense early atmosphere and are remarkably rapid in transforming this light into heat in the presence of liquid water. From this perspective, the origin and evolution of life, inseparable from water and the water cycle, can be understood as resulting from the natural thermodynamic imperative of increasing the entropy production of the Earth in its interaction with its solar environment. A mechanism is proposed for the reproduction of RNA and DNA without the need for enzymes, promoted instead through UV light dissipation and diurnal temperature cycling of the Archean sea-surface.

The full paper is available free of charge at http://www.earth-syst-dynam.net/2/37/2011/esd-2-37-2011.pdf

Michaelian, K.: Thermodynamic dissipation theory for the origin of life, Earth Syst. Dynam., 2, 37-51, doi:10.5194/esd-2-37-2011, 2011.

Atmospheric new particle formation

real and apparent growth of neutral and charged particles

In this study the authors have provided simple analytical formulae to estimate the growth rate of a nucleation mode due to self-coagulation and the apparent growth rate due to coagulation scavenging by larger particles. These formulae were used on a set of simulations covering a wide range of atmospheric conditions. The modal growth rates were determined from the simulation results by summing the contribution of each process, by calculating the increase rate in the count mean diameter of the mode and by following the peak concentration of the mode. The results of these three methods were compared with each other and the means used to estimate the growth rate due to self-coagulation and coagulation scavenging were found to give accurate values.

The authors also investigated the role of charged particles and electric interactions in the growth of a nucleation mode. Charged particles were found to increase the growth rate due to both self-coagulation and coagulation scavenging by a factor of ~1.5 to 2. In case of increased condensation onto charged particles, the total condensational growth rate of a nucleation mode may increase significantly in the very early steps of the growth. The analytical formulae provided by this paper were designed to provide the growth rates due to different processes from aerosol dynamic simulations, but the same principles can be used to determine the growth rates from measurement data.

The full paper is available free of charge at http://www.atmos-chem-phys.net/11/4939/2011/acp-11-4939-2011.pdf

Leppä, J., Anttila, T., Kerminen, V.-M., Kulmala, M., and Lehtinen, K. E. J.: Atmospheric new particle formation: real and apparent growth of neutral and charged particles, Atmos. Chem. Phys., 11, 4939-4955, doi:10.5194/acp-11-4939-2011, 2011.

Medusa-1.0: a new intermediate complexity plankton ecosystem model for the global domain

state variables, differential equations, functional forms and parameter values is included, with particular attention on the submodel for the export of organic carbon

The ongoing, anthropogenically-driven changes to the global ocean are expected to have significant consequences for plankton ecosystems in the future. Because of the role that plankton play in the ocean's "biological pump", changes in abundance, distribution and productivity will likely have additional consequences for the wider carbon cycle. Just as in the terrestrial biosphere, marine ecosystems exhibit marked diversity in species and functional types of organisms. Predicting potential change in plankton ecosystems therefore requires the use of models that are suited to this diversity, but whose parameterisation also permits robust and realistic functional behaviour.

In the past decade, advances in model sophistication have attempted to address diversity, but have been criticised for

doing so inaccurately or ahead of a requisite understanding of underlying processes. Here the authors introduce MEDUSA-1.0 (Model of Ecosystem Dynamics, nutrient Utilisation, Sequestration and Acidification), a new "intermediate complexity" plankton ecosystem model that expands on traditional nutrient-phytoplankton-zooplankton-detritus (NPZD) models, and remains amenable to global-scale evaluation. MEDUSA-1.0 includes the biogeochemical cycles of nitrogen, silicon and iron, broadly structured into "small" and "large" plankton size classes, of which the "large" phytoplankton class is representative of a key phytoplankton group, the diatoms. A full description of MEDUSA-1.0's state variables, differential equations, functional forms and parameter values is included, with particular attention focused on the submodel describing the export of organic carbon from the surface to the deep ocean. MEDUSA-1.0 is used here in a multi-decadal hindcast simulation, and its biogeochemical performance evaluated at the global scale.

The full paper is available free of charge at http://www.geosci-model-dev.net/4/381/2011/gmd-4-381-2011.pdf

Yool, A., Popova, E. E., and Anderson, T. R.: Medusa-1.0: a new intermediate complexity plankton ecosystem model for the global domain, Geosci. Model Dev., 4, 381-417, doi:10.5194/gmd-4-381-2011, 2011.

The global ocean circulation on a retrograde rotating earth

used to study the surface freshwater flux impact on the Atlantic Meridional Overturning Circulation asymmetry

To understand the three-dimensional ocean circulation patterns that have occurred in past continental geometries, it is crucial to study the role of the present-day continental geometry and surface (wind stress and buoyancy) forcing on the present-day global ocean circulation. This circulation, often referred to as the Conveyor state, is characterised by an Atlantic Meridional Overturning Circulation (MOC) with a deep water formation at northern latitudes and the absence of such a deep water formation in the North Pacific. This MOC asymmetry is often attributed to the difference in surface freshwater flux: the Atlantic as a whole is a basin with net evaporation, while the Pacific receives net precipitation.

