



ISSUE 2, JUNE 2012

Programme Committee Chair reflects on the 2012 General Assembly

This year's EGU awards and medals

Press Release: Geoengineering could disrupt rainfall patterns



2094

HOW TO NAVIGATE THROUGH THIS NEWSLETTER

Due to its interactive features, this PDF file is best viewed with Adobe Acrobat Reader.

Use the Navigation Bar on the right to move between sections



Click on the links (in blue and underlined) to direct you to a webpage or to compose an e-mail

Click BACK TO CONTENTS to go to the Table of Contents page

EDITORIAL

Just a few months separate the publication of the first two issues of GeoQ, but what a few months they were! The highlight, of course, was April's General Assembly in Vienna. With 11,275 participants from 95 countries and over 13,500 presentations, the conference was a resounding success. There was new and exciting research presented in more than 530 scientific sessions, two heated Great Debates, the first-ever EGU General Assembly smartphone app, keen media reporting, and much more.

In the months that preceeded the conference, EGU's social media networks were a hive of activity, and this only continued to increase during the Assembly itself. Since the publication of GeoQ #1, the Union's presence on social media has been strengthened by a growing number of followers on Twitter (@EuroGeosciences) and 'likes' on our Facebook page (European Geosciences Union). Driven by a series of guest posts and articles about the General Assembly, the Union's official blog, GeoLog, has also enjoyed a marked increase in hits over the past few months.

Now, with the General Assembly behind us, the focus of EGU's communications activities returns to this newsletter. The Articles section brings you three pieces dedicated to three distinct topics in the Earth sciences: soils and wildfires; forests, hydrology and erosion risk; and the intersection between molecular ecology and the history of Earth's climate. It also features an interview with Millie Basava-Reddi of the International Energy Agency Greenhouse Gas R&D programme (IEAGHG) focusing on carbon capture and storage.

There is also room in this issue to reminisce on the General Assembly. Gert-Jan Reichart, the 2012 Programme Committee Chair, reflects on the conference in the EGU Voice section. EGU News features an article on this year's Medal Ceremony and a short report on Press Office activities at the conference, as well as selected pieces from our blog and website about some of the Assembly's events and sessions. Finally, the Education section reports on the GIFT Workshop in Vienna.



Prior to joining EGU in September 2011, Bárbara worked as a science writer at the European Southern Observatory in Garching near Munich, and as a technical editor for London-based Form & Content Media. She completed a PhD in astrophysics from the University of Cambridge in 2010.

I couldn't finish this editorial without mentioning Envisat. ESA's Earth observation satellite was instrumental for many new findings and used widely for research in many of the disciplines covered by EGU. Sadly, the European Space Agency lost communication with the satellite in April, and formally ended the mission on May 9.

It is now more urgent than ever to secure funding for the follow-on Sentinel satellites to make sure the Global Monitoring for Environment and Security (GMES) initiative proceeds as scheduled. This is crucial to avoid disruption in the products and services GMES delivers, which have applications ranging from flood warnings and airquality forecasting, to food security and humanitarian aid. The EGU has written to European policymakers to highlight the importance of environmental satellites and urge all parties to come to an agreement to allow the prompt launch of Envisat's follow-on mission.

> Bárbara Ferreira Chief Editor & EGU Media and Communications Officer

The current and previous editions of the the EGU newsletter (GeoQ and The Eggs) are available online at www.egu.eu/newsletter.

CHIEF EDITOR: Bárbara T. Ferreira – EGU Executive Office, Luisenstr. 37, 80333 Munich, Germany | Phone: +49-6189-2180-6703 | geoq@egu.eu CONTRIBUTORS: Edvard Glücksman, Adam Booth, Eline Vanuytrecht, Tim Middleton, Stefano Nativi, Walter Schmidt, Markku Poutanen, Huw Davies, Andreas Lang, Nick Arndt, Gert-Jan Reichart, EGU Committee on Education, David Bressan

DESIGN: André Roquette

COVER PHOTO: EGU flags outside the Austria Center Vienna during the 2012 General Assembly, by Edvard Glücksman (EGU Science Communications Fellow)

© European Geosciences Union 2012.

Reproduction is authorized, provided the source is acknowledged, save where otherwise stated. Where prior permission must be obtained for the reproduction or use of textual and multimedia information (sound, images, software, etc.), such permission shall cancel the above mentioned general permission and indicate clearly any restrictions on use.



Articles	=	Scorching the soil – 5 Why virgin forests are not erosion-free – 6 Ink-redible insight – 7 Interview with Millie Basava-Reddi of the IEA Greenhouse Gas R&D Programme at EGU 2012 – 9
EGU Voice	ø	Letter from the General Assembly Programme Committee Chair – 11 Division reports – 12
EGU News	6	EGU awards and medals – 15 Research on Flood Resilience and Europe: achievements and future – 17 Short report on 2012 General Assembly Press Centre activities – 18 EGU 2012 Photo Competition winners – 19 Join the EGU Blog Network! – 20 International Innovation interview: EGU Executive Secretary – 21
Press Release		Geoengineering could disrupt rainfall patterns – 23
Journal Watch	٢	A tsunami wave recorded near a glacier front – 24 Drivers of flood risk change in residential areas – 24 Photo-lability of deep ocean dissolved black carbon – 25 Global characteristics of the lunar tidal modulation of the equatorial electrojet derived from CHAMP observations – 25 On the role of ozone in long-term trends in the upper atmosphere-ionosphere system – 26 The regulation of the air: a hypothesis – 26 Evidence of a possible turning point in solar UV-B over Canada, Europe and Japan – 26 Estimating the climate significance of halogen-driven ozone loss in the tropical marine troposphere – 27 Revisiting Narrow Bipolar Event intracloud lightning using the FORTE satellite – 27
External News		ESA declares end of mission for Envisat – 28 Study of Patagonian glacier's rise and fall adds to understanding of global climate change – 29 Taming uncertainty in climate prediction – 30 'Warming hole' delayed climate change over eastern United States – 31 Cassini sees objects blazing trails in Saturn ring – 32
Education	Â	Report on the 2012 editon of GIFT – 33
Books		Continuum Mechanics in the Earth Sciences – 34 Orogenesis: The Making of Mountains – 34 Tsunamis in the World Ocean: Past, Present and Future, Volume II – 35 Atmosphere, Clouds, and Climate – 35 Book review: The Ecology of Snow and Ice Environments – 36
On the Web	@	Featured website: Climate Communication – 37 Social media: Who's following the EGU? – 37
Events	10	Conferences, meetings and workshops – 38

 -
 _

GEO C ARTICLES

Scorching the soil

How do wildfires influence soil properties?

"It only takes one match to burn a thousand trees," the saying goes. Trees may be the obvious casualties of wildfires, but the soil they grow in has just as much significance in the local ecosystem. How is soil modified by a wildfire? Is it baked beyond recognition, or is it fertilized by the flames? These are the questions that have fired the imagination of <u>Dr Cristina Santín</u> (College of Science, Swansea University, Wales) and her colleagues.

"Soil is a non-renewable resource," explains Santín. "Trees grow back, but a damaged soil takes hundreds or thousands of years to regenerate." Therefore, understanding how a soil is altered by a wildfire is a key component in environmental management – particularly with currently increasing trends of wildfire occurrence and severity. However, predicting the effect of burning on a given soil is far from straightforward. A number of factors complicate the picture and Santín highlights local climate, vegetation type, slope aspect, and fire intensity as key factors.

Isolating the effect of a wildfire from other environmental variables can therefore be a tricky problem, and this is where Santín steps in. Her research, published in a wildfire-specific edition of *Catena*, shows differences in soil chemistry between two neighbouring river basins in the Cantabrian Cordillera, a fire-prone region in the north of her home-country of Spain. The proximity of these basins implies that variations of environmental variables would be limited, and only their wildfire history would differ.

"The novelty of our research was our choice of sites," says Santín,

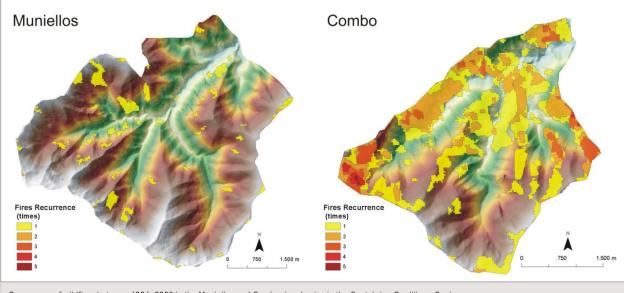
who collaborated with experts in satellite imaging to establish the

explains that the Muniellos basin (below, left) has experienced relatively few wildfires, with only 20% of its area being burnt during the 20-year record. By contrast, the Combo basin (below, right) is a relative fire-trap: burning occurred over 77% of its area, with 25% burnt on more than one occasion. Soil samples made in the Muniellos basin therefore served as the control, whereas those from Combo were used to diagnose wildfire effects.

burning history of the two basins over the period 1984-2005. She

Santín and colleagues used carbon-13 nuclear magnetic resonance spectroscopy to identify different compounds within a number of soil samples, based on their electromagnetic fingerprint. In all cases, samples from Combo were enriched with aromatics. Aromatic ring molecules, Santín explains, including phenols and benzenes, are highly concentrated in charcoal, hence their presence in the soil is a clear signature of burning. "During a fire," she adds, "most carbon is emitted to the atmosphere but some of it remains in the soil as black carbon." Indeed, if any generalization can be made about the effect of wildfires, it is that fire-affected soils should typically be black and carbon-enriched.

Wildfires therefore play an important part in the global carbon cycle and, consequently, their impact on global warming is considered in the influential reports of the Intergovernmental Panel on Climate Change (IPCC). "The IPCC says that most fires are in balance as a source or sink of carbon," says Santín, "but some carbon is retained in the ground, providing a net sink." Paradoxically, despite the smoke they produce, wildfires could therefore be seen as a means of storing carbon – but Santín cautions against such a simplistic



Occurrence of wildfires between 1984–2005 in the Muniellos and Combo river basins in the Cantabrian Cordillera, Spain.

viewpoint. In her experience, the amount of black carbon contained within a burnt soil is somehow less than would be expected.

"Fires are everywhere," she says. "Black carbon is being produced, but we look into the soil and there's not enough black carbon there." So what happens to it? Santín blames erosion. Intense wildfires not only change soil chemistry, they also make it easier to erode by damaging its physical structure. In the Cantabrian Cordillera, this process is particularly evident: soil erosion is exacerbated by steep slopes and high rainfall, and intense wildfires have caused mountain peaks, like those below, to be denuded of their soil and vegetation cover.

The fate of eroded black carbon is unclear, and it is not known whether it is mineralized and released to the atmosphere or simply transported elsewhere and buried. The problem for climate prediction is that black carbon in the soil behaves completely differently to that in the atmosphere, where it is identified as an agent of global warming. Santín therefore hopes further integrated research will determine the role of black carbon in different components of our climate system and ultimately find out if wildfires really are a carbon sink.

Recently, Santín has been setting off alarm bells around the Swansea campus, conducting controlled burning tests in the University grounds. The team are therefore looking forward to the summer season of research, to be spent in the Northwest Territories of Canada; here, to prevent catastrophic wildfires, land management agencies burn over 12,000 hectares of forest each year, providing the ideal testing environment for black carbon studies. The spark of wildfire research has certainly taken hold, and <u>dedicated sessions</u> were reconvened at the EGU General Assembly in April. There, twelve talks, twenty posters – and the 'celebrities' of the wildfire world – focused on the life story of black carbon, from its production through to its decomposition and erosion. The role of wildfires, it would seem, truly is a hot topic.

Adam Booth, post-doc at Imperial College, London

Reference

Santín, C. et al (2008): Wildfires influence on soil organic matter in an Atlantic mountainous region (NW of Spain), *Catena*, 74, 286–295.



Mountain peaks in the Cantabrian Cordillera, stripped of their soil cover following erosion after a wildfire. (Credit: C. Santín)

Why virgin forests are not erosion-free

Study asserts that hydrological characteristics of undisturbed forests, not vegetation cover, determine land susceptibility to erosion

It is a widely held belief that forest cover controls erosion. Yet, observations worldwide suggest high erosion rates are far from exceptional in undisturbed, or so-called virgin, forests. A recent study advances that incident low erosion rates under forest ecosystems are not associated with the tree cover. Instead, they are related to the oriented course that water follows in the soil, the so-called flow path, in these particular ecosystems. A flow path can be oriented in predominantly vertical or horizontal direction. If lateral or horizontally oriented flow paths prevail under virgin forest – not a rare occurrence, – well-developed forest cover is no guarantee for effective erosion control. These conclusions are important to identify erosion-prone areas and select appropriate mitigation measures.

After a survey of published research disclosed apparent heterogeneity of the eroded material under forests, Alexander Zimmermann (Potsdam University, Germany) and his colleagues dug further and found that a selection bias exists for study sites with dominantly vertical flow paths. This bias may have contributed to the idea that forests are effective at erosion control.

Evidence from Panama

Zimmermann and his team monitored suspended sediment concentrations in overland and stream flows of a tropical forest in Barro Colorado Island in Panama, undisturbed since 1923. Despite the forest's relatively high density, and rainfall intensities that rarely exceed the soil infiltration capacity, the site is prone to frequent and widespread discharge that flows overland. In dry and normal years, respectively, between one and two tonnes of eroded material per hectare are observed. The research team identified impermeable soil layers near the soil surface as drivers of the erosion processes. These layers render the soil saturated and impede unrestricted vertical flow. The researchers drew their conclusions based on samples of suspended erosion material taken at different sites in the forest. Additionally, they modeled the amount of eroded material that is lost during single high-rainfall events and what is lost over a whole year.

They did not use the traditional graphical methods that relate discharge and sediment concentration in a one-to-one correspondence. Instead, they applied statistical techniques that, based on a set of twofold rules, divide observations of discharge and other hydrological variables into groups, forming what is called decision trees. Each leaf of these decision trees contains an interval of values that cover new observations. Based on the group to which new observations belong, prediction intervals of erosion material quantity are constructed. The techniques are suitable to consider different processes that determine the amount of eroded material, including the antecedent wetness of the soil. Further, with these techniques, it is possible to assess the accuracy and precision of the predicted amount of eroded material.

The site at Barro Colorado Island is not an isolated case where the interplay between soil and rainfall characteristics triggers horizontal flow near the forest floor. The findings in Panama add to the wealth of evidence that overland flow may occur frequently in undisturbed forest environments. In these environments, soils with superficial impermeable layers (shallow soils that hold only a limited amount of water), or water-rejecting conditions at the soil surface, contribute to the activation of overland flow. The erosion process starts with the movement of leaf litter and fine soil material that fill the pores of the hill slope soils, which promotes more transport and results in more eroded material. Additionally, major rainfall events can even cause the banks of streams to collapse, which increases the amount of erosion material dramatically.

Comparisons among undisturbed forest sites indicate that hydrological characteristics strongly influence the quantity of eroded material in discharge in forested areas. Where horizontal flow paths near the forest's soil surface are absent, the annual sum of eroded material can be very low, while high erosion rates can be found where these horizontal paths dominate.

Nutrient-poor and sparse tree cover is beneficial

Interestingly, the scientists hypothesize that nutrient-poor or sparsely covered forests may be more effective in erosion control. In strongly nutrient-limited ecosystems, leaf litter of low quality decomposes slowly and accumulates on the forest soil. In combination with thick networks of fine roots in the soil, this may reduce the kinetic energy of precipitation that reaches the ground through the forest cover and slow down erosion processes. Counterintuitively, sparse forest covers may have a beneficial influence as well. In this case, better light conditions allow growth of shrubs and herbs on the forest floor, which are effective in preventing sediment transport.

