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EGU 2013 presentation: The hills have ears – How seismic monitoring is reshaping geomorphology

Letter from the 2013 Programme Committee Chair

EGU News: Looking back at the EGU 2013 General Assembly

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EDITORIAL

The EGU General Assembly is, without a doubt, the highlight of EGU activities – and, if I may, of European geoscience activities – each year. The conference this year was more vibrant and interactive than ever and we are thankful to everyone who worked behind the scenes, as well as to the fantastic participants, for an excellent meeting. With the conference now behind us, it was only appropriate to dedicate this issue of GeoQ to the EGU 2013 General Assembly.

The Articles section, for instance, features only research presented at this year's conference. It includes features on seismic monitoring in geomorphology, on the stability of methane stored in ocean sediments, and on dust-emission measurements tailored to climate models. There is also an interview with Andrew MacDougall, a young climate scientist working at the University of Victoria in Canada on a key issue: can a holocene-like climate be restored by removing carbon dioxide from the atmosphere?

In addition to the regular division reports in the EGU Voice section, we also publish a letter from the Chair of the General Assembly Programme Committee, Gert-Jan Reichart, about this year's meeting. The EGU News section features a report published earlier on our website that looks back at the EGU 2013 General Assembly, highlighting in particular the social media and press acitivities at this year's meeting.

It is not only scientists (and journalists) who take part in the conference: teachers too participate in the very special annual GIFT – Geosciences Information For Teachers – Workshop and can present educational posters at the meeting. For this issue of GeoQ, we interviewed two teachers about their experiences taking part in GIFT, where they learned about natural hazards (the theme of this year's workshop) directly from top scientists and dedicated valuable time to hands-on educational activities that they can now perform in their classrooms.

A final section fully dedicated to the General Assembly is On the Web, where we feature some of the many bloggers who covered this year's meeting. We briefly review their blogs and highlight the EGU 2013 blog posts they published.

Continuing on the EGU 2013 General Assembly theme, it is worth mentioning that this year's conference marked the 10th anniversary of the EGS-EUG-AGU Joint General Assembly (EGS, the European Geophysical Society, and EUG, the European Union of Geosciences, merged to form EGU in 2002–2003). The joint conference was also the first EGS/EUG meeting to have a press centre and media participation – another 10th anniversary worth highlighting! Both events are documented in <u>issue 1</u> and <u>issue 2</u> of the EGGS newsletter, the percursor of GeoQ launched in November 2002. (On the occasion of the 10 years of EGU newsletters and the 10th anniversary of the Union, we published a <u>special edition of GeoQ</u>, which you may like to look into if you are interested in knowing more about the history of the EGU.)

Finally, on a new stage of EGU life, I would like to welcome all the new division presidents who were inaugurated during the Union Plenary Meeting on the Monday of the 2013 General Assembly. I look forward to working with you in promoting the best research and activities from your divisions.

Happy reading!

Bárbara Ferreira GeoQ Chief Editor & EGU Media and Communications Manager



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

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COVER PHOTO: Night time at the ACV. EGU flags hang outside the Austria Center Vienna (ACV), where the General Assembly has been taking place since 2005. (Credit: Edvard Glücksman)

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GEO C ARTICLES

The hills have ears

How seismic monitoring is reshaping geomorphology

If a tree falls in the forest, does anybody hear it? Well, the jury is still out on trees, but if it's a rockfall or a landslide occurring inside one of the rugged catchments studied by Niels Hovius, the answer is probably yes. Hovius is a geomorphologist at the GFZ German Research Centre for Geosciences in Potsdam, who has teamed up with seismologist Arnaud Burtin, also at GFZ, on an unconventional project. Together with colleagues from the Swiss Federal Institute for Forest, Snow and Landscape Research and the National Taiwan University, they have wired a handful of watersheds with sprawling networks of seismometers that listen for any signs of erosional activity. By zooming in on the details of individual study sites, Hovius and Burtin are pioneering a novel approach to monitoring geomorphic change.

The problem they are after is this: it is widely accepted that climate ultimately drives landscape evolution. It acts through the stealthy persistence of water reshaping the Earth's surface and through violent events of mass wasting in which, for lack of a better term, geology happens. But the details of these processes – when and why they happen and how they relate to weather conditions – remain poorly understood. Hovius and Burtin hope to elucidate the link between individual climate events and their erosional aftermath using 2D seismic arrays. As Hovius explains, the goal is "to study the driver and the geomorphic response at a similar resolution." Since automated weather stations already provide detailed meteorological data almost to the minute, their challenge rests in bringing the geomorphic side up to speed.