This issue is revisited in this paper by considering the global ocean circulation on a retrograde rotating earth, computing an equilibrium state of the coupled atmosphere-ocean-land surface-sea ice model CCSM3. The Atlantic-Pacific asymmetry in surface freshwater flux is indeed reversed, but the ocean circulation pattern is not an Inverse Conveyor state (with deep water formation in the North Pacific) as there is relatively weak but intermittently strong deep water formation in the North Atlantic. Using a fully-implicit, global ocean-only model the stability properties of the Atlantic MOC on a retrograde rotating earth are also investigated, showing a similar regime of multiple equilibria as in the present-day case.

These results indicate that the present-day asymmetry in surface freshwater flux is not the most important factor setting the Atlantic-Pacific salinity difference and, thereby, the asymmetry in the global MOC.

The full paper is available free of charge at http://www.clim-past.net/7/487/2011/cp-7-487-2011.pdf

Kamphuis, V., Huisman, S. E., and Dijkstra, H. A.: The global ocean circulation on a retrograde rotating earth, Clim. Past, 7, 487-499, doi:10.5194/cp-7-487-2011, 2011.

Evolution and Biodiversity GIFT Workshop

during the last General Assembly

At this year's EGU General Assembly (Vienna, 3-8 April, 2011)80 teachers from 19 different countries have participated this year to the GIFT Workshop «Evolution and Biodiversity».

Only the main aspects of the study of Evolution have been addressed during the two and a half days dedicated to the workshop:

- the geological point of view
- the molecular genetics aspects
- the possible influence of « external » factors such as an impact by a meteorite or huge volcanic eruptions
- the aspects of recent human evolution.

Two «round table discussions» have been scheduled at the end of each day, one focussed on Evolution, the second one on Biodiversity.

As part of GIFT an Educational Poster Session has also been organized, "Science in tomorrow's classroom", specifically to allow the teachers to show their classroom activities, not only to their fellow teachers, but also to all the participants of the EGU General Assembly.

To encourage communication among teachers, we have included some "teacher-to-teachers" communications in the program, one on a classroom activity (Phylogen), a second on the Earth Sciences Olympiads for teachers in 2011, and a third about a new web site specifically aimed at making connections among GIFT teachers. Finally, an entire morning has been dedicated to hands-on activities led by a science communicator.

A 78-page brochure on the Workshop can be downloaded at http://www.egu.eu/fileadmin/files/GIFT/gift_brochure_2011.pdf

EGU Office

EIROforum teachers school

Many of you may be interested in the forthcoming teacher workshop given by EIROforum, the publisher of Science in School. The deadline for applications is fast approaching, so you will need to apply soon.

This free, three-day course is entitled 'Physics and chemistry of life' and is open to European science teachers. It will take place at the European Photon and Neutron Science Campus in Grenoble, France, from 9-12 October 2011.

Participants will attend a series of short lectures and laboratory tutorials in small groups. Time slots are reserved for participants to exchange classroom experience, and for visits to the research laboratories.

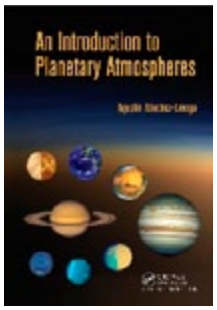
The course lectures, tutorials and practicals will be given by top scientists from four of the EIROforum members: the European Molecular Biology Laboratory, the European Synchrotron Radiation Facility, the Institute Laue-Langevin and the European X-ray Free Electron Laser.

There are no course fees, and accommodation and food are provided free. Travel costs up to 400 EUR will be covered for the participants.

To apply, visit http://tinyurl.com/eiroschool and upload your CV and an application letter. The deadline is 15 May 2011.

Eleanor Hayes
Editor-in-Chief of Science in School
editor@scienceinschool.org
http://www.scienceinschool.org

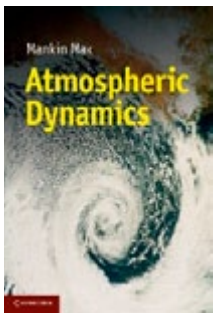
Forests, Water and People in the Humid Tropics



Authors: Agustin Sanchez-Lavega
Publisher: CRC Press (Taylor & Francis Group)
ISBN: 9781420067323
YEAR : 2010
EDITION : 1st
PAGES : 587
PRICE : 64.00 €
Hardback

Planetary atmospheres is a relatively new, interdisciplinary subject that incorporates various areas of the physical and chemical sciences, including geophysics, geophysical fluid dynamics, atmospheric science, astronomy, and astrophysics. Providing a much-needed resource for this cross-disciplinary field, An Introduction to Planetary Atmospheres presents current knowledge on atmospheres and the fundamental mechanisms operating on them. The author treats the topics in a comparative manner among the different solar system bodies—what is known as comparative planetology. Based on an established course, this comprehensive text covers a panorama of solar system bodies and their relevant general properties. It explores the origin and evolution of atmospheres, along with their chemical composition and thermal structure. It also describes cloud formation and properties, mechanisms in thin and upper atmospheres, and meteorology and dynamics. Each chapter focuses on these atmospheric topics in the way classically done for the Earth's atmosphere and summarizes the most important aspects in the field. The study of planetary atmospheres is fundamental to understanding the origin of the solar system, the formation mechanisms of planets and satellites, and the day-to-day behavior and evolution of Earth's atmosphere. With many interesting real-world examples, this book offers a unified vision of the chemical and physical processes occurring in planetary atmospheres.