Without doubt, vegetation can reduce erosion risk compared to bare soil. Yet, forests are not necessarily a guarantee for complete control of erosion. The conclusions of this study are important to identify erosion hot-spots, in particular at sites where high erosion rates are not expected. Undisturbed forest ecosystems characterized by the horizontal flow paths near the soil surface, relatively nutrient rich soils, and a low light availability at the forest soil, are especially vulnerable. It is clear now that, for erosion control, we should also watch our virgin forests carefully.

> Eline Vanuytrecht, freelance science writer and PhD student in soil and water management, KU Leuven

Reference

Zimmermann, A.et al. (2012): Forests and erosion: Insights from a study of suspended-sediment dynamics in an overland flow-prone rainforest catchment, *Journal of Hydrology* 428–429, 170181.

Ink-redible insight

Southern Ocean octopus DNA exposes Antarctica's mercurial climatic history

Molecular ecologists have traditionally used genetics to better understand the evolution, ecology, and behaviour of life on Earth. But DNA can also be used to gain an historical understanding of the Earth itself, to unlock mysteries of the planet's past, and to support predictions about its future.

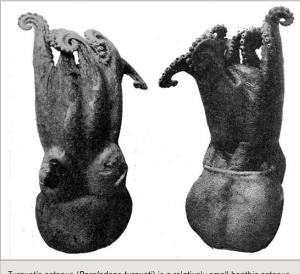
By comparing genetic patterns found within populations of living organisms, researchers can look back in evolutionary time to estimate when each population may have split off as a result of changing climatic or geographical features.

In an compelling study published recently in *Molecular Ecology*, researchers show how DNA from a species of Antarctic octopus can

 be used to support and interpret hypothesized past climate events
 in this case, the collapse of the West Antarctic Ice Sheet during the Pleistocene interglacial periods roughly 1.25 million years ago.

Reconstructing the past with present-day implications

In a broader sense, these findings are important because they demonstrate how geoscientists can apply biological data to expose the history of the abiotic, or non-living, environment. More specifically, however, these results provide a rare glimpse into the climatic



Turquet's octopus (*Pareledone turqueti*) is a relatively small benthic octopus. An enigmatic homebody, its DNA may harbour untold stories about the climatic history of Antarctica. (Source: Wikimedia.)

history of Antarctica during relatively recent geologic times. They support existing climatic reconstructions, showing that the West Antarctic Ice Sheet, one of the planet's largest ice bodies, may on several occasions have collapsed and melted as a result of warming temperatures.

These historic melting events would likely have had far-reaching consequences on local and global biogeography. Sea levels would have risen, connecting seas on opposite ends of the Antarctic continent. Today, such sea-level rise would be catastrophic to human coastal communities, emphasising the need for scientists to continue to raise awareness about the impact of climate change on Antarctica.

The interdisciplinary nature of this study, merging genetics with the geosciences, was a main driver in its conception. "We wanted to investigate whether there was any genetic information that could tell us what the past environment could have been like," notes Louise Allcock of the National University of Ireland in Galway to <u>Scientific American</u>.

Octopod as an ideal model

The study, carried out by an international group of scientists, examined genetic patterns in Turquet's octopus (*Pareledone turqueti*), a relatively small polar octopod found on the floor of the Southern Ocean at depths of up to 1,000m. Despite its circumpolar distribution, living around the entire Antarctic continent, this species has a characteristically small home range and low level of dispersal. Such life history traits are vital for this study because they ensure that populations sampled at different localities have mostly lived in physical, and thus genetic, isolation from each other.

"This octopus species, with its large population around the region and limited movements, was an ideal species to use," reflects Allcock. In addition, octopods are an appropriate model organism for this study because their genetic makeup is well known and enables the use of a molecular clock, a technique by which mutations in genes and the resulting evolution of new species can be chronologically placed in the context of Earth's history.

Finally, environmental factors further prevent Turquet's octopus populations from mixing, including powerful circular currents, or gyres, that prevail in the Weddell and Ross seas and keep most smaller organisms from leaving the area.

Genetically similar separate populations

Despite the significant genetic differentiation found between most pockets of Turquet's octopus populations, individuals sampled specifically at the Weddell and Ross seas, some 10,000km apart and on opposite sides of Antarctica, are remarkably similar on the genetic level. This suggests that, at some point in the past, the two seas were connected at what is now the West Antarctic Ice Sheet.

"These two seas are completely separate so we expected the genetics of these octopuses to be quite different. Ocean currents both facilitate and hinder the flow of genes. But the Antarctic Circumpolar Current almost certainly would not have facilitated so much dispersal by octopuses that the two populations would have almost identical genetics if the ice sheet had been in place," explains the study's first author, Jan Strugnell of La Trobe University, Australia.

This point was reiterated by Phil Watts of the University of Liverpool, UK, also an author on the paper. In a <u>press release</u>, he explains, "We found that they [the different octopus populations] were genetically similar, suggesting that at some point in their past these populations would have been in contact with each other, perhaps at a time when the oceans were connected by, not separated from, the West Antarctic Ice Sheet."



8

The genetic survey also provided novel biological information about the dynamics of Turquet's octopus populations in the Southern Ocean. For example, the data show that populations spiked in 1829 and 1902 near South Georgia and that the species managed to survive glacial maximum periods in these and other areas, when ice sheets were at their maximum extension and water bodies were locked away under thick layers of ice. The last of these periods occurred between 26,500–20,000 years ago.

The team used samples previously gathered by the International

Polar Year and Census of Antarctic Marine Life efforts, fish surveys,

and by the Alfred Wegener Institute, which allowed them to examine

the genetic data on an unprecedented scale. They obtained gene sequences from over 450 Turquet's octopus individuals taken, by trawling the sea floor with a net, from locations all around the Ant-

Unprecedented sampling scale

arctic continent.

"We were able to take advantage of much larger sample sizes than had been collected from Antarctica before. This presented us with a unique opportunity," said Allcock to Planet Earth Online.

Taken together, these results provide an interdisciplinary perspective on Earth's past climate, and the life cycle of an enigmatic octopod species, while also demonstrating the important potential role of modern molecular methods in unlocking the mysteries of our planet's geologic history.

Edvard Glücksman, EGU Science Communications Fellow

References

Strugnell, J. M. et al. (2012): Persistent genetic signatures of historic climatic events in an Antarctic octopus, *Molecular Ecology*, 21 (11), 2775–2787

Interview with Millie Basava-Reddi of the IEA Greenhouse Gas R&D Programme at EGU 2012

Basava-Reddi talks about her work on evaluating technologies that can reduce greenhouse gas emissions, in particular carbon capture and storage.

Could you introduce IEAGHG, the International Energy Agency Greenhouse Gas research and development programme and tell us a bit more about it?

The programme is implementing an agreement set up by the IEA in 1991, with the aim of evaluating technologies which can be used to mitigate greenhouse gases. Most of what we're looking into at the moment is carbon capture and storage (CCS). Programme staff, along with our members and research networks, try to identify existing knowledge gaps and we commission contractors to carry out studies in these areas. All of the studies are then reviewed by external experts. Our aim is to produce non-biased and trustworthy information.

What sort of studies have you conducted recently?

The most recent study I was looking after was one on the feasibility of monitoring CO_2 storage underground. When CO_2 is injected into the ground, the pH will increase due to the increased partial pressure of CO_2 and it's likely to react with the rocks and minerals *in situ*. A range of cations and anions will be produced and it's important to be able to monitor these substances. You also need to be able to monitor brine that is displaced from storage sites in order to comply with regulations. Our study was concerned with these substances that are mobilized by injection of CO_2 .



Millie Basava-Reddi after her interview at this year's General Assembly. (Credit: Tim Middleton)

Does the IEA programme do any research on the total global capacity available for CO₂ storage?

We like to keep up to date with everything going on and we've had a few studies looking at capacity. An interesting study a few years ago looked at efficiency factors. The study found that about 2% of the available storage space in deep saline aquifers is actually usable. Other studies since have found even lower numbers.

We're also planning a future study looking at the differences between static and dynamic capacity. Static capacity simply looks at how much of the available storage space can be used, whereas dynamic capacity considers the injection scenario, where the wells are, how far apart they are, and the length of time injection will be occurring for.

Do your research programmes consider the safety of CCS and how this is communicated to the general public?

We run a set of research networks that have meetings once a year. One of these is a social research network which looks into the public perception of CCS. The IEA itself doesn't do any work directly with the public though.

It has been suggested that we need 3,500 projects the size of the Sleipner CCS scheme in Norway in order to make a significant contribution to GHG mitigation. But the number of projects likely to be in operation over the next few decades is much less than this. Are we ever going to be able to achieve these ambitious targets?

The IEA CCS Technology Roadmap suggests that we need 100 CCS projects by 2020. We commissioned a study which found that a G8 target of 20 CCS projects by 2020 is achievable with the right investment inputs but that the IEA target is not really possible! However, the target of 100 projects might be realized by 2028. What

this is all dependent on, though, is the actual capacity that will be available because there's so much uncertainty related to this at the moment. In the North Sea, we're likely to use depleted gas fields to begin with where you have more of an idea about how much you're going to be able to store, whereas with deep saline aquifers there's the potential for high capacities, but with a lot of uncertainty. The main area for further research, therefore, is improvement of capacity estimates.

Most current CCS projects are pilot schemes or demonstration projects. How do we go about implementing more large-scale projects?

There are a few larger-scale projects in the pipeline, such as the Gorgon Project in Australia which is due to come online in 2014. The UK competition (which includes one billion pounds of capital funding) is also looking at the potential for larger projects. We really need these larger projects to come online so that we can learn from them.

So is the major barrier to progress a scientific one or a political one?

The majority of projects that have been cancelled or put on hold have been for political or economic reasons, but that's not to say that there aren't technical issues. The ZeroGen project in Australia, for example, was cancelled for technical reasons because there wasn't adequate storage space. But for a project to get going, it does have have a fair amount of government subsidy because they're not cheap, especially the first project of a certain kind.

Interview conducted by Tim Middleton (University of Cambridge) at the 2012 EGU General Assembly





GEO C EGU VOICE

Letter from the General Assembly Programme Committee Chair

Gert-Jan Reichart reflects on this year's meeting

It was a very energetic General Assembly for me this year – the first as programme chair. Fortunately, I benefited from the great organizational infrastructure developed over the years by conference-organiser Copernicus and previous chairs. The result was a very successful meeting with over 11,000 participants, 4,436 oral presentations and 9,092 posters. I very much enjoyed the lively scientific discussions in some of the sessions, as well as the meetings with colleagues from all over the world. For me, this is what makes the EGU General Assembly the most important meeting of the year.

The newly introduced smartphone app helped me navigate the conference, not only by showing me the scientific programme, but also by providing maps with the location of the different rooms. But while the app worked perfectly, there were some complaints concerning the accessibility of the Internet. This is, of course, essential as the meeting tries to be visible on social media and we promote blogging, tweeting and so on. Although we invested considerably this year in the accessibility of the Internet at the conference centre, somehow we were confronted with the limit of what was technically possible. Next year we will have to do our very best again to try to optimize the wireless network.

The high quality of the sessions, both in the different divisions and at Union level, was a feature of the meeting. In addition to our core business, the scientific presentations, we organized several geofocused side events. The photo exhibition showing the devastation left behind by last year's earthquake and tsunami in Japan impressed me. There was also an elegant presentation of silica with all kinds of different minerals and shapes. And the Geocinema featured films on a wide variety of subjects.

The success of the General Assembly is, at the same time, our greatest pitfall. Rooms were overfull at times, something difficult to avoid with the large number of parallel sessions we have. Should we reconsider the concept of the General Assembly? This summer we will start a working group to try and come up with new ideas,

without changing the general concept of the meeting. After all, the large number of participants is indicative of our community's satisfaction with the Assembly.

The organization of the next General Assembly is underway, with our first planning meeting scheduled already. I will do my best for the 2013 Assembly to be a similar success. At the same time, I realize that the success of the meeting mainly depends on you, conveners, participants, and audience. Please use the EGU and its Assembly as it is intended: as a platform to present your newest scientific results, to communicate with fellow scientists, and to inform decision makers on the geosciences. I hope to see you all again in Vienna in 2013!

> Gert-Jan Reichard 2012 Programme Committee Chair



Gert-Jan Reichart, a researcher at the Department of Earth Sciences, Utrecht University, is also the president of the EGU Biogeosciences Division.



Division reports

News brought to you by six of EGU's division presidents

In each edition of GeoQ, we select several division presidents to contribute a report updating members with news from their division. Issue 2 gives voice to Stefano Nativi of Earth and Space Science Informatics (ESSI), Markku Poutanen of Geodesy (G), Huw Davies of Geodynamics (GD), Walter Schmidt of Geosciences Instrumentation and Data Systems (GI), Andreas Lang of Geomorphology (GM), and Nick Arndt of Geochemistry, Mineralogy, Petrology & Volcanology (GMPV).

Earth and Space Science Informatics

2012 GA meeting in Vienna: The 2012 General Assembly meeting was a great success for the ESSI Division. Our sessions went well, in many cases doubling the number of attendees compared to previous years.

2012 Ian McHarg Division Medal: The 2012 Ian McHarg Medal is awarded to <u>Peter Fox</u> for his contribution to recognising the fundamental importance of establishing informatics as a genuine discipline within the Earth sciences. Peter was born in Tasmania, has been working in the US for many years, and has an Irish passport. In Vienna, Peter gave an inspiring and visionary lecture in an overcrowded room. After the lecture, ESSI offered a lunch to honor Peter.

2013 Division programme: For 2013, the ESSI Division is going to consider three programme strands: (a) Community-driven challenges and solutions dealing with informatics (Committee: Kerstin Lenhert, Giuseppe Manzella); (b) Multi-disciplinary challenges and solutions across the Earth and space sciences (Committee: Horst Schwichtenberg, Wim Som de Cerff, Paolo Mazzetti); (c) Visualize and discover (Committee: John Blower, Mohan Ramamurthy).

Looking for a new division president: ESSI is looking for a new president. If you are interested, please submit your application through the EGU website once the call for applications opens over the summer.

Contribution to international programmes: In the field of informatics applied to Earth and Space disciplines, the ESSI Division confirmed its commitment to inform, contribute, and reach out to the EGU community about important initiatives and programmes that are ongoing at the European and international levels. They include: the European INSPIRE directive, the <u>GEOSS</u> and <u>Eye On Earth</u> initiatives, and the US EarthCube programme, among others.

> Stefano Nativi ESSI Division President

Geodesy

2012 GA meeting in Vienna: The 2012 General Assembly in Vienna was very good; the sessions were well attended and, with



one exception, lecture rooms were sufficiently large for the audience. Number of sessions and submitted abstracts were slightly smaller than last year, but not significantly compared to the average during the last five years. Most popular sessions (by number of abstracts and by number of participants in oral sessions) were related to gravity satellites. A gravity change on a global scale is under intensive investigation because it is related to the fate of glaciers and sea level rise.

2012 Vening Meinesz Medal: The 2012 Geodesy Division Vening Meinesz Medal was awarded to <u>C.-K. Shum</u> for his pioneering work on the recent developments in geodetic techniques that have made profound contributions to the Earth sciences through the precise measurement of mass transports within the Earth system.

Geodesy Division officers and committees: Division officers were confirmed and approved in the Geodesy Business Meeting:

- President Markku Poutanen, Vice-Presidents Michael Schmidt and Johannes Bouman. A new president will be elected in November; candidates are sought for in due time before the autumn nomination.
- Vening Meinesz Medal committee: four past medallists and an *ex* officio Geodesy division president and EGU Award Committee chair (both non-voting). Second-year medallist chairing the committee.
 2013 committee: C.-K. Schum, Harald Schuh (chair), Philip Woodworth, Susanna Zerbini (in addition to Markku Poutanen and Alberto Montanari).
- Outstanding Young Scientist Award committee: division president, vice-presidents, and past medallist.
- Outstanding Student Poster Award committee: division president and vice-presidents.
- Programme committee for 2013 GA program: division president, vice presidents, and one or two others to cover the whole field of geodesy.