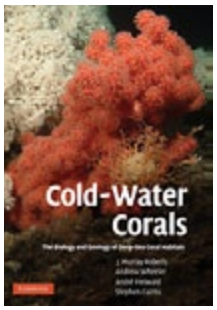
Atmospheric Dynamics



Authors: Mankin Mak
Publisher: Cambridge University Press
ISBN: 9780521195737
YEAR : 2011
EDITION : 1st
PAGES : 486
PRICE : 39.70 €
Hardback

Atmospheric dynamics is a core component of all atmospheric science curricula. It is concerned with how and why different classes of geophysical disturbances form, what dictates their structure and movement, how the Earth's uneven surface impacts with them, how they evolve to mature stage, how they interact with the background flow, how they decay and how they collectively constrain the general circulation of the atmosphere. Mankin Mak's new textbook provides a self-contained course on atmospheric dynamics. The first half of the book is suitable for undergraduates, and develops the physical, dynamical and mathematical concepts at the fundamental level. The second half of the book is aimed at more advanced students who are already familiar with the basics. The contents have been developed from many years of the author's teaching at the University of Illinois. The discussions are supplemented with schematics, weather maps and statistical plots of the atmospheric general circulation. Students often find the connection between theoretical dynamics and atmospheric observation somewhat tenuous, and this book demonstrates a strong connection between the key dynamics and real observations in the atmosphere, with many illustrative analyses in the simplest possible model settings. Physical reasoning is shown to be even more crucial than mathematical skill in tackling dynamical problems. This textbook is an invaluable asset for courses in atmospheric dynamics for undergraduates as well as for graduate students and researchers in atmospheric science, ocean science, weather forecasting, environmental science and applied mathematics. Some background in mathematics and physics is assumed.

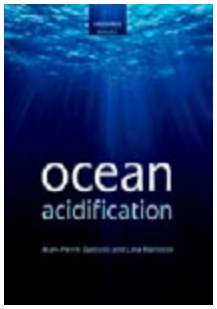
Cold-Water Corals



Authors: J. Murray Roberts, Andrew J. Wheeler, André Freiwald and Stephen D. Cairns
Publisher: Cambridge University Press
ISBN: 9780521884853
YEAR : 2009
EDITION : 1st
PAGES : 352
PRICE : 93.00 €
Hardback

There are more coral species in deep, cold waters than in tropical coral reefs. This broad-ranging treatment is the first to synthesise current understanding of all types of cold-water coral, covering their ecology, biology, palaeontology and geology. Beginning with a history of research in the field, the authors describe the approaches needed to study corals in the deep sea. They consider coral habitats created by stony scleractinian as well as octocoral species. The importance of corals as long-lived geological structures and palaeoclimate archives is discussed, in addition to ways in which they can be conserved. Topic boxes explain unfamiliar concepts, and case studies summarise significant studies, coral habitats or particular conservation measures. Written for professionals and students of marine science, this text is enhanced by an extensive glossary, online resources (www.lophelia.org/coldwatercoralsbook), and a unique collection of colour photographs and illustrations of corals and the habitats they form.

Ocean Acidification



Authors: Jean-Pierre Gattuso and Lina Hansson
Publisher: Oxford University Press
ISBN: 9780199591084
YEAR : 2011
EDITION : 1st
PAGES : 368
PRICE : 85.00 €
Hardback

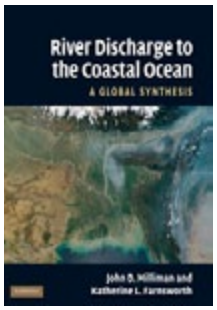
This book:

•Synthesizes the findings of recent national and international research efforts, including those of EPOCA (European Project on Ocean Acidification), set in a broader global context.

•Reviews our current knowledge of the chemical, biological, biogeochemical, and societal implications of ocean acidification, with a particular emphasis on its impact on marine organisms and ecosystems.

•Assesses the uncertainties, risks, and thresholds related to ocean acidification at molecular, cellular, organismal, local, and global scales. The ocean helps moderate climate change thanks to its considerable capacity to store CO2, through the combined actions of ocean physics, chemistry, and biology. This storage capacity limits the amount of human-released CO2 remaining in the atmosphere. As CO2 reacts with seawater, it generates dramatic changes in carbonate chemistry, including decreases in pH and carbonate ions and an increase in bicarbonate ions. The consequences of this overall process, known as “ocean acidification”, are raising concerns for the biological, ecological, and biogeochemical health of the world’s oceans, as well as for the potential societal implications. This research level text is the first to synthesize the very latest understanding of the consequences of ocean acidification, with the intention of informing both future research agendas and marine management policy. A prestigious list of authors has been assembled, among them the coordinators of major national and international projects on ocean acidification.

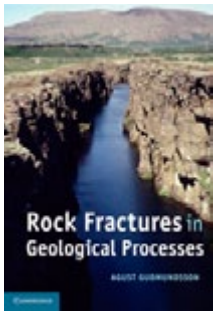
River Discharge to the Coastal Ocean



Authors: John D. Milliman and Katherine L. Farnsworth
Publisher: Cambridge University Press
ISBN: 9780521879873
YEAR : 2011
EDITION : 1st
PAGES : 384
PRICE : 113.80 €
Hardback

Rivers provide the primary link between land and sea, historically discharging annually about 36000 km3 of freshwater and more than 20 billion tons of solid and dissolved sediments to the global ocean. Together with tides, winds, waves, currents, and geology, rivers play a major role in determining the estuarine and coastal environment. The movement of freshwater and the distribution of river-derived sediments to the ocean have fundamental impacts on a wide variety of coastal environments, ranging from the Mississippi and Nile deltas, to coastal Siberia, to the Indonesian archipelago. Utilizing the world's largest database – 1534 rivers that drain more than 85% of the landmass discharging into the global ocean – this book presents a detailed analysis and synthesis of the processes affecting the fluvial discharge of water, sediment, and dissolved solids. The ways in which climatic variation, episodic events, and anthropogenic activities – past, present, and future – affect the quantity and quality of river discharge are discussed in the final two chapters. The book contains more than 165 figures – many in full color – including global and regional maps. An extensive appendix presents the 1534-river database as a series of 44 tables that provide quantitative data regarding the discharge of water, sediment and dissolved solids. The appendix's 140 maps portray the morphologic, geologic, and climatic character of the watersheds. The complete database is also presented within a GIS-based package.

Rock Fractures in Geological Processes



Authors: Agust Gudmundsson
Publisher: Cambridge University Press
ISBN: 9780521863926
YEAR : 2011
EDITION : 1st
PAGES : 578
PRICE : 52.00 €
Hardback

Rock fractures control many of Earth's dynamic processes, including plate-boundary development, tectonic earthquakes, volcanic eruptions, and fluid transport in the crust. An understanding of rock fractures is also essential for effective exploitation of natural resources such as ground water, geothermal water, and petroleum. This book combines results from fracture mechanics, materials science, rock mechanics, structural geology, hydrogeology, and fluid mechanics to explore and explain fracture processes and fluid transport in the crust. Basic concepts are developed from first principles and illustrated with worked examples linking models of geological processes to real field observations and measurements. Many additional examples and exercises are provided online, allowing readers to practise formulating and quantitative testing of models. Rock Fractures in Geological Processes is designed for courses at the advanced undergraduate and graduate level but also forms a vital resource for researchers and industry professionals concerned with fractures and fluid transport in the Earth's crust.

Joint Training Course on Remote Sensing Data Analysis - Course

08/10/2011 - 12/10/2011 - Vladivostok, Russia

In collaboration with the North Pacific Marine Science Organization (PICES) and IOC Sub-Commission for the Western Pacific (WESTPAC), the Special Monitoring & Coastal Environmental Assessment Regional Activity Centre (CEARAC), one of the four Regional Activity Centres of the Northwest Pacific Action Plan (NOWPAP), will conduct an intensive training course at V.I. Il'ichev Pacific Oceanological Institute in Vladivostok, Russia from October 8-12, 2011 on the analysis of remote sensing data, with a focus on the Northwest Pacific Ocean. The course will consist of lectures by experts and hands-on tutorial sessions on analysis of satellite data. This training course aims at providing opportunities for students, young researchers and coastal managers to obtain useful skills and knowledge to utilize remote sensing data to monitor and assess the coastal and marine environment.

Submission deadline is June 30, 2011.

Successful applicants will be notified by the end of July, 2011.

Please see the 1st Announcement (http://cearac.nowpap.org/monitoring/3rdRST/1st_Announcement.html) for further details. The IOCCG is a co-sponsor of this training course.

Organizer:

V.I.Il'ichev Pacific Oceanological Institute

http://cearac.nowpap.org/monitoring/3rdRST/1st_Announcement.html

TTORCH Summer school 2011 - Course

27/09/2011 - 04/10/2011 - Hyytiala, Forestry Field Station, Finland

The first TTORCH Summer School will take place between 27 September and 4 October 2011 at Hyytiala Forestry Field Station, in Finland. Local hosts are Timo Vesala and Ivan Mammarella.

The school will be organized in three sections: Atmospheric composition, Atmospheric measurements and Atmospheric modeling. The last two sections will each include a practical session.

Lecturers include: Christoph Gerbig, Martin Heimann, Sander Houweling, Jürgen Kesselmeier, Maarten Krol, Ingeborg Levin, Anders Lindroth, John Moncrieff, Xavier Rodo and Timo Vesala.

The school is mainly oriented to PhD students, but a number of PostDocs and master students preparing to start a Doctorate will be accepted.

For application, the candidate should prepare a document containing the CV, a short description of her/his work and a recommendation letter of the supervisor. The selection will take into account the connection between the candidate's research subject and the TTORCH focus.

Most of the costs (accommodation, catering, organization and lectures) will be covered from TTORCH funds. The students will have to pay themselves the travel costs only.

Please visit www.ttorch.org for more information.

Contact:

Elena Popa (epopa2@yahoo.com); Alex Vermeulen (a.vermeulen@ecn.nl).