Markku Poutanen G Division President

Geodynamics

The Geodynamics Programme at EGU 2012 was very exciting with sessions on topics ranging from the planets, to the core, through mantle, and lithosphere/asthenosphere to the crust. Other sessions focussed on processes such as subduction, ridges, localization, anisotropy, basins, plate tectonics; and others discussed the geodynamics of regions like the Atlantic, Laurasia craton and Arctic. There were also very successful sessions on specialized topics such as computational geodynamic methods, new methods to observe deformation, and heat flow and hydrothermal circulation. The oral and poster components of all sessions were very vibrant. The GD Division continued its tradition of having a strong co-organized programme with relevant cognate divisions - including sessions on such topics as the Alpine-Himalayan collision, analogue modelling, mantle mineralogy, glacial isostatic adjustment and surface processes. In total there were 17 division-led sessions, and 36 in total including co-organized sessions. This involved over 400 presentations in division-led sessions, and over 1,000 presentations in total. There were nearly exactly two poster presentations for every one oral presentation.

The highlight of the division programme was the excellent Love Medal lecture of <u>Yanick Ricard</u> (Universite de Lyon 1) on mantle dynamics on the Wednesday evening. The Division Outstanding Young Scientist <u>Richard Katz</u> (University of Oxford) gave an exciting lecture on two-phase flow related to ridges on the Monday. The Division Business Meeting saw the presentation of the Outstanding Student Poster prize to <u>Robert Myhill</u> (University of Cambridge) – collected in his absence by Tim Middleton, – and there was also a very useful discussion of future improvements for the General Assembly.

> Huw Davies GD Division President

Geosciences Instrumentation and Data Systems

2012 GA meeting in Vienna: With 14 sessions and a 24% increase of submitted abstracts compared to 2011, the 2012 General Assembly was a great success for the GI division. The co-organization and co-listing with other divisions' sessions supported well the interdisciplinary role of the division for Geosciences Instrumentation & Data Systems. The division programme was this time divided into the groups Data Networks and Analysis, Atmosphere and Ocean Monitoring and Space Instrumentation, and Earth Surface Investigation Methods, providing a better focus for the very wide range of topics covered by the GI division.

Highlights from the 2012 GA presentations: New trends for integrating access to data with refereed scientific publications were presented from research institutes, libraries and publishing companies. The miniaturization of instruments and their cross-disciplinary application were the subject of many presentations like miniaturized automatic infrared spectroscopes for *in situ* analysis of planetary dust grains on Mars, or for monitoring atmospheric trace gases from small unmanned airplanes, providing real-time information for weather-related catastrophe management. Earth penetrating radars, developed for geoscience research, were used to locate trapped and buried people. None-destructive monitoring means to find and analyse archeological artifacts are used to restore damaged buildings or detect possibly dangerous damages in bridges.

Division program 2012/13: The session topics developed during the past year will be maintained for 2013 with possibly joined session according to submitted contributions:

- Data Networks and Analysis: from general system design to largescale European research infrastructures and data publishing;
- Atmosphere/Ocean Monitoring and Space Instrumentation;
- Earth Surface Investigation: instrumentation for sub-surface, surface structure and historical artifact monitoring and investigations.
 These areas are supported by dedicated science officers arranging activities in their field during the year.

Recently launched GI journal: The EGU Open Access journal was launched in autumn 2011. A well-attended inauguration party was held during the 2012 General Assembly. By now about 15 articles have been submitted, the first four passed the referee process and are published in their final form. The first special issue related to the instrumentation on board a major European space mission is under preparation. Contributions from all fields covered by the GI division are welcome.

Walter Schmidt GI Division President

.....

Geomorphology

The Geomorphology programme at the 2012 General Assembly continued the success of past years and saw a further increase in abstract numbers by 9% (compared to 2011), confirming the Assembly's place as a leading annual event for the GM Division. A total of 576 abstracts (896 including co-organized sessions) were presented filling Room 21 all week, two full days in Room 22, and several other locations across the conference centre.

The 2012 Bagnold Medal has been awarded to Gregory E. Tucker for his innovative modeling and field studies leading to fundamental advances in our understanding of the way processes and landscape elements interact in the genesis of landforms, and for providing new insights on the importance of temporal variability of the driving



Patterns in the landform by Basudev Biswal, distributed by EGU under a Creative Commons licence.

forces of geomorphic systems. The Medal Lecture was preceded by a reception sponsored by the British Society for Geomorphology and the *Journal of Earth Surface Processes and Landforms*.

The 2012 Outstanding Young Scientists Award was awarded to <u>Veerle Vanacker</u> for her novel approach to distinguish between natural benchmarks and accelerated erosion rates in mountain environments under pressure of land use change. She also gave the 2012 Penck Lecture.

Pauline Dieras received the 2011 Outstanding Student Poster award for her poster 'Controls on initial oxbow sedimentation as observed within recently cut-off channels of the Ain River, France'.

The workshops for young researchers were further highlights of the 2012 programme. They focused on 'writing papers and research proposals in geomorphology' and 'pitfalls, statistical and otherwise, in analysis of environmental data'. Thanks go to Stuart Lane, Mike Ellis, and James Kirchner. The great success and excellent feedback received stimulates us to continue workshops for young researchers as part of the Assembly programme in future years.

One focus of the division activities this year was enhancing ties with other geomorphology organizations for improving information exchange between associations. The aims of this innitiative are to strengthen the visibility of geomorphology as scientific discipline of relevance to societies, to join forces in supporting the next generation of geomorphologists, and to help shape the agenda in research programmes. Besides a round table discussion on 'Geomorphology in Europe' to establish the dialog between associations in Europe, also a <u>Memorandum of Understanding</u> was signed between the Division and the International Association of Geomorphologists.

For further details please consult the presentation from the Division Business Meeting on the EGU website.

> Andreas Lang GM Division President

Geochemistry, Mineralogy, Petrology & Volcanology

At EGU 2012, four GMPV sessions were co-sponsored by the Volcanology-Geochemistry-Petrology (VGP) Division of AGU and by other organizations (European Association of Geochemistry, Society of Economic Geologists, Society for Geology Applied to Mineral Deposits). This collaboration emerged from an initiative taken by the presidents of the two divisions, myself for GMPV and Steve Sparks for VGP. Plans for future collaboration, as agreed during discussions with Catherine McCammon, president elect of VGP who was at EGU2012, are outlined below. **Kuno award lecture at EGU 2013:** The Kuno Award is given by VGP but no Medal Lecture is given at AGU. Katie Kelly, the 2011 recipient, gave a lecture in a GMPV session. We agreed to continue this practice in 2013 – the Kuno medalist would be invited to EGU 2013 and if he/she accepts, would give a talk in an appropriate session. We will explore the possibility of obtaining travel support from an organization such as EAG or EMU.

Committee membership: We discussed appointment of GMPV members to VGP award committees and vice versa. The composition of the 2012 medal committees has been voted on so any cross appointments will start in early 2013 for VGP, and in April for GMPV.

Reciprocal agreement regarding newsletters: We will also explore whether GMPV members could have access to VGP mailings and vice versa, and will investigate means of assuring that news of GMVP activities are given in the existing VGP newsletter and website. In the future VGP news will be added to the GMPV page on the EGU website and in other appropriate EGU newsletters.

In addition to these actions, we are also opening discussions with representatives of the MRP (Mineral Rock Physics) Division at AGU. This interaction will also include the EMRP (Earth Magnetism and Rock Physics) Division of EGU.

Nicholas Arndt GMPV Division President



Nicholas Arndt (far left) chairs a press conference on strategic mineral resources at the 2012 General Assembly.

GEO CEGU NEWS

EGU awards and medals

Awardees were honored at the 2012 General Assembly

EGU awards and medals are presented annually in recognition of scientific excellence in the Earth, space and planetary sciences, or service to the community. This year's awardees, listed below, were honored at the EGU Medal Ceremony on Tuesday 24 April.

Union Awards

Arthur Holmes Medal & Honorary Membership

Awarded to <u>Vincent Courtillot</u> for seminal contributions to geomagnetism and the geodynamics of mantle hotspots.

Alfred Wegener Medal & Honorary Membership

Awarded to <u>Michael Ghil</u> for his leading contributions to theoretical climate dynamics; his innovative observational studies involving model assimilation of satellite data in meteorology, oceanography and space physics; the breadth of his interdisciplinary studies, including macroeconomics; and also for his extensive supervision and mentoring of scores of graduate and postdoctoral students.

Jean Dominique Cassini Medal & Honorary Membership

Awarded (posthumously) to <u>Angioletta Coradini</u> in recognition of her important and wide range of work in planetary sciences and Solar System formation, and her leading role in the development of space infrared instrumentation for planetary exploration.

Alexander von Humboldt Medal

Awarded to Robin T. Clarke for fundamental contributions in statistical analysis and modeling of hydrological processes.

Arne Richter Award for Outstanding Young Scientists

Awarded to <u>Aikaterini Radioti</u> for her remarkable work in the field of auroral dynamics of Jupiter and Saturn, to which she contributed with original ideas based on combined studies of remote auroral and *in situ* magnetospheric data. Also awarded to <u>Encarnación Ruiz-Agudo</u> for her ground-breaking work on the structure of mineral surfaces, on fluid-mineral interaction and on the influence of organic and inorganic additives on the growth of crystals in multicomponent aqueous solutions. To <u>Lieven Clarisse</u> for his outstanding contribution to exploiting remote atmospheric sensing techniques to improve our understanding of emission and transport processes of ash and gases in relation to various natural hazardous processes. And to <u>Stephanie Henson</u> for her fundamental contribution to the study of marine ecosystems.

Union Service Award

Awarded to <u>Bruce D. Malamud</u> in recognition of his innovative and organized service for the Union as Chair of the Programme Committee, and his exceptional dedication as President of the Division on Natural Hazards.

Division Outstanding Young Scientists Award

Atmospheric Sciences

To <u>Diana Rose</u> for outstanding contributions to the elucidation of the influence of atmospheric aerosol particles on the formation of clouds.

Climate: Past, Present & Future

To <u>Didier M. Roche</u> for his innovative development of forward models of isotopic proxies and his contribution to the understanding of past climate changes.

Cryospheric Sciences

To <u>Gaël Durand</u> for his contributions in the understanding of polar ice dynamics from micro-scale to macro-scale.

Energy, Resources, and the Environment

To <u>Suzanne Hangx</u> for her outstanding contribution to understanding the mechanical and chemical effects of CO_2 on rock materials, in the context of geological storage of CO_2 .

Geodesy

To Xavier Collilieux for his significant contributions towards improved methods and procedures in computing global terrestrial reference frames and for his studies of surface loading effects therein.

Geodynamics

To <u>Richard Foa Katz</u> for his outstanding contributions to the understanding of the mechanics of Earth's fluid-solid systems.

Geomorphology

To <u>Veerle Vanacker</u> for her novel approach to distinguish between natural benchmark and accelerated erosion rates in mountain environments under pressure of land use change.

Hydrological Sciences

To <u>Giuliano Di Baldassarre</u> for his remarkable contribution to understanding and communicating the impact of global changes on flood risk.

Nonlinear Processes in Geosciences

To <u>Claudia Cherubini</u> for valuable contributions to the hydrogeological modeling of groundwater applied to resource management, with specific approaches for coastal fractured aquifers, and for applying advanced geo-statistical techniques to model environmental and anthropogenic variables.

Soil System Sciences

To <u>Claudio Zaccone</u> for his contribution to understanding the role of humification processes in ombrotrophic bog profiles and the



Union awardees, their nominators, and EGU president (far left) and vice-president (far right) at the Medal Ceremony at the 2012 General Assembly.

interactions between humic substances and organic/inorganic pollutants.

Solar-Terrestrial Sciences

To <u>Alejandro Luque</u> for his outstanding contribution to the understanding of the electrodynamics of plasma streamers found in Transient Luminous Events occurring in the mesosphere of the Earth.

Tectonics and Structural Geology

To <u>André R. Niemeijer</u> for his exceptional work on the effects of fluid-rock interactions and fabric development on rock and fault mechanical properties.

Division Medals

Vilhelm Bjerknes Medal – Atmospheric Sciences

To <u>Adrian Simmons</u> in recognition of his outstanding and diverse scientific contributions to dynamic meteorology and numerical weather prediction over the past four decades.

Vladimir Ivanovich Vernadsky Medal – Biogeosciences

To <u>Jean-Pierre Gattuso</u> for creative and scholarly contributions to biogeosciences at the interface between microbial ecology, coral ecology, biogeochemistry and chemical oceanography.

Milutin Milankovic Medal - Climate: Past, Present & Future

To <u>Wolfgang Berger</u> for his pioneering contributions to understanding the imprint of orbital forcing on the marine carbonate system and its interaction with atmospheric CO₂ concentration and for his ground-breaking studies on isotope geochemistry.

Hans Oeschger Medal - Climate: Past, Present & Future

To <u>Michael Mann</u> for his significant contributions to understanding decadal-centennial scale climate change over the last two millennia and for pioneering techniques to synthesize patterns and northern hemispheric time series of past climate using proxy data reconstructions.

Louis Agassiz Medal - Cryospheric Sciences

To <u>lan Joughin</u> for outstanding contributions to the study of the dynamics and mass balance of polar ice sheets using differential SAR interferometry and other techniques that he has helped to pioneer.

Ian McHarg Medal - Earth and Space Science Informatics

To <u>Peter Fox</u> for his contribution to recognising the fundamental importance of establishing informatics as a genuine discipline within the Earth sciences.

Robert Wilhelm Bunsen Medal – Geochemistry, Mineralogy, Petrology & Volcanology

To <u>William F. McDonough</u> for his outstanding contribution to our understanding of the geochemical composition and evolution of the solid Earth. His ground-breaking research in defining the major and trace element composition of primitive mantle and of modern mantle reservoirs has become a cornerstone of geochemical investigation of the Earth's interior and will form the basis for further investigations by generations of geochemists.

Vening Meinesz Medal – Geodesy

To <u>Che-Kwan Shum</u> for his pioneering work on the recent developments in geodetic techniques that have made profound contributions to the Earth sciences through the precise measurement of mass transports within the Earth system.

Augustus Love Medal – Geodynamics

To <u>Yanick Ricard</u> for fundamental contributions to geodynamics through studies of how geoid, true polar wander, topography, seismic tomography and plate motions can be used to probe the mantle viscosity structure, mantle mixing and convective flow.

Ralph Alger Bagnold Medal – Geomorphology

To Gregory E. Tucker for his innovative modeling and field studies leading to fundamental advances in our understanding of the way processes and landscape elements interact in the genesis of landforms as well as for providing new insights on the importance of the temporal variability of the driving forces of geomorphic systems.

John Dalton Medal – Hydrological Sciences

To <u>Kurt Roth</u> for his extraordinary creativity and pioneering contributions to flow and transport processes in the vadose zone, and its interactions with the saturated zone and with the atmosphere.

Petrus Peregrinus Medal – Earth Magnetism & Rock Physics

To Frank J. Lowes for innovative research in geomagnetism, notably the first experimental geodynamo model, the spatial geomagnetic power spectrum, error analysis of satellite data, and leadership in the community developing the International Geomagnetic Research Field.

Plinius Medal - Natural Hazards

To <u>Timothy Sullivan</u> for his outstanding research achievements in seismic engineering design, seismic assessment, seismic retrofit and mitigation of seismic risk.

Lewis Fry Richardson Medal – Nonlinear Geosciences

To <u>Harry Swinney</u> for his pioneering experiments on deterministic chaos and highly original laboratory models of geophysical flows.