Organizer:

TTORCH (Tall Tower and surface Observation Research Network for verification of Climate relevant emissions of Human origin in Europe) is an ESF Research Networking Programme focusing on measurements and modelling of non-CO2 greenhouse gases (CH4, N2O, SF6) and related tracers (e.g., CO, H2, 14CO2, O2/N2). The main purpose of TTORCH is to support and help improve the European network of observations of greenhouse gases through communication, workshops, grants for exchange visits and summer schools.

http://www.ttorch.org/

Elena Popa

13th Plinius Conference on Mediterranean Storms - Meeting

07/09/2011 - 09/09/2011 - Savona, Italy

Since its first edition, in 1999, the Plinius Conference on Mediterranean Storms has provided a crucial interdisciplinary contribution for improving our understanding of hazardous weather-related storms of over the Mediterranean basin.

The objective of the 2011 edition of the Conference, the 13th of the series, is to provide an interdisciplinary forum for presentations and discussions of our current state of knowledge, as well as motivating new research and applications within the variety of disciplines related to Mediterranean storms and their impacts on people.

Over these last 13 years, the scientific community that contributes to the conference has achieved enormous success in the understanding of many of the scientific aspects of Mediterranean storms. The conference has undoubtedly helped to increase the knowledge about the causes, to improve the modeling and prediction capabilities, to identify the sources of uncertainty, to improve the observation and management of weather-related disasters in the Mediterranean area. This achievement was undoubtedly due to the inter-disciplinary nature of the conference. We strongly encourage and support then the participation of experts in different disciplines, including: meteorology, climatology, oceanography, hydrology, geology, sociology, economics, ICT, decision-making. Experts from these disciplines will be able to present their own unique perspectives on how to understand and manage storm-related disasters across the Mediterranean basin.

The conference will cover a wide range of topics related to extreme events in the Mediterranean, including: (i) the causes and physics of extreme events; (ii) the possible changes in behavior of extremes resulting from climate change; (iii) advanced techniques of observation; (iv) modeling and forecasting techniques; (v) social impact, information dissemination, sustainable development and emergency management.

Issues to be addressed by the 13th Plinius Conference on Mediterranean Storms will generally fit within one of the following topic areas:

Topic 1: Societal impacts of Mediterranean Storms

Topic 2: Monitoring of Mediterranean Storms

Topic 3: Diagnosis and Forecasting of Mediterranean Storms

Topic 4: Hydrometeorology and hydrology of Mediterranean Storms

Topic 5: Mediterranean hazards of different origin

Along with the conference meetings of international projects focused on topics related to the objectives of the conference will be organized, in order to give opportunity for wider audience to get in touch with the scientific communities that manage these projects.

Organizer:

EGU Topical Conference Series

http://meetings.copernicus.org/plinius13/home.html

Abstract submission - Earth Observation for Ocean-Atmosphere Interactions - Meeting

29/11/2011 - 02/12/2011 - Frascati (Rome), Italy

This is to inform you that abstract submission is now open for the topical conference on Earth Observation for Ocean-Atmosphere Interactions Science that will take place at the ESA premises of ESRIN in Frascati (Rome), Italy from 29 November – 2 December 2011.

Contributions are invited for oral and poster presentations on novel research activities and developments exploiting EO data in support to ocean-atmosphere interaction studies.

The deadline for abstract submission is 29 April 2011.

For detailed information about organization, abstract submission (plain text, max 5000 characters) and registration, please visit the conference website: http://www.eo4oceanatmosphere.info/.

Many thanks in advance for your contribution and best regards.

Organizer:

ESA Conference Bureau on behalf of the Organising Committee:

- Bernard Barnier (University of Grenoble, France, EGU Ocean Sciences)
- Craig Donlon (ESA-ESTEC, the Netherlands)
- Diego Fernández Prieto (ESA-ESRIN, Italy)
- Christoph Garbe (University of Heidelberg, Germany, SOLAS SSC)
- Simon Pinnock (ESA-ESRIN, Italy)
- Roberto Sabia (ESA-ESRIN, Italy)
- Brian Ward (NUIG, Ireland, SOLAS SSC)

http://www.eo4oceanatmosphere.info/

CAREX Conference on Life in Extreme Environments - Meeting

18/10/2011 - 20/10/2011 - Stillorgan Park Hotel, Dublin, Ireland

Building up on the project's activities and community, the CAREX conference will be a key event on the European and international scenes providing the opportunity to discuss and present the state of the art and the latest developments on research on life in extreme environments.

Following CAREX's approach to research on life in extreme environment, the conference will be a truly interdisciplinary event. Oral presentations and posters will consider microbes, plants and animals evolving in various marine, polar, terrestrial extreme environments as well as outer space. It will be a unique opportunity to network and elaborate on cross-disciplinary scientific challenges.

The programme Committee expects participation from around 150 European and international scientists.

This conference and the call for papers will be structured around five overarching themes:

· Stressful environments - responses, adaptation and evolution

· Biodiversity, bioenergetics and interactions in extreme environments

· Contributions of life in extreme environments to biogeochemical cycles and

responses to environmental change

· Life and habitability

· Technology Development

Abstract Submission Deadline: 29 April 2011

A limited number of grants will be available for early career scientists (PhD students and Postdocs).

http://www.carex-eu.org/activities/carex-conference-on-life-in-extreme-environments.html

WCRP OSC Climate Research in Service to Society - Meeting

24/10/2011 - 28/10/2011 - Denver, CO, USA

The WCRP OSC represents an exclusive opportunity to assemble the international scientific community working to advance understanding and prediction of variability and change of the Earth's physical climate system on all space and time scales. The OSC will facilitate cross-fertilization across the diverse research communities within the WCRP, as well as with other international research programmes, including the International Geosphere-Biosphere Programme (IGBP), the World Weather Research Programme (WWRP) and the Earth System Science Partnership (ESSP).