Fridtjof Nansen Medal – Ocean Sciences

To <u>Pierre-Yves Le Traon</u> for his excellent contributions to and leadership in establishing satellite altimetry as a quantitative observational technique for research on mesoscale ocean variability, ocean circulation and sea level.

David Bates Medal - Planetary & Solar System Sciences

To Hans Rickman for his fundamental contributions to cometary physics and the analysis of non-gravitational forces in comets.

Louis Néel Medal – Earth Magnetism & Rock Physics

To James R. Rice for his seminal contributions to our fundamental understanding of strain localization, poromechanics and friction and his elegant and systematic studies have elucidated fault mechanics and the coupling with hydrologic and thermal processes during all phases of the earthquake cycle.

Beno Gutenberg Medal - Seismology

To <u>Michel Campillo</u> in recognition of the outstanding contributions he has made to the study of earth structure and seismic sources using novel methods.

Philippe Duchaufour Medal – Soil System Sciences

To <u>José Torrent</u> for his contribution on the mineralogy of iron oxides and the iron and phosphorus biogeochemical cycle in the soil-plant system.

Julius Bartels Medal - Solar-Terrestrial Sciences

To <u>Michael Lockwood</u> for his outstanding contributions to the understanding of the dynamics of the terrestrial magnetosphere and the coupling between solar variability, magnetospheric and ionospheric processes, and the terrestrial climate.

Jean Baptiste Lamarck Medal – Stratigraphy, Sedimentology & Palaeontology

To <u>Emiliano Mutti</u> for his internationally acclaimed research in clastic sedimentology, especially his ground-breaking detailed fieldbased models of turbidite systems, their petroleum reservoir characterization, and their relationship to fluvio-deltaic systems.

Stephan Mueller Medal – Tectonics & Structural Geology

To <u>Jacques Malavieille</u> in recognition of his fundamental contributions to the integration of field-based studies with analog modeling to study lithospheric deformation.

Henry Darcy Medal – Hydrological Sciences

To <u>Tissa H. Illangasekare</u> for fundamental contributions to engineering hydrology and exceptional support to the hydrological community.

An earlier version of this article was published on the EGU website

Research on Flood Resilience and Europe: achievements and future

Report from the conveners of the EG4 Union session at this year's General Assembly

Vienna, 26 April 2012 – The extent and consequences of recent flood events in Europe and worldwide showed that the existing flooddefence structures do not guarantee a sufficient protection level for people and properties. Considering the uncertainty of future conditions shaped by the main drivers of urban development such as climate change and rapid urbanization, the situation is getting even more severe. Where defences exist, the residual risk will increase as the probability will increase that they fail or be overtopped by severe floods. In this unfavourably changing environment, a substantial rethinking of the existing strategies and paradigm shift from the traditional approaches is required in order to cope with future flooding in an adequate way.



During the EGU General Assembly (Vienna, 22–27 April, 2012), the session Research on Flood Resilience and Europe (EG4) broadly covered the current research on Flood Resilience in Europe and worldwide. The follow-up splinter meeting 'Future of European Research on Flood Resilience' issued the resulting recommendations for future research.

The EG4 session was called and organized by the SMARTeST project in the framework of the programme group Europe and Geoscience of the EGU General Assembly. Other 7th Framework projects such as FloodProbe, and CORFU were represented, as well as the Interreg project RainGain, the projects BlueGreenDream (pending), CAPHAZ-NET, FREEMAN, MPRINTS, WATER2ADAPT and the UNESCO-IHE/TU Delft Resilience Group.

Leading speakers from research and industry around Europe broadly covered the current research on Flood Resilience in Europe and worldwide by presenting the findings of these projects obtained through joint investigation, implementation, and dissemination of short to medium term strategies.

The session was followed by the splinter meeting <u>Future of Euro-</u> pean Research on Flood Resilience that called for further research in flood resilience technology, systems and tools to protect vulnerable urban areas. It emphasized that there is a need for demonstration projects that can show the findings presented during the session. Furthermore, the development of standards for technology and tools should be the focus of further research, with unified test standards for flood resilience technology being a matter of increasing urgency. Relevant flood resilience tools and models should see the development of standards for data management and presentation of results and uncertainty to decision makers.

> Stephen L Garvin, SMARTeST Coordinator, Building Research Establishment, UK Daniel Schertzer and Ioulia Tchiguirinskaia, ENPC, Paris, SMARTeST Partner Conveners of Seminar Session, Flood Resilience and Europe at EGU 2012.

SMARTeST is holding an <u>international conference and flood resil-</u> <u>ience technology exhibition</u>, in Athens in September 2012, and further national events are being held in the seven partner countries.

This article was originally published on the EGU website

Short report on 2012 General Assembly Press Centre activities

This year's General Assembly, with over 13,500 presentations and more than 11,200 participating scientists, was one of the most successful to date. In addition to its scientific achievements, the conference also saw keen media participation and reporting.

The Press Centre, run for the first time by EGU's Media and Communications Officer Bárbara Ferreira, welcomed over 40 media participants, including journalists, press officers, science writers, and EGU guest bloggers. The Centre hosted 12 press conferences on topics ranging from flood disasters and sea-level rise to mitigation of tsunami risk and space weather. The conferences were not only well attended by the journalists at the Assembly, but also had hundreds of live views via a webstreaming link.

Media participants attended press conferences and scientific sessions, interviewed scientists, and reported extensively on the General Assembly. The conference has featured in over 100 online, print and radio articles published by the BBC, Bloomberg News, Spiegel, to name a few. News agencies such as Agence France-Presse, Austria Presse Agentur, and the Spanish Agencia EFE also extensively covered research presented at the General Assembly.



The EGU is grateful to all those who worked at the Press Centre, in particular Tim Middleton, Julia Wöger, Celso Gomes, and Suzanne Voice, as well as for everyone at the conference-organizer Copernicus, especially Katja Gänger. Thank you also to the scientists who participated in this year's press conferences and, of course, to the hard-working journalists the EGU had the pleasure to host.

This article was originally published on the EGU website

EGU 2012 Photo Competition winners

All images are available from EGU's Open Access image repository, Imaggeo

The selection committee received close to 300 photos for this year's EGU Photo Competition, in most areas covered by Union's activities. From these, ten finalist photographs were exhibited at the 2012 General Assembly, where conference participants voted on their favourites. The three most-voted photographs, and winning entries, are:

Melt stream



 $1^{\rm st}$ prize (214 votes): Melt stream, Greeland by Ian Joughin, distributed by EGU under a Creative Commons licence.

Supraglacial lakes are created when water forms in depressions on top of a glacier, remaining there until it dissipates by seeping through crevasses, or cracks in the ice sheet. Despite their sometimes impressive size, supraglacial lakes may drain in a matter of hours under the right conditions, when the pressure they exert on the ice causes it to crack creating a <u>sometimes spectacular</u> lake draining event.

Draining of supraglacial lakes may have important environmental consequences and may even, as warming temperatures further increase meltwater volumes, affect rates of sea-level rise by accelerating the rate by which ice sheets slide into the ocean.

lan Joughin, from the University of Washington Polar Science Center, took this breathtaking photo under freezing conditions, earning him the 1st Prize at the 2012 General Assembly Photo Competition.

"This image was taken as part of a project investigating the rapid drainage of supraglacial lakes in Greenland," he explains. "Each year, these lakes, which often are a few kilometres across and 10 or more metres deep, fill with melt water. If the water can find an open crack, it fills the crack and the greater density of water relative to ice allows it to hydro-fracture through the full thickness (~1km) of the ice sheet, causing the entire lake to drain rapidly (< 2hours). This picture shows a large melt stream that we encountered as we

were out exploring the lake basin, and it is only one of many streams feeding the lake."

Additional images from this trip can be viewed here.

Burst



 $2^{\rm nd}$ prize (142 votes): Burst by Melissa Bukovsky, distributed by EGU under a Creative Commons licence.

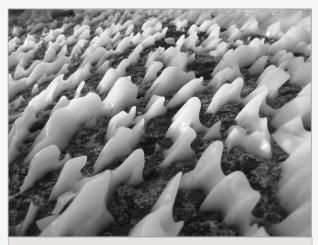
This photo won 2nd prize at the 2012 General Assembly Photo Competition and, according to the photographer, Melissa S. Bukovsky, epitomizes the idea that an expensive camera is not a necessity for taking great photos. "You just need to know how to use what you have. I travel with a point and shoot that fits in my back pocket," she explains.

Currently a Project Scientist at the US National Center for Atmospheric Research, Bukovsky snapped this shot on one of her many work related trips. "This picture of a bursting mud bubble in a boiling pool of mud was taken just outside of the Wai-O-Tapu geothermal area near Rotorua, New Zealand. The area is part of New Zealand's Taupo volcanic zone. I stayed in this area for a few days of holiday before traveling back to the US after working in Melbourne for the summer. Aside from all of the fantastic geothermal phenomena to see in that area, there are numerous hot springs that are great for relaxing in."

Mud pools, hot springs of bubbling mud, form in high-temperature geothermal areas where water is in short supply. The little water that is available rises to the surface at a spot where the soil is rich in volcanic ash, clay, and other fine particulates. The viscosity of the mud varies, from fluid during the rainy season to viscous in drier months.

The Wai-O-Tapu geothermal complex has been protected as a scenic reserve since 1931 and it remains a major tourist attraction.

Icy landscape



 $3^{\rm rd}$ prize (135 votes): Icy landscape by Lucien von Gunten, distributed by EGU under a Creative Commons licence.

Ice is a hazardous beauty, ephemeral in nature and, under the right conditions, capable of dominating landscapes. Earlier this year, while North America enjoyed an unusually mild winter, central and eastern Europe experienced brutal cold spells. The continent witnessed widespread freezing as cold air swept south from Siberia, claiming hundreds of lives, knocking out power supplies, and disrupting transport services. In Poland and the Ukraine, temperatures dropped as low as -33C and in Italy over 80,000 citizens were left without electricity after power lines were felled by trees.

This year's icy spell brought Switzerland its coldest weather since 1987, the year it experienced its lowest ever recorded temperature. Lucien von Gunten, Science Officer at <u>PAGES</u> (<u>Past Global</u> <u>Changes</u>), explains the exceptional circumstances behind this captivating shot, taken earlier this year. "In Versoix, near the Lake of Geneva, the combination of low temperatures and strong easterly winds led to an unusual natural spectacle as the lake shores were partly covered with ice. Images of cars and boats under a thick ice shell were shown in the international press. Next to these popular eye-catchers one could also admire smaller scale ice structure, such as those depicted on this photograph, which covers an area of 30×30cm." This photo won 3rd Prize at the 2012 General Assembly photo competition.

Exceptional weather events, such as extreme temperatures, drought, or tropical storms and hurricanes, have increased in frequency over the past 50 years, partly as a result of human-induced climate change.

More pictures of Switzerland during this year's freeze can be seen here.

After the General Assembly, the three photos were highlighted on <u>GeoLog</u>, the EGU Blog. The texts were originally publish on the blog's weekly Imaggeo on Mondays series.

Join the EGU Blog Network!

To complement our official blog, we are launching a blog network related to the Earth, planetary, and space sciences. If you are a scientist who likes blogging about your research, or about geosciences in general, we would like to hear from you.

In a few months, the EGU blog will migrate from WordPress to the EGU website, and we would like to have other bloggers joining us within an EGU Blog Network. The aim of this project is to foster a diverse community of geoscientist bloggers and to offer them a place to interact with each other and with the Union.

The network would be similar to <u>Nature Network</u> or <u>Scientific Ameri-</u> <u>can Blog Network</u>, with all blogs having a unified design and general theme – Earth, space and planetary sciences – but with each blogger being responsible for the content of their own blog. Apart from your site gaining exposure by having its name and a short introduction listed on the EGU website, we will also share highlights of your work on our social media channels, and may ask you to contribute original content on our official blog.

If you'd like your blog to be considered for our network, fill out this form. Please note that only blogs in English will be considered.

Feel free to contact the EGU Media and Communications Officer Bárbara Ferreira if you have any questions.

Happy blogging!

This article was originally published on the EGU blog

International Innovation interview: EGU Executive Secretary

Philippe Courtial details the work of the Union in assisting scientists and improving the availability of accurate scientific data

Could you outline the main intention and mission of the European Geosciences Union?

The European Geosciences Union (EGU) is Europe's premier geosciences organization, and is dedicated to the pursuit of excellence in the geosciences, planetary, and space sciences for the benefit of humanity worldwide. It was established in September 2002 as a merger of the European Geophysical Society (EGS) and the European Union of Geosciences (EUG), and has headquarters in Munich, Germany. The EGU is a non-profit, international, and interdisciplinary learned association of scientists, with over 11,000 members from all over the world.

The objectives of the Union are to promote cooperation and discussion in Europe among scientists (including students, post-docs and senior scientists) concerned with studies of the Earth and its environment and of planetary and space sciences, and to promote and encourage the development of any or all of the relevant sciences, within and outside Europe.

Moreover, what gaps has the organization filled?

EGU provides a platform to its members and to the scientific community. It hosts and organizes the largest and most prominent event in geosciences held in Europe, the EGU General Assembly, attracting over 10,000 scientists from all over the world each year. The conference includes over 700 different scientific sessions. Furthermore, EGU has a number of travel awards to financially assist young scientists and others who wish to attend its General Assembly each year (e.g. the Young Scientist's Travel Award for Europeans, the Adrian Gill Travel Award for a young scientist from Great Britain to take part in a session of the Atmospheric Sciences or Ocean Sciences programme, and the Keith Runcorn Travel Award for Non-Europeans). Furthermore, EGU provides support to scientists in the organization of conference series, topical meetings, training schools and short courses.

In addition, EGU has a current portfolio of 14 scientific journals, which use an innovative 'open access' format. As signatory of the Berlin Open Access Initiative (Berlin Declaration on Open Access to Knowledge in Sciences and Humanities), EGU has contributed to Europe's global leadership in providing open-access publications. EGU's open-access portfolio also includes an online geosciences image repository (Imaggeo).

EGU also runs a Geosciences Information for Teachers (GIFT) programme that offers teachers from elementary to high school the opportunity to extend their knowledge in geo-scientific topics.

The Union further fosters communication between scientists through a mentoring scheme (the Women in Geosciences Mentoring Programme was recently launched) and by means of a quarterly newsletter distributed to all its members.

EGU also plays a role in identifying and drawing attention to societal problems which could be addressed by the scientific work of its members, and in fostering its communication to the non-scientific public.

Dedicated to the pursuit of excellence in the geosciences and the planetary and space sciences, what benefits does the EGU bring to humanity?

Some of the EGU Divisions cover topics that are of great societal importance, such as energy, natural hazards and climate change. Furthermore, many of the EGU General Assembly sessions, sponsored or co-sponsored conference series, topical meetings, training schools and short courses, as well as papers published in EGU journals, tackle such issues, which have significant public impact.

Would you talk us through the main challenges that geosciences tackle and that your researchers face? Are the issues that some of the EGU Divisions investigate being affected by human behaviour or are they just part of the Earth's cycles?

Geoscientists face scientific challenges that can be, to a certain degree, of great interest for the citizens of Europe. I would like to highlight two of the challenges that have been reported in previous issues of this [International Innovation] publication: Climate studies have investigated numerous mechanisms and processes for the best knowledge of present changes. While understanding the present realities is one important point, understanding how they relate to past climate variability is the necessary condition to apprehend the future possibilities correctly. The demand on resources and the impact mankind has on the environment today is enormous. The massive input of carbon dioxide into the atmosphere is responsible not only for global warming, but also for an increase in acidity of the oceans. This so-called ocean acidification is probably affecting marine life, but how, and to what extent, is still largely unknown. Moreover, the impact of global warming on ecosystems and possible relationships between vegetation and greenhouse gases are still not fully understood.

Statements made by the EGU are quoted in the media. How are these conclusions reached?