The OSC will appraise the current state of climate science, thereby making a measurable contribution on the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). It will identify key opportunities and challenges in observations, modeling, analysis and process research required to understand and predict responses of the Earth as a system.

By entraining as many young scientists and students as possible from across the world, including less-developed and developing countries, the OSC will facilitate growth of the diverse future workforce needed to meet the increasingly complex scientific challenges of the future.

As part of WCRP's ongoing commitment to education and capacity development and to train the next generation of climate experts, travel grants are available to enable and support participation of students, early career scientists and scientists from developing countries to attend the conference.

Grants will be assigned based on financial need and scientific merit of proposed presentation described in the abstract,

contribution to conference and all supporting documents (see below). Priority will be given to:

1) Students: those pursuing their graduate studies (MSc, PhD)

2) Early Career Scientists: post-graduates and researchers who received their highest degree in 2005 or later

3) Scientists from emerging and developing economies

Grantees must attend the entire conference in order to benefit from the financial support which includes total refund of Abstract and Registration fees.

The deadline for applying for financial assistance has been extended to 15 April 2011.

Individuals who wish to present their work at the WCRP Open Science Conference are encouraged to submit an abstract of their presentation for review and selection by the Programme Committee. Abstract Submissions will be used to select presentations for poster and oral sessions. The selected abstracts will be posted on the conference website. Poster sessions will be the main form of presentation during the conference. The number of oral presentations is limited and only a selected number of talks will be chosen for the three parallel sessions planned for each day.

Abstract Submission Deadline: 15 May 2011.

http://www.wcrp-climate.org/conference2011/

GwFR2012, International Conference on Groundwater in Fractured Rocks - Meeting

21/05/2012 - 24/05/2012 - Prague, Czech Republic

This conference focuses on the occurrence and properties of groundwaters in fractured rocks, nowadays the most dynamic developing field in hydrogeology. These rocks exist all over the world, but for a long time were much neglected from the viewpoint of hydrogeology. European hydrogeologists paid attention to the so-called hard rocks in developing countries of Africa where these rocks in many arid and semi-arid areas were the only source of potable water. Hydrogeological studies in temperate climatic zones were directed mostly at basinal structures. Only the last decade has shown that fractured rocks represent in many respects attractive hydrogeological environments, deserving attention.

Organizer:

1) International Association of Hydrogeologists (IAH), IAH Commission on Hydrogeology of Hard Rocks

2) IAH National Chapter of Czech Republic

3) International Association of Hydrological Sciences (IAHS), International Commission on Groundwater

4) Institute of Hydrogeology, Engineering Geology and Applied Geophysics, Faculty of Science, Charles University, Prague, Czech Republic

5) T.G. Masaryk Water Research Institute (VÚV), Prague, Czech Republic

http://web.natur.cuni.cz/gwfr2012/

Karel Kovar, PBL Netherlands Environmental Assessment Agency, P.O. Box 303, 3720 AH Bilthoven, The Netherlands

16th Quaternary Research Association Postgraduate Symposium - Meeting

30/08/2011 - 01/09/2011 - Durham, UK

The 16thQuaternary Research Association Postgraduate Symposium will be held at the Department of Geography, Durham University, from 30th August - 1st September 2011. The conference provides an opportunity for postgraduates to present their research and meet others in the field of Quaternary science in a relaxed and friendly environment.

Full details can be found at http://www.dur.ac.uk/qrapg2011/

The conference will be structured around four main themes: palaeoglaciology, sea-level change, palaeoclimatology and geoarchaeology/landscape evolution. Registration and abstract submission are now open and will close on Friday 5th August.

Conference organisers:

Vicky Brown v.h.brown@durham.ac.uk

Ed Garrett edmund.garrett@durham.ac.uk

http://www.dur.ac.uk/qrapg2011/

Planet Under Pressure: New knowledge towards solutions - Meeting

26/04/2012 - 29/04/2012 - London, UK

The 2012 international Planet Under Pressure conference will provide a comprehensive update of the pressure planet Earth is now under. The conference will discuss solutions at all scales to move societies on to a sustainable pathway. It will provide scientific leadership towards the 2012 UN Conference on Sustainable Development - Rio+20.

Conference Themes

Three broad themes will guide the conference:

Meeting global needs: food, energy, water and other ecosystem services.

Transforming our way of living: development pathways under global environmental change.

Governing across scales: innovative stewardship of the Earth system.

Key Aims

A state of the planet assessment and solutions for a sustainable future.

2500 participants combining global-change science and policy, business and development communities.

Scientific leadership towards the 2012 UN Rio +20 conference.

Building trans-disciplinary research communities.

Identifying opportunities for enhanced partnerships between global change science and policy, industry and the public.