The EGU has issued a few position statements that can be found on the EGU homepage. The aim of these statements is to provide state-of-the-art research regarding a specific topic (at the time the position statement is issued). They can be accompanied by a policy briefing – a short document which provides more information on the topic in question, including possible policy implications.

How does the EGU ensure that science is at the heart of all it does?

The EGU is a bottom-up Union devoted to the promotion of geosciences and to encouraging discussion between scientists. The EGU achieves this through its General Assembly, and by organising, sponsoring or co-sponsoring conference series, topical meetings, training schools and short courses. The Union's core activities also include the publication of a newsletter and several openaccess scientific journals, in addition to the previously mentioned outreach activities.

Many institutions are struggling to keep up with the pace of science communication – an essential part of any environment organization today – how vital is it to engage not only the general public but policy makers unfamiliar with the vocabulary researchers use? What activities are you involved in facilitating an increased dialogue between scientists and decision makers?

We are actively working to increase recognition of the EGU, not only among the scientific community, but also among decision makers, the media, and the wider public as an authoritative source of information in the Union's disciplines. For this reason, the EGU has hired a Media and Communications Officer, Bárbara T. Ferreira, to join the EGU Executive Office in Munich. Providing independent scientific expertise to politicians and decision makers is an important part of our communications strategy, one that our media officer will seek to implement in the short term.

Regarding the dissemination of your activities, the EGU is actively engaged in a wide range of undertakings. What other activities, other than those mentioned, is the EGU busy with?

Bárbara T. Ferreira has been actively coordinating media-related scientific communications between the EGU and its membership, the working media, and the public at large. Aside from preparing press releases and taking over the editorship of the EGU newsletter, she increased the activity of EGU on social media platforms such as Twitter (@EuroGeosciences), Facebook, and Google+. Continuing the work of EGU's first Science Communications Postdoctoral Fellow, Jennifer Holden, Bárbara has also been actively blogging for EGU at GeoLog.

Do the EGU Divisions collaborate internally? What results has this led to?

Yes, since some scientific topics are not specific to one division and may be relevant to several. EGU encourages collaboration between its divisions, as illustrated by the presence of inter-division sessions (sessions co-organized by several EGU divisions) at our General Assembly. Over 170 inter-division sessions have been scheduled at the EGU General Assembly in 2011.

What impact, if any, has the global economic downturn had on the progression of the EGU?

The global economic downturn has had wide-reaching impacts, but EGU activities have not suffered a great deal so far. Annual membership numbers have been relatively constant over the past two



EGU staff ready for a *Weißwurst Frühstück* on Carnival day. From left to right: Edvard Glücksman (Science Communications Fellow), Karen Resenberger (Secretary), Philippe Courtial (Executive Secretary), Robert Barsch (Webmaster & System Admin), and Bárbara Ferreira (Media and Communications Officer).

years (EGU has had about 12,000 and 11,200 members for 2010 and 2011 respectively), and our annual meetings have not demonstrated a decrease in participation (10,463 and 10,725 attendees in 2010 and 2011 respectively). Furthermore, EGU offers free online access to its publications, which is a great deal when budget cuts are affecting some institution libraries.

To what extent does the EGU cooperate internationally? What challenges has this posed, and how has the EGU overcome these?

In addition to the activities mentioned previously, EGU also aims to establish liaisons with other scientific organizations, both within and outside Europe, to mutual benefits. Currently, we have a cooperation with the American Geophysical Union (AGU), the Geological Society of America (GSA), the Asia Oceania Geosciences Society (AOGS), the Japan Geosciences Union (JpGU) and the European Association of Geoscientists & Engineers (EAGE). In 2011, EGU signed a Memorandum of Understanding with AGU and AOGS for further cooperation with these organizations.

Would you like to draw our attention to any other aspect of the EGU's work?

The bottom-up approach of EGU encourages the participation of young scientists in the affairs of the Union, including its General Assembly. For example, EGU actively seeks for young scientists interested in organising sessions during its General Assembly. Merit awards for young scientists at Division and Union levels have also been created (eg. the Arne Richter Outstanding Young Scientists, the Outstanding Young Scientists, the Plinius and the Outstanding Student Poster awards). EGU has also established links with communities of young scientists.

Interview (except image) reproduced with permission from <u>International Innovation</u>. This leading global dissemination publication provides unique access to bespoke interviews, content and presentations for the wider scientific, technology and research communities. EGU members can subscribe free to this resource here.

Geoengineering could disrupt rainfall patterns

EGU press release highlights research published in Earth System Dynamics

A geoengineering solution to climate change could lead to significant rainfall reduction in Europe and North America, a team of European scientists concludes. The researchers studied how models of the Earth in a warm, CO_2 -rich world respond to an artificial reduction in the amount of sunlight reaching the planet's surface. The study is now published in Earth System Dynamics, an Open Access journal of the European Geosciences Union (EGU).

Tackling climate change by reducing the solar radiation reaching our planet using climate engineering, known also as geoengineering, could result in undesirable effects for the Earth and humankind. In particular, the work by the team of German, Norwegian, French, and UK scientists shows that disruption of global and regional rainfall patterns is likely in a geoengineered climate.

"Climate engineering cannot be seen as a substitute for a policy pathway of mitigating climate change through the reduction of greenhouse gas emissions," they conclude in the paper.

Geoengineering techniques to reduce the amount of solar radiation reaching the Earth's surface range from mimicking the effects of large volcanic eruptions by releasing sulphur dioxide into the atmosphere to deploying giant mirrors in space. Scientists have proposed these sunlight-reflecting solutions as last-ditch attempts to halt global warming.

But what would such an engineered climate be like?

To answer this question, the researchers studied how four Earth models respond to climate engineering under a specific scenario. This hypothetical scenario assumes a world with a CO_2 concentration that is four times higher than preindustrial levels, but where the extra heat caused by such an increase is balanced by a reduction of radiation we receive from the Sun.

"A quadrupling of CO_2 is at the upper end, but still in the range of what is considered possible at the end of the 21st century," says Hauke Schmidt, researcher at the Max Planck Institute for Meteorology in Germany and lead author of the paper.

Under the scenario studied, rainfall strongly decreases – by about 15 percent (some 100 millimetres of rain per year) of preindustrial precipitation values – in large areas of North America and northern Eurasia. Over central South America, all models show a decrease in rainfall that reaches more than 20 percent in parts of the Amazon region. Other tropical regions see similar changes, both negative and positive. Overall, global rainfall is reduced by about five percent on average in all four models studied.



Volcanic eruptions, such as the one of the Karymsky volcano (Russia) in 2004, release sulphur dioxide to the atmosphere, which has a cooling effect. Geoengineering an 'artificial volcano' to mimic this release could be a solution to global warming, but one that may have undesirable effects for the Earth. (Photo by Alexander Belousov of the Earth Observatory of Singapore, distributed by EGU under a Creative Commons licence.)

"The impacts of these changes are yet to be addressed, but the main message is that the climate produced by geoengineering is different to any earlier climate even if the global mean temperature of an earlier climate might be reproduced," says Schmidt.

The authors note that the scenario studied is not intended to be realistic for a potential future application of climate engineering. But the experiment allows the researchers to clearly identify and compare basic responses of the Earth's climate to geoengineering, laying the groundwork for more detailed future studies.

"This study is the first clean comparison of different models following a strict simulation protocol, allowing us to estimate the robustness of the results. Additionally we are using the newest breed of climate models, the ones that will provide results for the Fifth IPCC [Intergovernmental Panel on Climate Change] Report," explains Schmidt.

The scientists used climate models developed by the UK Met Office's Hadley Centre, the Institut Pierre Simon Laplace in France, and the Max Planck Institute in Germany. Norwegian scientists developed the fourth Earth model used.

Reference

Schmidt, H. et al. (2012): Solar irradiance reduction to counteract radiative forcing from a quadrupling of CO2: Climate responses simulated by four Earth system models, *Earth System Dynamics*, 3, 1–16

A tsunami wave recorded near a glacier front

Article published in Natural Hazards and Earth System Sciences



Deformed sea ice near the glacier front: buckling (above) and fold (below). (Credit: Marchenko et al. 2012)

Abstract

We observed a tsunami wave near the glacier front in the Temple Fjord (Spitsbergen). Two temperature and pressure recorders were deployed on a wire from the ice approximately 300m from the glacier front. A pressure recorder was located under them on the bottom. The vertical displacement of the ice was approximately 30cm and the period of the tsunami wave was 90s. We attribute the generation of this wave to the displacement of the glacier similarly to the landslide tsunami generated by the motion of a block of rocks down the sloping bottom. The glacier motion also generated a short-period (12s) deformation wave in the ice cover. The measurements allowed us to estimate the wave number of these waves and the Young's modulus of the ice.

Reference

Marchenko, A. V., Morozov, E. G., and Muzylev, S. V. (2012): A tsunami wave recorded near a glacier front, *Nat. Hazards Earth Syst. Sci.*, 12, 415–419.

Drivers of flood risk change in residential areas

Article published in Natural Hazards and Earth System Sciences

Abstract

The observed increase of direct flood damage over the last decades may be caused by changes in the meteorological drivers of floods, or by changing land-use patterns and socio-economic developments. It is still widely unknown to which extent these factors will contribute to future flood risk changes.

We survey the change of flood risk in terms of expected annual damage for residential buildings in the lower part of the Mulde River basin (Vereinigte Mulde) between 1990 and 2020 in 10-yr time steps based on measurements and model projections. For this purpose we consider the complete risk chain from climate impact via hydrological and hydraulic modelling to damage and risk estimation. We analyse what drives the changes in flood risk and quantify the contributions of these drivers: flood hazard change due to climate change, land-use change and changes in building values.

We estimate flood risk and building losses based on constant values and based on effective (inflation adjusted) values separately. For constant values, estimated building losses for the most extreme inundation scenario amount to more than 360 million € for all time steps. Based on effective values, damage estimates for the same inundation scenario decrease from 478 million € in 1990 to 361 million € in 2000 and 348 million € in 2020 (maximum land-use scenario). Using constant values, flood risk is 111% (effective values: 146%) of the 2000 estimate in 1990 and 121% (effective values: 115%) of the 2000 estimate for the maximum land-use scenario in 2020. The quantification of driver contributions reveals that land-use change in the form of urban sprawl in endangered areas is the main driver of flood risk in the study area. Climate induced flood hazard change is important but not a dominant factor of risk change in the study area. With the historical exception of the economic effects in Eastern Germany following the German reunification, value developments only have minor influence on the development of flood risk.

Reference

Elmer, F. et al. (2012): Drivers of flood risk change in residential areas, Nat. Hazards Earth Syst. Sci., 12, 1641–1657.

Photo-lability of deep ocean dissolved black carbon

Article published in Biogeosciences

Abstract

Dissolved black carbon (DBC), defined here as condensed aromatics isolated from seawater via PPL solid phase extraction and quantified as benzenepolycarboxylic acid (BPCA) oxidation products, is a significant component of the oceanic dissolved organic carbon (DOC) pool. These condensed aromatics are widely distributed in the open ocean and appear to be tens of thousands of years old. As such DBC is regarded as highly refractory. In the current study, the photo-lability of DBC, DOC and coloured dissolved organic matter (CDOM; ultraviolet-visible absorbance) were determined over the course of a 28 day irradiation of North Atlantic Deep Water under a solar simulator. During the irradiation DBC fell from 1044±164nM-C to 55±15nM-C, a 20-fold decrease in concentration. Dissolved black carbon photo-degradation was more rapid and more extensive than for bulk CDOM and DOC. The concentration of DBC correlated with CDOM absorbance and the quality of DBC indicated by the ratios of different BPCAs correlated with CDOM absorbance spectral slope, suggesting the optical properties of CDOM may provide a proxy for both DBC concentrations and quality in natural waters. Further, the photo-lability of components of the DBC pool increased with their degree of aromatic condensation. These trends indicate that a continuum of compounds of varying photo-lability exists within the marine DOC pool. In this continuum, photo-lability scales with aromatic character, specifically the degree of condensation. Scaling the rapid photo-degradation of DBC to rates of DOC photo-mineralization for the global ocean leads to an estimated photo-chemical half-life for oceanic DBC of less than 800 years. This is more than an order of magnitude shorter than the apparent age of DBC in the ocean. Consequently, photo-degradation is posited as the primary sink for oceanic DBC and the apparent survival of DBC molecules in the oceans for millennia appears to be facilitated not by their inherent inertness but by the rate at which they are cycled through the surface ocean's photic zone.

Reference

Stubbins, A., Niggemann, J., and Dittmar, T. (2012): Photo-lability of deep ocean dissolved black carbon, *Biogeosciences*, 9, 1661–1670.

Global characteristics of the lunar tidal modulation of the equatorial electrojet derived from CHAMP observations

Article published in Annales Geophysicae

Abstract

It has been known since many decades that lunar tide has an influence on the strength of the equatorial electrojet (EEJ). There has, however, never been a comprehensive study of the tidal effect on a global scale. Based on the continuous magnetic field measurements by the CHAMP satellite over 10 years it is possible to investigate the various aspects of lunar effects on the EEJ. The EEJ intensity is enhanced around times when the moon is overhead or at the antipode. This effect is particularly strong around noon, shortly after new and full moon. The lunar tide manifests itself as a semi-diurnal wave that precesses through all local times within one lunar month. The largest tidal amplitudes are observed around December solstice and smallest around June solstice. The tidal wave crest lags behind the moon phase. During December this amounts to about four days while it is around two days during other times of the year. We have not found significant longitudinal variations of the lunar influence on the EEJ. When comparing the average EEJ amplitude at high solar activity with that during periods of solar minimum conditions a solar cycle dependence can be found, but the ratio between tidal amplitude and EEJ intensity stays the same. Actually, tidal signatures standout clearer during times of low solar activity. We suggest that the tidal variations are caused by a current system added to the EEJ rather than by modulating the EEJ. Gravitational forcing of the lower atmosphere by the moon and the sun is assumed to be the driver of an upward propagating tidal wave. The larger tidal amplitudes around December solstice can be related to stratospheric warming events which seem to improve the conditions for upward propagation.

The results described here have to large extent been presented as a Julius-Bartels Medal Lecture during the General Assembly 2011 of the European Geosciences Union.

Reference

Lühr, H., Siddiqui, T. A., and Maus, S. (2012): Global characteristics of the lunar tidal modulation of the equatorial electrojet derived from CHAMP observations, *Ann. Geophys.*, 30, 527–536.

On the role of ozone in long-term trends in the upper atmosphere-ionosphere system

Article published in Annales Geophysicae

Abstract

Origin of long-term trends in the thermosphere-ionosphere system has been discussed since the beginning of trend studies. The two most prioritized explanations have been those via long-term increase of atmospheric concentration of greenhouse gases and long-term increase of geomagnetic activity throughout the 20th century. Secular changes of the Earth's main magnetic field play an important role in trends in a limited region. Recently, Walsh and Oliver (2011) suggested that the long-term cooling of the upper thermosphere (above 200km) may be due largely to the stratospheric ozone depletion. Here, we show that the role of ozone is very important in the mesosphere and lower thermosphere but not in the upper thermosphere. The suggestion of Walsh and Oliver (2011) is based on historical (before 1988) data from Saint-Santin radar, whereas more recent data do not support their conclusion.

Reference

Laštovička, J. (2012): On the role of ozone in long-term trends in the upper atmosphere-ionosphere system, *Ann. Geophys.*, 30, 811–816.

The regulation of the air: a hypothesis

Article published in Solid Earth

Abstract

We propose the hypothesis that natural selection, acting on the specificity or preference for CO_2 over O_2 of the enzyme rubisco (ribulose-1,5-bisphosphate carboxylase/oxygenase), has controlled the $CO_2:O_2$ ratio of the atmosphere since the evolution of photosynthesis and has also sustained the Earth's greenhouse-set surface temperature. Rubisco works in partnership with the nitrogen-fixing enzyme nitrogenase to control atmospheric pressure. Together, these two enzymes control global surface temperature

and indirectly the pH and oxygenation of the ocean. Thus, the coevolution of these two enzymes may have produced clement conditions on the Earth's surface, allowing life to be sustained.