A new vision for international research.

Building on a comprehensive update of knowledge of the Earth system and the pressure it is under, the Planet Under Pressure conference will present and debate new insights into potential opportunities and constraints for innovative development pathways based on novel partnerships.

Abstracts will be invited for oral and poster presentation. The abstracts submission facility will open in May following the review for the Call for Sessions. The deadline for abstracts is: 19 August 2011.

Organizer:

International Geosphere-Biosphere Programme (www.igbp.net), DIVERSITAS (www.diversitas-international.org), International Human Dimensions Programme on Global Environmental Change (www.ihdp.unu.edu), World Climate Research Programme (www.wcrp-climate.org), Earth System Science Partnership (www.essp.org).

http://www.planetunderpressure2012.net/

Egg Weight determines the hatchability

Dear Colleague,

We received a manuscript Titled: Egg Weight, but not Egg Shape Index, Determines the Hatchability in Japanase Quail (Coturnix coturnix japonica).

I wish to inquire if you can create time to review this manuscript and send it to us within two weeks. Find below the Abstract:

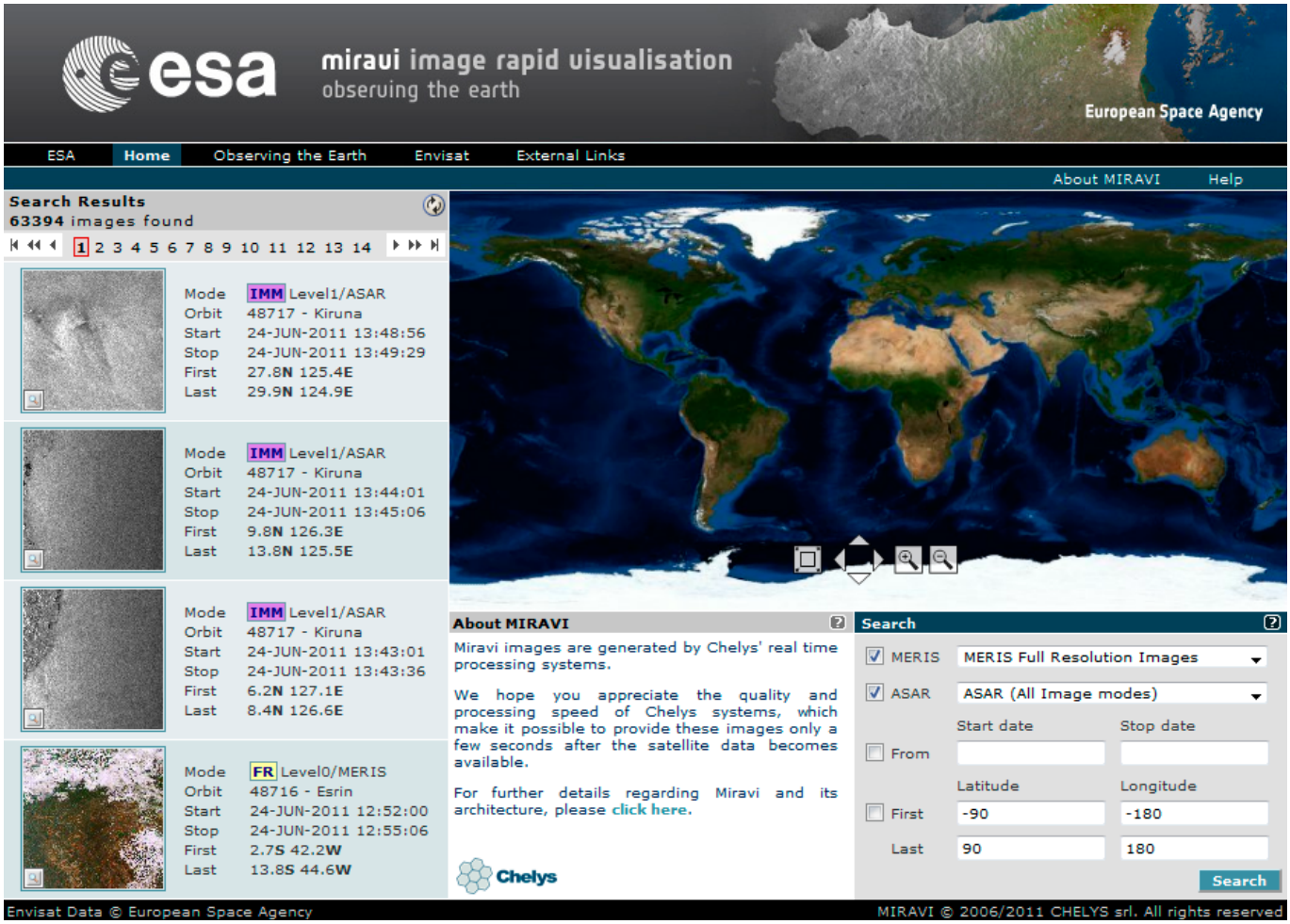
This study was carried out to investigate the effect of egg shape index (SI) and egg weight (EW) on hatchability parameters, hatching weight and weekly live weight in Japanese quails (Coturnix coturnix japonica). Quail eggs were divided into three groups according to their SI (SI-1:<=% 76: SI-2:%77-78 and SI-3:>=%79) and into three groups according to their weight (A1:<13.00 g, A2:13.01-14.00 g and A3:>=14.01 g) respectively. The mean values of hatching weight were found as 8.41 g, 9.40 g, 10.27 g in A1, A2 and A3 egg weight groups and as 8.97 g, 9.37 g and 8.90 g in SI-1, SI-2 and SI-3 SI groups respectively. The differences between groups in terms of these traits were statistically significant (P<0.01). The fertility rate was not affected significantly by egg weight. The hatchability of fertile eggs was not affected by (SI) groups but it was affected by egg weight groups (P<0.01). The highest hatchability of fertile eggs was observed in A1 group (%79.47) and this was followed by A2 (%78.67) and A3 (%74.86) groups. The difference in hatchability between egg weight groups was statistically significant (P<0.01) and the mean value of this trait in A3 group was lower (%64.31) than those in A1 (%72.12) and A2 (%70.45) groups. The differences between SI groups in terms of hatchability of total eggs, embryonic mortality rates, pipped and discarded chick rates were not statistically significant. The average body weights (BW) for the first two weeks between egg weight groups were statistically significant (P<0.01), but these differences were not statistically significant after three weeks of age.