Reference

Nisbet, E. G., Fowler, C. M. R., and Nisbet, R. E. R. (2012): <u>The regulation of</u> the air: a hypothesis, *Solid Earth*, 3, 87–96.

Evidence of a possible turning point in solar UV-B over Canada, Europe and Japan

Article published in Atmospheric Chemistry and Physics

Abstract

This study examines the long-term variability of UV solar irradiances at 305nm and 325nm over selected sites in Canada, Europe and Japan. Site selection was restricted to the availability of the most complete UV spectroradiometric datasets during the period 1990–2011. The analysis includes the long-term variability of total ozone, aerosol optical depth and cloud fraction at the sites studied. The results, based on observations and modeling, suggest that over Canada, Europe and Japan the period under study can be divided into three sub-periods of scientific merit: the first period (1991– 1994) is the period perturbed by the Pinatubo volcanic eruption, during which excess volcanic aerosol has enhanced the 'conventional' amplification factor of UV-B at ground level by an additional factor that depends on solar elevation. The increase of the UV-B amplification factor is the result of enhanced scattering processes caused by the injection of huge amounts of volcanic aerosols during the perturbed period. The second period (1995–2006) is characterized by a 0.14%/yr increase in total ozone and an increasing trend in spectral irradiance by 0.94%/yr at 305nm and 0.88%/yr at 325nm. That paradox was caused by the significant decline of the aerosol optical depth by more than 1%/yr (the 'brightening' effect) and the absence of any statistically significant trend in the cloud fraction. The third period (2007–2011) shows statistically significant evidence of a slowdown or even a turning point in the previously reported upward UV-B trends over Canada, Europe and Japan.

Reference

Zerefos, C. S. et al. (2012): Evidence of a possible turning point in solar UV-B over Canada, Europe and Japan, *Atmos. Chem. Phys.*, 12, 2469–2477.

Estimating the climate significance of halogen-driven ozone loss in the tropical marine troposphere

Article published in Atmospheric Chemistry and Physics

Abstract

We have integrated observations of tropospheric ozone, very shortlived (VSL) halocarbons and reactive iodine and bromine species from a wide variety of tropical data sources with the global CAM-Chem chemistry-climate model and offline radiative transfer calculations to compute the contribution of halogen chemistry to ozone loss and associated radiative impact in the tropical marine troposphere. The inclusion of tropospheric halogen chemistry in CAM-Chem leads to an annually averaged depletion of around 10% (~2.5 Dobson units) of the tropical tropospheric ozone column, with largest effects in the middle to upper troposphere. This depletion contributes approximately -0.10W/m² to the radiative flux at the tropical tropopause. This negative flux is of similar magnitude to the ~0.33W/m² contribution of tropospheric ozone to present-day radiative balance as recently estimated from satellite observations. We find that the implementation of oceanic halogen sources and chemistry in climate models is an important component of the natural background ozone budget and we suggest that it needs to be considered when estimating both preindustrial ozone baseline levels and long term changes in tropospheric ozone.

Reference

Saiz-Lopez, A. et al. (2012): Estimating the climate significance of halogendriven ozone loss in the tropical marine troposphere, *Atmos. Chem. Phys.*, 12, 3939–3949.

Revisiting Narrow Bipolar Event intracloud lightning using the FORTE satellite

Article published in Annales Geophysicae

Abstract

The lightning stroke called a Narrow Bipolar Event, or NBE, is an intracloud discharge responsible for significant charge redistribution. The NBE occurs within 10-20µs, and some associated process emits irregular bursts of intense radio noise, fading at shorter timescales, sporadically during the charge transfer. In previous reports, the NBE has been inferred to be guite different from other forms of lightning strokes, in two ways. First, the NBE has been inferred to be relatively dark (non-luminous) compared to other lightning strokes. Second, the NBE has been inferred to be isolated within the storm, usually not participating in flashes, but when it is in a flash, the NBE has been inferred to be the flash initiator. These two inferences have sufficiently stark implications for NBE physics that they should be subjected to further independent test, with improved statistics. We attempt such a test with both optical and radio data from the FORTE satellite, and with lightning-stroke data from the Los Alamos Sferic Array.

We show rigorously that by the metric of triggering the PDD optical photometer aboard the FORTE satellite, NBE discharges are indeed less luminous than ordinary lightning. Referred to an effective isotropic emitter at the cloud top, NBE light output is inferred to be less than ~3×10⁸W.

To address isolation of NBEs, we first expand the pool of geolocated intracloud radio recordings, by borrowing geolocations from either the same flash's or the same storm's other recordings. In this manner we generate a pool of $\sim 2 \times 10^5$ unique and independent FORTE intracloud radio recordings, whose slant range from the satellite can

be inferred. We then use this slant range to calculate the Effective Radiated Power (ERP) at the radio source, in the passband 26–49 MHz. Stratifying the radio recordings by ERP into eight bins, from a lowest bin (<5kW) to a highest bin (>140kW), we document a trend for the radio recordings to become more isolated in time as the ERP increases. The highest ERP bin corresponds to the intracloud emissions associated with NBEs. At the highest ERP, the only significant probability of temporal neighbors is during times following the high-ERP events. In other words, when participating in a flash, the high-ERP emissions occur at the apparent flash initiation.

Reference

Jacobson, A. R. and Light, T. E. L. (2012): Revisiting 'Narrow Bipolar Event' intracloud lightning using the FORTE satellite, Ann. Geophys., 30, 389–404.



Lightning in Germany during a summer thunderstorm, by Jutta Holst, distributed by EGU under a Creative Commons licence.



ESA declares end of mission for Envisat

Paris, 9 May 2012 – Just weeks after celebrating its tenth year in orbit, communication with the Envisat satellite was suddenly lost on 8 April. Following rigorous attempts to re-establish contact and the investigation of failure scenarios, the end of the mission is being declared.

A team of engineers has spent the last month attempting to regain control of Envisat, investigating possible reasons for the problem.

Despite continuous commands sent from a widespread network of ground stations, there has been no reaction yet from the satellite.

As there were no signs of degradation before the loss of contact, the team has been collecting other information to help understand the satellite's condition. These include images from ground radar and the French Pleiades satellite.

With this information, the team has gradually elaborated possible failure scenarios. One is the loss of the power regulator, blocking telemetry and telecommands.

Another scenario is a short circuit, triggering a 'safe mode' – a special mode ensuring Envisat's survival. A second anomaly may have occurred during the transition to safe mode, leaving the satellite in an intermediate and unknown condition.

Although chances of recovering Envisat are extremely low, the investigation team will continue attempts to re-establish contact while considering failure scenarios for the next two months.

The outstanding performance of Envisat over the last decade led many to believe that it would be active for years to come, at least until the launch of the follow-on Sentinel missions.

However, Envisat had already operated for double its planned lifetime, making it well overdue for retirement.

With ten sophisticated sensors, Envisat has observed and monitored Earth's land, atmosphere, oceans and ice caps during its tenyear lifetime, delivering over a thousand terabytes of data.

An estimated 2500 scientific publications so far have been based on this information, furthering our knowledge of the planet.

During those ten years, Envisat witnessed the gradual shrinking of Arctic sea ice and the regular opening of the polar shipping routes during summer months.

Together with other satellites, it monitored the global sea-level height and regional variations, as well as global sea-surface temperatures with a precision of a few tenths of a degree.



The Envisat satellite. (Credit: ESA)

Years of Envisat data have led to a better understanding of ocean currents and chlorophyll concentrations.

In the atmosphere, the satellite observed air pollution increase in Asia and its stability in Europe and North America, and measured carbon dioxide and methane concentrations. Envisat also monitored the Antarctica ozone hole variations.

Over land, it mapped the speed of ice streams in Antarctica and Greenland. Its images were used regularly to update the global maps of land use, including the effects of deforestation.

Using its imaging radar, Envisat mapped ground displacements triggered by earthquakes and volcanic eruptions, improving understanding of tectonics and volcanic mechanisms.

Envisat provided crucial Earth observation data not only to scientists, but also to many operational services, such as monitoring floods and oil spills. Its data were used for supporting civil protection authorities in managing natural and man-made disasters.

Envisat has also contributed valuable information to the services within Europe's Global Monitoring for Environmental Security (GMES) programme, paving the way for the next generation of satellites.

Now with the end of the mission, the launch of the upcoming GMES Sentinel satellites has become even more urgent to ensure the continuity of data to users, improve the management of the environment, understand and mitigate the effects of climate change and ensure civil security.

Release published by the European Space Agency (ESA)

Study of Patagonian glacier's rise and fall adds to understanding of global climate change

Woods Hole, Mass., 16 March 2012 – Glaciers play a vital role in Earth's climate system, and it's critical to understand what contributes to their fluctuation.

Increased global temperatures are frequently viewed as the cause of glacial melt, but a new study of Patagonia's Gualas Glacier highlights the role of precipitation in the glacier's fluctuation. The study, conducted by Sébastien Bertrand of the Woods Hole Oceanographic Institution (WHOI) and his colleagues, reconstructs a 5,400 year-record of the region's glacial environment and climate, comparing past temperature and rainfall data with sediment records of glacier fluctuations and the historical observations of early Spanish explorers.

The study, 'Precipitation as the main driver of Neoglacial fluctuations of Gualas Glacier, Northern Patagonian Icefield,' was published March 15 in the Open Access journal *Climate of the Past*.

As glaciers fluctuate, retreating or adding mass, they dramatically affect the water cycle – locking up fresh water as they amass, causing the sea level to rise as they thaw and retreat.

"Improving our understanding of the impact of climate changes on glacier variability is one of the most pressing aspects of present-day climate research," says Bertrand, a postdoctoral fellow in WHOI's Marine Chemistry and Geochemistry department and the Renard Centre of Marine Geology, University of Ghent.

The focus of the work is Gualas Glacier, a 32-kilometre long shifting mountain of ice with an area of 119.2 square kilometres that sits above Golfo Elefantes. It is part of the Northern Patagonian Icefield (NPI), a series of 70 glaciers fed by precipitation that originates in the Pacific Ocean and falls in the rain belt west of the Andes, reaching levels of up to ten metres a year. The majority of the western NPI glaciers have retreated over the last 150 years.

"These glaciers are retreating as a response to global climate change, but not only because of increasing temperature, which is generally cited as the cause of worldwide glacier retreat," said Bertrand. "The fast retreat of Gualas, and other western NPI glaciers,



WHOI postdoctoral fellow Sébastien Bertrand calibrates an instrument along the Rio Aysen, South America. (Photo courtesy of Zakaria Ghazoui, Renard Centre of Marine Geology, University of Ghent, Belgium.)



A team of researchers led by Sébastien Bertrand, of the WHOI Marine Chemistry and Geochemistry department, took sediment samples during five weeks of field work in the fjords of Chilean Patagonia. (Photo courtesy of Dr. Claudia Silva.)

during the last century, seems to be driven by a decrease in winter precipitation – snow – rather than by an increase in temperature."

The study constituted the first effort to use glaciomarine sedimentssediments transported by glaciers or their meltwater to the marine environment – from the fjords of Northern Chilean Patagonia to reconstruct Holocene glacier fluctuations, reaching back 5,400 years. After analyzing a sediment core gathered in the central basin of Golfo Elefantes during a 2005 cruise aboard the icebreaker *Nathaniel B. Palmer*, the scientists reckoned that over five millennia the glacier had seen three major periods of advance. Once this picture was assembled, it was compared with data on regional temperature and precipitation to determine which factor most impacted Gualas Glacier.

Two high resolution sea-surface temperature records were used as temperature indicators, and pollen records demonstrated precipitation levels. Examining these, the scientists discovered trends in the pollen/precipitation levels that corresponded to the fluctuations seen in the glacier, while the temperature levels were less influential, suggesting the glacier was mostly affected by precipitation.

In addition to the geological record, the study incorporates the observations of early Spanish explorers, beginning with Antonio de Vea in 1675. Spanish explorers documented their voyages to Patagonia, noting what they saw, and omitting what they didn't – or couldn't – see. Using the explorers' maps and descriptions of Patagonia's fjords, Bertrand and his colleagues pieced together the life-story of Gualas Glacier. Through studying these historical documents, the scientists determined that Gualas Glacier has retreated nine kilometres over the last 110 years, including 2.5km during the last 25 years.

Although this study reveals the glaciers west of the Andes are controlled by precipitation, Bertrand says that glaciers on the eastern – leeward – flank of the icefield may be controlled by temperature. "It needs to be tested if we are to understand and better predict the impact of global climate change on Patagonian glaciers," he said. He added that glaciers located in other maritime environments might also be driven by changes in precipitation rather than temperature.

The idea to use historical documents came from team member Fernando Torrejón, an historian with the University of Concepción (Chile) who specializes in extracting climate and environmental information from written and iconographic documents. Bertrand recalls, "I knew his work on some Chilean glaciers, such as San Rafael, so I asked him to participate in this study to complement the results from the sediment cores." Torrejón plumbed the records of the 17th-century Spanish explorers archived at the library at the University of Concepción and the National Library of Chile, in Santiago. His contribution added an interesting historical component to the study and confirmed the interpretation of the geological/sediment record.

Reference

Bertrand, S. et al. (2012): <u>Precipitation as the main driver of Neoglacial</u> <u>fluctuations of Gualas glacier, Northern Patagonian Icefield</u>, *Clim. Past*, 8, 519–534.

Release published by the Woods Hole Oceanographic Institution

Taming uncertainty in climate prediction

Using the uncertainty quantification method in precipitation modeling

March 2012 – Uncertainty just became more certain. Atmospheric and computational researchers at Pacific Northwest National Laboratory used a new scientific approach called 'uncertainty quantification,' or UQ, that allowed them to better simulate precipitation. Their study is the first to apply a stochastic sampling method to select model inputs for precipitation representations and improve atmospheric simulations within a regional weather research and forecasting model. Their approach marks a significant advancement in representing precipitation, one of the most difficult climate components to simulate.

The word 'uncertain' always seems to appear when describing Earth and atmospheric systems in numerical models. Trying to represent complexity through computer simulations has limitations, not the least of which is a lack of sufficient computing power. Consider trying to model human body systems with numbers. Humans come in all shapes, sizes, ages, locations, and temperaments. It's the same with atmospheric systems. Getting a handle on the systems' uncertainties, to effectively and efficiently represent current weather and climate systems in a computer model, paves the way for scientists to apply those same techniques to predict the future climate changes. Sound predictions will give planners the tools to forecast the probability of extreme weather and climate events.

A PNNL team of atmospheric scientists and computational modelers used the <u>Weather Research Forecasting</u> (WRF) model to validate a new approach to improving parameters used to estimate precipitation. Using observational data from the Southern Great Plains (SGP), gathered by a US Department of Energy <u>Atmospheric Radiation Measurement (ARM) Climate Research Facility</u>, they reduced the uncertainty for several parameters in the convective cloud scheme in WRF to improve the precipitation calculations.

"We used an interdisciplinary team and the powerful computing resources at multiple locations to tackle this challenge," said Dr. Yun Qian, a climate scientist at PNNL. "Precipitation is much more challenging to represent in climate simulations than, for example, temperature. And it's harder to predict. The UQ methodology provides

a way to assess key parameters that are critical for precipitation calculation in regional and global climate models."

Using the vast amount of data collected at SGP, the team used a numerical technique to identify and improve the precipitation calculations in WRF. The team was the first to use a stochastic algorithm, an important sampling method to study parameterizations in regional climate simulations. The method, called Multiple Very Fast Simulated Annealing (MVFSA), randomly chooses numbers within distributions to minimize model errors. MVFSA is computationally more efficient, requiring a lower number of simulations to better match the observational data.

MVFSA identified five optimal parameters to reduce the model precipitation bias at a 25-kilometre climate grid. The team then improved precipitation simulations on a 12-kilometre grid, as well as temperature and wind results. Testing the model on another climate region showed that the MVFSA process produces improved results across spatial scales, processes, and other climatic regions.

The results of the UQ process show an improved model with better predictability making it more reliable in projecting future climate change.

Working within the <u>Community Atmospheric Model</u> (CAM5), a global climate model, the team will test the optimized representations in convective precipitation scenarios. Finding that some representations were more important than others, the UQ approach will focus on how improving representations of convection in climate model helps to improve simulations of the global circulation and climate.

Reference

Yang, B. et al. (2012): <u>Some issues in uncertainty quantification and</u> parameter tuning: a case study of convective parameterization scheme in the WRF regional climate model, *Atmos. Chem. Phys.*, 12, 2409–2427.

Research highlight published by the Pacific Northwest National Laboratory

'Warming hole' delayed climate change over eastern United States

50-year model suggests regional pollution obscured a global trend

Cambridge, Mass., 26 April 2012 – Climate scientists at the Harvard School of Engineering and Applied Sciences (SEAS) have discovered that particulate pollution in the late 20th century created a 'warming hole' over the eastern United States – that is, a cold patch where the effects of global warming were temporarily obscured.

While greenhouse gases like carbon dioxide and methane warm the Earth's surface, tiny particles in the air can have the reverse effect on regional scales.

"What we've shown is that particulate pollution over the eastern United States has delayed the warming that we would expect to see from increasing greenhouse gases," says lead author Eric Leibensperger (Ph.D. '11), who completed the work as a graduate student in applied physics at SEAS.

"For the sake of protecting human health and reducing acid rain, we've now cut the emissions that lead to particulate pollution," he adds, "but these cuts have caused the greenhouse warming in this region to ramp up to match the global trend."

At this point, most of the 'catch-up' warming has already occurred.

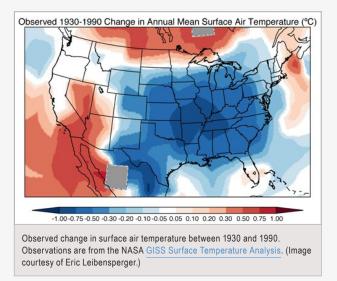
The findings, published in the journal <u>Atmospheric Chemistry and</u> <u>Physics</u>, present a more complete picture of the processes that affect regional climate change. The work also carries significant implications for the future climate of industrial nations, like China, that have not yet implemented air quality regulations to the same extent as the United States.

Until the United States passed the <u>Clean Air Act</u> in 1970 and strengthened it in 1990, particulate pollution hung thick over the central and eastern states. Most of these particles in the atmosphere were made of sulfate, originating as sulfur emissions from coal-fired power plants. Compared to greenhouse gases, particulate pollution has a very short lifetime (about one week), so its distribution over the Earth is uneven.

"The primary driver of the warming hole is the aerosol pollution – these small particles," says Leibensperger. "What they do is reflect incoming sunlight, so we see a cooling effect at the surface."

This effect has been known for some time, but the new analysis demonstrates the strong impact that decreases in particulate pollution can have on regional climate.

The researchers found that interactions between clouds and particles amplified the cooling. Particles of pollution can act as nucleation sites for cloud droplets, which can in turn reflect even more sunlight than the particles would individually, leading to greater cooling at the surface.



The researchers' analysis is based on a combination of two complex models of Earth systems. The pollution data comes from the <u>GEOS-Chem</u> model, which was first developed at Harvard and, through a series of many updates, has since become an international standard for modeling pollution over time. The climate data comes from the <u>general circulation model</u> developed by NASA's <u>Goddard Institute for Space Studies</u>. Both models are rooted in decades' worth of observational data.

Since the early 20th century, global mean temperatures have risen – by approximately 0.8 degrees Celsius from 1906 to 2005 – but in the US 'warming hole,' temperatures decreased by as much as one degree Celsius during the period 1930–1990. US particulate pollution peaked in 1980 and has since been reduced by about half. By 2010 the average cooling effect over the East had fallen to just 0.3 degrees Celsius.

"Such a large fraction of the sulfate has already been removed that we don't have much more warming coming along due to further controls on sulfur emissions in the future," says principal investigator Daniel Jacob, the Vasco McCoy Family Professor of Atmospheric Chemistry and Environmental Engineering at SEAS.

Jacob is also a Professor of Earth and Planetary Sciences at Harvard and a faculty associate of the <u>Harvard University Center for</u> the Environment.

Besides confirming that particulate pollution plays a large role in affecting US regional climate, the research emphasizes the importance of accounting for the climate impacts of particulates in future air quality policies.

"Something similar could happen in China, which is just beginning to tighten up its pollution standards," says co-author Loretta J. Mickley, a Senior Research Fellow in atmospheric chemistry at SEAS. "China could see significant climate change due to declining levels of particulate pollutants."

Sulfates are harmful to human health and can also cause acid rain, which damages ecosystems and erodes buildings.

"No one is suggesting that we should stop improving air quality, but it's important to understand the consequences. Clearing the air could lead to regional warming," Mickley says.

Reference

Leibensperger, E. M. et al. (2012): <u>Climatic effects of 1950–2050 changes in</u> <u>US anthropogenic aerosols – Part 2: Climate response</u>, *Atmos. Chem. Phys.*, 12, 3349–3362.

> Release published by the Harvard's School of Engineering and Applied Sciences

Cassini sees objects blazing trails in Saturn ring

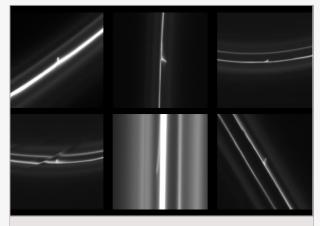
Pasadena, Calif., 23 April 2012 – Scientists working with images from NASA's Cassini spacecraft have discovered strange half-milesized (kilometre-sized) objects punching through parts of Saturn's F ring, leaving glittering trails behind them. These trails in the rings, which scientists are calling 'mini-jets,' fill in a missing link in our story of the curious behavior of the F ring. The results will be presented tomorrow at the European Geosciences Union meeting in Vienna, Austria.

"I think the F ring is Saturn's weirdest ring, and these latest Cassini results go to show how the F ring is even more dynamic than we ever thought," said Carl Murray, a Cassini imaging team member based at Queen Mary University of London, England. "These findings show us that the F ring region is like a bustling zoo of objects from a half mile [kilometre] to moons like Prometheus a hundred miles [kilometres] in size, creating a spectacular show."

Scientists have known that relatively large objects like Prometheus (as long as 92 miles, or 148 kilometres, across) can create channels, ripples and snowballs in the F ring. But scientists didn't know what happened to these snowballs after they were created, Murray said. Some were surely broken up by collisions or tidal forces in their orbit around Saturn, but now scientists have evidence that some of the smaller ones survive, and their differing orbits mean they go on to strike through the F ring on their own.

These small objects appear to collide with the F ring at gentle speeds – something on the order of about four miles per hour (two metres per second). The collisions drag glittering ice particles out of the F ring with them, leaving a trail typically 20 to 110 miles (40 to 180 kilometres) long. Murray's group happened to see a tiny trail in an image from Jan. 30, 2009 and tracked it over eight hours. The long footage confirmed the small object originated in the F ring, so they went back through the Cassini image catalog to see if the phenomenon was frequent.

"The F ring has a circumference of 550,000 miles [881,000 kilometres], and these mini-jets are so tiny they took quite a bit of time and serendipity to find," said Nick Attree, a Cassini imaging associate at Queen Mary. "We combed through 20,000 images and were



This set of six images obtained by NASA's Cassini spacecraft shows trails that were dragged out from Saturn's F ring by objects about a half mile (1 kilometre) in diameter. NASA/JPL-Caltech/SSI/QMUL.

delighted to find 500 examples of these rogues during just the seven years Cassini has been at Saturn."

In some cases, the objects traveled in packs, creating mini-jets that looked quite exotic, like the barb of a harpoon. Other new images show grand views of the entire F ring, showing the swirls and eddies that ripple around the ring from all the different kinds of objects moving through and around it.

"Beyond just showing us the strange beauty of the F ring, Cassini's studies of this ring help us understand the activity that occurs when solar systems evolve out of dusty disks that are similar to, but obviously much grander than, the disk we see around Saturn," said Linda Spilker, Cassini project scientist based at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "We can't wait to see what else Cassini will show us in Saturn's rings."

Release published by NASA's Cassini-Huygens mission team

GEO C EDUCATION

Report on the 2012 editon of GIFT

The 10th edition of the GIFT (Geosciences Information For Teachers) Workshop took place on 23–25 April at the EGU General Assembly, starting with the traditional visit and ice-breaker party in Vienna's Museum of Natural Sciences on Sunday April 22.



The 2012 GIFT group at the EGU General Assembly.

The general theme of this year's workshop, which united 80 teachers from 19 different countries, was 'Water!'. Leading scientists in the field (Alberto Montanari, Gilles Bœuf, Murugesu Sivapalan, Günter Blöeschl, Hubert Savenije, Pierre-Philippe Mathieu, Mario Rebolledo, and Nick van de Giesen) gave presentations on the current major problems of the water cycle, including water availability and distribution, biological significance of water, floods, water pollution, research for underground water, and atmospheric processes contributing to the water cycle and water management.

Some teachers also gave presentations (teacher-to-teacher communications) on their school projects aimed to improve the understanding of the water cycle. Hands-on activities were also present in this year's workshop. They were of particular interest, turning the GIFT lecture room into a laboratory for an afternoon as François Tilquin, a French teacher, presented a project on piezometric mapping and underground water modeling.

In the past three years, the GIFT Workshop has also included a poster session, Science in Tomorrow's Classroom. This year, teachers presented 34 posters, demonstrating the activities they use to engage their students in a variety of science subjects and community outreach. This forum resulted in a great deal of discussions among teachers for sharing teaching strategies and making connections for future cooperation between their schools. For many teachers, it was the first opportunity to produce a poster, and several teachers realized that posters can be used in their schools to highlight to other students, teachers, and the community, the exceptional work they and their students carry out.

The 2012 GIFT Workshop marks the 10th anniversary of this activity, which has been the driving force for advancing the importance of education at EGU. The initial GIFT Workshop model at the General Assembly has grown into a multi-faceted educational outreach effort that now includes distinguished lecturers, teachers at sea, video-conferences and Powerpoint presentations of GIFT lectures that can be downloaded for classroom use. This effort has resulted, particularly this year, in many exchanges and networking between the participating teachers post-GIFT, which bodes well for pan-European and international links in the future.

Also, in the 10 years of existence, the GIFT Workshops have built a <u>library of digital material</u> that teachers all over the world can use with their pupils in the classroom:

- Presentations of all invited speakers are available for download, free from copyrights, as PDF files.
- Selected lectures have been video-recorded and mounted online for use in the classroom. The GIFT library will have 24 online presentations including seven new ones recorded in 2012, available starting September 2012. In addition, interviews, extra videos, and photographic collections are available to teachers to illustrate the initiative to their colleagues and students.
- Occasionally, additional material provided by speakers is placed online, including the presentations given at the Alexander von Humboldt GIFT workshops.

Feedback from participating teachers

"[François Tilquin's presentation] is how teaching should be done, nowadays it has become so prescriptive and textbook, how great to see such an enthusiastic practitioner" – Sarah Calne, UK

"I have just come back home and I want to thank you for the opportunity you gave me to take part in this activity. It was amazing; I am still fascinated and impressed!" – Ramona Retegan, Romania

"At a time when funding and support for teachers is being cut in school systems across the world, I am so pleased to see the level of dedication of the Committee on Education of the European Geosciences Union. Your committee put together an extremely amazing conference and a learning experience that I will be able to share with my students for years to come." – Kisha Davies-Caldwell, USA

"[The main benefits are] contact with foreign teachers in the aim of future exchanges (experiments and also true exchange with students), because it's an incredible opportunity to meet colleagues, to know them, and to be able to stay in touch for working together after the GIFT." – Karine Tardy, France

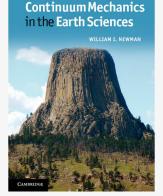
"It was pleasure to be part of something so great" – Petra Skoupilova, Czech Republic

EGU Committee on Education



GEO C BOOKS

Continuum Mechanics in the Earth Sciences



By William I. Newman

CAMBRIDGE UNIVERSITY PRESS

194 pages | Hardback 1st edition | March 2012 ISBN 978-0-52-156289-8

Price: £40.00 (~€50.00)

Publisher's summary

Continuum mechanics underlies many geological and geophysical phenomena, from earthquakes and faults to the fluid dynamics of the Earth. This interdisciplinary book provides geoscientists, physicists and applied mathematicians with a class-tested, accessible overview of continuum mechanics. Starting from thermodynamic principles and geometrical insights, the book surveys solid, fluid and gas dynamics. In later review chapters, it explores new aspects of the field emerging from nonlinearity and dynamical complexity and provides a brief introduction to computational modeling. Simple, yet rigorous, derivations are used to review the essential mathematics. The author emphasizes the full three-dimensional geometries of real-world examples, enabling students to apply this in deconstructing solid earth and planet-related problems. Problem sets and worked examples are provided, making this a practical resource for graduate students in geophysics, planetary physics and geology and a beneficial tool for professional scientists seeking a better understanding of the mathematics and physics within Earth sciences.

Orogenesis: The Making of Mountains





By Michael R. W. Johnson and Simon L. Harley

CAMBRIDGE UNIVERSITY PRESS

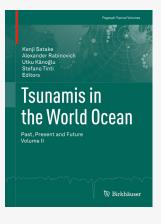
398 pages | Hardback 1st edition | March 2012 ISBN 978-0-52-176556-5

Price: £45.00 (~€55.00)

Publisher's summary

Orogenesis, the process of mountain building, occurs when two tectonic plates collide - either forcing material upwards to form mountain belts such as the Alps or Himalayas or causing one plate to be subducted below the other, resulting in volcanic mountain chains such as the Andes. Integrating the approaches of structural geology and metamorphism, this book provides an up-to-date overview of orogenic research and an introduction to the physico-chemical properties of mountain belts. Global examples are explored, the interactioning roles of temperature and deformation in the orogenic process are reviewed, and important new concepts such as channel flow are explained. This book provides a valuable introduction to this fast-moving field for advanced undergraduate and graduate students of structural geology, plate tectonics and geodynamics, and will also provide a vital overview of research for academics and researchers working in related fields including petrology geochemistry and sedimentology.

Tsunamis in the World Ocean: Past, Present and Future, Volume II



Edited by K. Satake, U. Kânoğlu, and S. Tinti

SPRINGER

233 pages | Softcover 1st edition | January 2012 ISBN 978-3-0348-0233-8

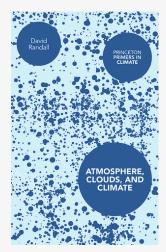
Price: € 53.45

Publisher's summary

The tsunami from the 1960 Chilean earthquake affected the entire Pacific Ocean and motivated the international coordination of tsunami research and warning systems around the Pacific. However, the 2004 Indian Ocean tsunami affected the entire world, and reminded that tsunamis are not a local or regional problem but a global issue.

This volume contains 15 papers, mostly presented at the 24th International Tsunami Symposium held on 14–16 July 2009 in Novosibirsk, Russia. They reflect the current state of tsunami science, including studies of recent tsunamis, tsunami statistics and warning, and modeling tsunami runup and inundation.