Also attached is the full manuscript, Instruction for author and reviewer\'s guide.

BEST REGARDS,

PROF. N.A. AMUSA
EDITOR
AFRICAN JOURNAL OF AGRICULTURAL RESEARCH
HTTP://WWW.ACADEMICJOURNALS.ORG/AJAR
ISI indexed journal; Impact factor 0.080

We received this letter at the Editorial Office of The EGGS; unfortunately we could not accomodate this request. -Ed.



ESA expands its Earth-exploring service

http://www.esa.int/miravi

3 May 2011.- Since 2006 ESA has been making satellite images of Earth available to anyone. ESA has now added nearly 13 000 radar images to the service, bringing the number of viewing possibilities to about 58.000.

The MIRAVI service tracks ESA's Envisat satellite around the globe, generates images from the raw data collected by its instruments and provides them online free of charge within two hours.

"We have been very pleased with the number of people using MIRAVI to explore our planet. This enthusiasm inspired us to offer new images that provide different types of information", said ESA's Director of Earth Observation Programmes Volker Liebig.

Until recently, MIRAVI provided optical images from Envisat's MERIS. To date, nearly 45 000 optical images have been made available.

With the addition of radar images from the Advanced Synthetic Aperture Radar, it is now possible to observe oil spills, ice-berg calving, flooding and sea ice.

To enjoy the service, visit the MIRAVI website.

ESA

Atmospheric Sciences-Academic

Faculty Position In Earth And Atmospheric Sciences

Company: Cornell University
Location: USA-Ithaca, New York
Date Posted: 20/04/2011
[show details...]

Ocean Sciences-Academic

Postdoc in ocean dynamics

Company: University of Brest
Location: France-Brest
Date Posted: 22/04/2011
[show details...]

Interdisciplinary / Other-Academic

Directory, Lamont-Doherty Earth Observatory

Company: Lamont-Doherty Earth Observatory at the Columbia University Earth Institute
Location: United States-Palisades, New York
Date Posted: 26/04/2011
[show details...]

Interdisciplinary / Other-Academic

NERC/ESRC PhD-Studentship

Company: King's College London
Location: United Kngdom-London
Date Posted: 12/05/2011
[show details...]

Biogeosciences-Academic

Postdoc Stream biogeochemistry

Company: University of Vienna
Location: Austria-Vienna
Date Posted: 05/06/2011
[show details...]

Interdisciplinary / Other-Academic

Post-doc: Biological Response to Climate Change

Company: The Ohio State University
Location: USA-Columbus, OH
Date Posted: 08/06/2011
[show details...]

Soil System Science-Academic

Assistant Professor in Soil Science

Company: University of Alberta - Renewable Resources
Location: Canada-Edmonton, Alberta
Date Posted: 10/06/2011
[show details...]

Geodynamics and Seismology-Academic

Senior Researcher

Company: Institute for Landscape Ecology of the University of Münster
Location: Germany-Münster
Date Posted: 21/06/2011
[show details...]

General-Other

MEDIA AND COMMUNICATIONS OFFICER

Company: EGU Executive Secretary and the EGU Council
Location: Germany-Munich
Date Posted: 05/05/2011
[show details...]

Geodynamics and Seismology-Other

Marie Curie PhD Position (TOPOMOD ESR10)

Company: Institut de Ciencies de la Terra Jaume Almera, ICTJA-CSIC
Location: Spain-Barcelona
Date Posted: 11/05/2011
[show details...]

Interdisciplinary / Other-Other

Marie Curie PhD Position (TOPOMOD ESR12)

Company: Institut de Ciencies de la Terra Jaume Almera, ICTJA-CSIC
Location: Spain-Barcelona
Date Posted: 11/05/2011
[show details...]

Geodynamics and Seismology-Other

Postdoctoral Research Fellow - Tropical Variability Dynamist

Company: CSIRO (Commonwealth Scientific and Industrial Research Organisation)
Location: Australia-Aspendale, Victoria
Date Posted: 19/05/2011
[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.