Atmosphere, Clouds, and Climate



By David Randall

PRINCETON UNIVERSITY PRESS

288 pages | Paperback 1st edition | May 2012 ISBN 978-0-69-114375-0

Price: £23.99 (~€30.00)

Publisher's summary

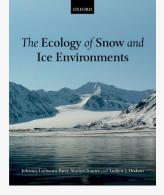
The atmosphere is critical to climate change. It can amplify shifts in the climate system, and also mitigate them. This primer offers a short, reader-friendly introduction to these atmospheric processes and how they work, written by a leading expert on the subject.

Giving readers an overview of key atmospheric processes, David Randall looks at how our climate system receives energy from the sun and sheds it by emitting infrared radiation back into space. The atmosphere regulates these radiative energy flows and transports energy through weather systems such as thunderstorms, monsoons, hurricanes, and winter storms. Randall explains how these processes work, and also how precipitation, cloud formation, and other phase changes of water strongly influence weather and climate. He discusses how atmospheric feedbacks affect climate change, how the large-scale atmospheric circulation works, how predicting the weather and the climate are fundamentally different challenges, and much more. This is the ideal introduction for students and nonspecialists. No prior experience in atmospheric science is needed, only basic college physics.

Authoritative and concise, Atmosphere, Clouds, and Climate features a glossary of terms, suggestions for further reading, and easy-to-follow explanations of a few key equations. This accessible primer is the essential introduction to atmospheric processes and the vital role they play in our climate system.

The Ecology of Snow and Ice Environments

A review of a new book by three UK geoscientists



By Johanna Laybourn-Parry, Martyn Tranter, and Andrew J. Hodson

OXFORD UNIVERSITY PRESS

192 pages | Paperback 1st edition | February 2012 ISBN 978-0-19-958308-9

Price: £32.50 (~€40.00)

On a first and superficial glimpse a landscape covered by ice and snow appears barren and devoid of life. But if you study more carefully the pockets of liquid water forming on, in, or below this cover, a fascinating microcosm emerges. An extreme environment, characterized by low temperatures, low nutrient content, reduced or increased solar irradiance (depending of thickness and the albedo of snow), sudden changes in salinity, pH, or water chemistry – a world inhabited mostly by microorganisms with peculiar adaptations to survive and thrive. Until now, a guide to this world was lacking and research on the subject was scattered in many scientific publications, hard to access by those not directly involved in the topic.

The Ecology of Snow and Ice Environments by polar researchers and geographers J. Laybourn-Parry, M. Tranter, and A. J. Hodson, tries to bridge this gap by providing a short (142 pages of text with black & white images, plus an inlet with colour plates) but well documented textbook, discussing the many aspects of ice and snow as a base of an ecosystem.

The book is divided into seven main chapters, dealing with specific cold habitats or discussing recent and future research. The first chapter introduces the basic physical and chemical properties of snow and ice, which on Earth are found in the form of superficial snow cover, glaciers, sea/lake ice, ice caps, and ice fields. The following four chapters cover these environments more specifically, citing research done from the mountain glaciers of middle latitudes to the ice caps of the poles. These environments are subdivided into more specific habitats, like cryoconites – pools of liquid water forming on the surface of melting glaciers, or brine channels – a network of water with high salt concentration forming during freezing of seawater, or subglacial lakes. The latter are especially interesting after the announcement this year that a Russian drilling project reached Lake Vostok, a lake buried under the Antarctic ice cap and possibly an ecosystem that remained isolated for millions of years.

Chapter six is dedicated to astrobiology and discusses whether these extreme, but earth-bound ecosystems can be used as models of inference towards possible extraterrestrial habitats and life forms on other worlds, like the icy moons of Jupiter or Saturn. Finally, the last chapter proposes possible future research directions, especially the use of remote-sensing technology or molecular analysis to understand the geographic distribution and evolution of the 'ice-loving' organisms.

The book is mainly addressed to glaciologists, microbiologists or ecologists, but the introductory chapter and a short glossary provide basic definitions of terms used, enabling also non-glaciologist/ biologists to follow the explanations and argumentations of later chapters.

There is only one minor point for criticism with this book: as the authors admit already in the preface, they don't discuss the ecology of frozen soils or permafrost. Considering the possible effects of increased microbial activity and release of greenhouse gases from warming soils, this would make for a timely and valuable additional chapter in future editions.

David Bressan, freelance geologist based in Italy



The Open Access Journals of the European Geosciences Union

Featured website: Climate Communication

Making climate science heard and understood

Funded by the Rockefeller Brothers Fund and the ClimateWorks Foundation, <u>Climate Communication</u> is a non-profit science and outreach project aiming to make climate science heard and understood. The staff of three publicizes the latest climate research in plain language, helps scientists improve their communication, and assists journalists in gathering reliable scientific information and contacting experts.

The project is directed by Susan Joy Hassol, an experienced climate change communicator, and by Richard Somerville, a climate scientist and Distinguished Professor Emeritus at the Scripps Institution of Oceanography. Over 20 leading climate scientists, who act as advisors, back the initiative.



Social media: Who's following the EGU?

To demonstrate the global reach of our social media network, we feature some of our most prominent followers



In this issue of GeoQ, we highlight five followers of the official accounts of EGU on Twitter, @EuroGeosciences.

<u>@YaleE360:</u> <u>Yale Environment 360</u> is a Publication of the Yale School of Forestry & Environmental Studies featuring opinions, analysis and the latest environmental news. The feed also includes external environmental news from trusted sources.

<u>@Cindy_sismologa:</u> Cindy Mora-Stock is a Chilean seismologist currently based in Kiel, Germany. She regularly tweets (mostly in Spanish) interesting stories on earthquakes, volcanos, Chilean geoscience, among others.

@GeographicalMag: Geographical is the magazine of the Londonbased Royal Geographical Society. Aside from geography, it covers topics such as culture, environment, science, and exploration.

<u>@BritGeoSurvey:</u> the BGS Twitter feed regularly brings their followers interesting news and updates from the <u>British Geological</u> Survey.

@Polar_Research: the Twitter feed of the Association of Polar Early Career Scientists, an international and interdisciplinary organization for young scientists and educators, is your one-stop source of APECS and polar research news.



GEO CEVENTS

XVIII International Symposium Atmospheric

and Ocean Optics. Atmospheric Physics

02-06 July 2012, Irkutsk, Russia

This Symposium is a traditional meeting of the atmospheric and ocean optics and the atmospheric physics community. The conference coincides with the forty-year anniversary of the Institute of Atmospheric Optics of the Siberian Branch of the Russian Academy of Sciences.

Website: http://symp.iao.ru/en/aoo/18/i1/ Contact: symp2012@iao.ru

4th International Summer School on Radar/SAR

13–20 July 2012, Bonn, Germany

At the 4th International Summer School on Radar / SAR, the organizers offer the unique opportunity to gain an in-depth education on radar and synthetic aperture radar (SAR) techniques by distinguished international lecturers. The programme covers a wide range from radar fundamentals over state-of-the-art Radar/SAR systems to sophisticated array signal processing techniques.

Website: http://www.radarsummerschool.fraunhofer.de/ summerschool/ Contact: humboldtstein@awobu.awo.org

39th Scientific Assembly of the Committee on Space Research and Associated Events COSPAR 2012

14-22 July 2012, Mysore, India

The COSPAR (Committee on Space Research) Scientific Assembly is a premier forum for presenting the most important results in space research in all disciplines and it is considered as a focal point for truly international space science. The Indian Space Research Organisation (ISRO) is organizing COSPAR 2012 in Mysore, India under the theme 'Space – for the benefit of Mankind'.

Website: http://www.cospar-assembly.org/ Contact: cospar2012@isro.gov.in

34th International Geological Congress (IGC)

05-10 August 2012, Brisbane, Australia

Under the theme 'Unearthing our Past and Future', the IGC will showcase Oceania's geoscience strengths, innovations and natural

wonders through an exciting range of pre and post Congress field trips. It will demonstrate the crucial role that geoscience plays in the quest for sustainable development and show how geoscience contributes directly to the future of its resource-based industries, land and water management and mitigation of geohazards.

Website: http://www.34igc.org/ Contact: info@34igc.org

8th International Conference on Urban Climate and 10th Symposium on the Urban Environment

06–10 August 2012, Dublin, Ireland

The International Association for Urban Climate & the American Meteorological Society (AMS) Board of the Urban Environment warmly invite you to the joint 8th International Conference on Urban Climate (ICUC8) & AMS 10th Symposium on the Urban Environment. These meetings are preeminent events presenting research on the urban climate effect at all scales and have set important benchmarks for the development of the field. The aims of this conference are to provide an international forum where the world's urban climatologists can discuss modern developments in research, and the application of climatic knowledge to the design of better cities.

Website: http://www.icuc8.org/ Contact: info@icuc8.org

AOGS-AGU (WPGM) Joint Assembly

13–17 August 2012, Singapore

The 2012 Western Pacific Geophysics Meeting is the Joint Assembly of the Asia Oceania Geosciences Society and the American Geophysical Union. In addition to the traditional AOGS's sessions including Atmospheric Sciences, Hydrological Sciences, Ocean Sciences, Planetary Sciences, Solar & Terrestrial Sciences, Solid Earth Sciences, Interdisciplinary Working Groups, the AOGS–AGU (WPGM) 2012 Joint Assembly will accommodate Biogeosciences.

Website: http://www.asiaoceania.org/aogs2012/ Contact: info@asiaoceania.org

33rd General Assembly of the European Seismological Commission (ESC)

19–24 August 2012, Moscow, Russia

The Assembly program will include plenary and breakout meetings, symposia, a poster session and an exhibition of geophysical equipment, books and journals in the Earth sciences. The participants are welcome to join various sightseeing activities in Moscow as well as trips to the northern capital of Russia, Saint-Petersburg, and the range of ancient cities known as the Golden Ring of Russia whose museums contain vast collections of historic treasures.

Website: http://www.esc2012-moscow.org/ Contact: esc2012@onlinereg.ru

2nd EGU Summer School on Structural Analysis of Crystalline Rocks

22–28 August 2012, Nevessee (Lago di Neves), Italy

The school is aimed at teaching advanced techniques of quantitative structural analysis in deformed basement rocks. The school is divided into two parts: (a) Two days of field work on glacier-polished outcrops in the Nevessee (Lago di Neves) area. (b) The field workshop will be followed by four days of in-classroom teaching in Varna (Brixen) on the theory of deformation and of quantitative methods of micro- and meso-structural analysis of deformed rocks.

Website: http://www.geoscienze.unipd.it/egu-summerschool/index. html

.....

Contact: Giorgio Pennacchioni, giorgio.pennacchioni@unipd.it

7th International Conference on

Mineralogy and Museums

27–29 August 2012, Dresden, Germany

This event will be held at the conference center of the Deutsches Hygiene-Museum in Dresden 27–29 August 2012. At the welcoming party on August 26 participants will have the opportunity to see one of the oldest mineralogical-geological collections – the Museum of Mineralogy and Geology in Dresden, Saxony. On August 28, during the conference, participants will visit Freiberg and its mineralogical collections at the TU Bergakademie in addition to the new mineral exhibit *Terra Mineralia* at the Freudenstein castle.

Website: http://www.conventus.de/mm7/ Contact: registrierung@conventus.de

1st EAGE/GRSG Remote Sensing Workshop and Near Surface Geoscience 2012

03-05 September 2012, Paris, France

The theme of the joint EAGE (European Association of Geoscientists and Engineers)/GRSG (Geological Remote Sensing Group) workshop is 'Mapping the morphology, chemistry and mineralogy of the ground surface'. The meeting will coincide with the Near Surface Geoscience meeting 2012, annually organized by EAGE. Both events will be held at the beautiful Palais des Congrès d'Issy in the south-west of Paris. Websites: http://www.eage.org/events/index.php?evp=6970&ActiveMenu=2&Opendivs=s3 and http://www.eage.org/events/index.php?eventid=577&Opendivs=s3 Contact: conferences@eage.org

Deciphering River Flood Change Symposium

03–05 September 2012, Vienna, Austria

When, where, how have floods changed in Europe? Why do floods change? How sensitive are floods to changes in land use and climate? How confident can we be about predicting future changes in floods? The symposium 'Deciphering River Flood Change' addresses these research questions in an European context. Specifically the following topics will be addressed: recent evidence on flood changes, historic floods, atmospheric and land use controls on flood changes, flood change modelling, harmonising flood related data in Europe.

Website: http://erc.hydro.tuwien.ac.at/index.php?id=2 Contact: Alberto Viglione, viglione@hydro.tuwien.ac.at

International Conference on Integrated Approaches for Volcanic Risk Management

11–12 September 2012, Stuttgart, Germany

Following UN International Strategy for Disaster Reduction recommendations and starting from shared existing knowledge and practices, this conference aims at presenting innovative tools and integrated cost effective methodologies to mitigate risks from various hazards on active volcanoes (prevention, crisis management and recovering). The focus is particularly put on integrating tools. This concerns interdisciplinary integration between different domains (e.g. inputs of social approaches in risk mapping methodologies) but also integration between the three different phases of risk management (e.g. Information System designed to be used both for risk mapping and crisis management). The aim of the conference is to enhance exchanges between specialists of different domains.

Website: https://miavita2012.uni-hohenheim.de/89253?&L=1 Contact: miavita2012@uni-hohenheim.de

7th IAGA/ICMA/CAWSES Workshop on Long-Term Changes and Trends in the Atmosphere

11–14 September 2012, Buenos Aires, Argentina

The goals of this workshop are to review the current state of knowledge about trends in these atmospheric regions, and to discuss what research is necessary for resolving inconsistencies, reducing uncertainties, and achieving a deeper understanding of middle and upper atmospheric climate change – especially the relative influences of anthropogenic and solar effects.

Website: http://www1.herrera.unt.edu.ar/faceyt/trends2012/ Contact: Ana G. Elias, aelias@herrera.unt.edu.ar

GRACE Science Team Meeting 2012, DFG SPP Final Colloquium and Sea Level Workshop

17-20 September 2012, Potsdam, Germany

The joint GRACE Science Team Meeting (GSTM) and Final Colloquium of the DFG Special Priority Program (SPP1257) 'Mass Transport and Mass Distribution in the System Earth' will take place at the German Research Centre for Geosciences (GFZ) in Potsdam. The meeting will be followed by a one day Sea Level Workshop (September 20) organized by the German National Academy of Sciences (Leopoldina) and the SPP1257.

Website: http://www.gfz-potsdam.de/portal/gfz/Neuestes/ Veranstaltungen/Tagungen+und+Konferenzen/2012/ GRACE+Meeting Contact: N/A

16th WEGENER General Assembly

23-26 September 2012, Strasbourg, France

The Institut de Physique du Globe and Ecole et Observatoire des Sciences de la Terre of the University of Strasbourg welcome the XVI General Assembly of WEGENER. The scientific programme is prepared around six sessions that emphasize multidisciplinary studies of Earth deformation using geodetic techniques, active tectonics, geophysical observations and various modeling approaches.

Website: http://wegener2012.sciencesconf.org/ Contact: Mustapha Meghraoui, m.meghraoui@unistra.fr

EAGE Hydrogeology Workshop

Dead Sea Sinkholes

23–25 September 2012, Amman, Jordan

Amman, Jordan has been chosen to host the first EAGE Workshop on Dead Sea Sinkholes. The workshop will be held at the Holiday Inn Amman. The meeting is expected to answer various questions regarding sinkholes in the Dead Sea region, including their geographical distribution and formation.

.....

Website: http://www.eage.org/events/index. php?eventid=733&Opendivs=s3 Contact: hba@eage.org

Predictions for Hydrology, Ecology, and Water Resources Management Conference

24-27 September 2012, Vienna, Austria

The conference will bring together professionals, scientists and members of governmental institutions dealing with water resources management. Representatives of natural, social and engineering sciences will meet together to exchange experience and present the current views on the adaptation and mitigation of adverse effects of global change on water resources systems.

Website: http://web.natur.cuni.cz/hydropredict2012/ Contact: hydropredict2012@interconvention.at