Luckily, pilot studies show them catching up fast. When I stumbled upon Hovius, speaking Friday afternoon at the EGU General Assembly in Vienna, he sparked a wave of tangible excitement in the crowded lecture room. He showed how a highly sensitive array of seismometers nestled in a rocky basin of the Swiss Alps could detect the increased foot traffic of the weekday lunch hour in the village below. In Taiwan, the team could tell when local farmers stayed inside, hiding from torrential rains. But this 'anthropogenic noise' is merely a fascinating accidental discovery unearthed by their study. The real treasures of their work lie in the streaks of high-frequency tremors associated with geomorphic events that punctuate their seismograms.

Their new method capitalises on what was previously viewed as a persistent nuisance in earthquake monitoring: that geomorphic events like large landslides pollute the seismic signal of tectonic activities. Hovius and Burtin, however, seize opportunities like this to study the characteristics of a geomorphic episode, decoding its origin using its unique seismic fingerprint. With their dense arrays of seismometers distributed over catchment-scale study areas, they can dissect the anatomy of an event with astonishing precision.



A rockfall event, for instance, would produce a seismogram with specific characteristics, Hovius explains. "It may start with a sudden, short pulse of seismic energy at low frequency – around 1Hz – generated by the break-away. This could be followed by a few seconds of very limited activity, during free fall of the mass." Next, the frequency of the signal could increase if the rock shatters as it careens down a talus slope, or the amplitude could increase if several large boulders begin to pick up speed. Instruments installed at a pilot study in the Swiss valley of Illgraben recorded these very patterns when a series of ten rockfalls let loose above the village of Susten on New Year's Day 2013.

And while the mechanics of a rockfall are not particularly mysterious, real-time seismic monitoring can provide insights into more elusive aspects of landscape dynamics. With obvious excitement, Hovius explains, "we have opened the black box." In the Illgraben, for instance, "it has been difficult to determine how debris flows build in this catchment. With our seismometers we can now 'see' the build-up phase. It takes about 20 minutes for such flows to constitute and travel through the upper Illgraben channel." Understanding the timing here is more than academic as many residents live on a large debris fan below the catchment. This information could provide early warning for those in harm's way precious minutes before the existing alarm would sound.

But as Hovius and Burtin forge ahead into unexplored applications of seismic data, they have inevitably encountered challenges. These obstacles chiefly relate to calibration: most flavours of geomorphic noise have never been rigorously described. "Much work remains to be done on source characterisation and some of it is not very glamorous," admits Hovius. "For example, there are few, if any, publications on the seismic signal of rainfall or thunder, so we'll have to go and collect the relevant data ourselves." At the moment, they



The rockfall location was determined by studying common features of eight seismograms recorded at different stations in the catchment. The most likely location of the rockfall source is at the top of the steep avalanche gully as shown by the colour map draped over the terrain image. Here, warmer colours indicate a greater likelihood. (Credit: Hovius et al., 2013)

rely heavily on their geomorphological expertise to match seismic patterns to specific erosional processes.

Despite their substantial credentials in this department, some people remain sceptical of their approach. As with all new methods, Hovius' colleagues want validation. He says their initial work has been met with a common response: "Nice, but do you have independent evidence?" While vetting new methods is a fundamental part of science, Hovius notes that seismic data often stand alone as the only proof of geologic processes that are otherwise undetectable by humans. Only time and more data will reveal whether erosional applications should be viewed any differently. Nonetheless, it seems clear that seismic monitoring will have significant impacts on the field of geomorphology. This work helps fill in long-standing gaps in the current understanding of erosional processes. "This method makes it possible to see how eroded mass travels through landscapes, from hillslopes into channels and onward into depositional settings," says Hovius. "The connectivity between different process domains is a crucial, but underconstrained aspect of landscape dynamics." An improved understanding of the mechanics of erosion will also strengthen models that aim to predict landscape dynamics under a changing climate.

From a societal perspective, such real-time monitoring can provide advance warning of natural disasters, like the debris flows of Illgraben. Seismic networks will also exponentially increase the number of observations of weather-driven erosion events, improving probabilistic estimates and statistical models used in hazard assessment. Looking at the astonishingly rich data they have produced, the possibilities seem endless and Hovius and Burtin sound understandably optimistic. Above all else, they see in this new approach "the promise that seismic monitoring will give the geomorphological community a new set of eyes with which to watch the landscape." Eyes which may eventually 'hear' that lone tree fall, answering an age-old question once and for all.

> Julia Rosen Freelance science writer

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Hovius, N. et al.: <u>Seismicity, seismology, and erosion</u>, Geophys. Res. Abstr., 15, EGU2013-8967, 2013 (conference abstract)

Sampling the methane buffet

Ocean sediments are capable of storing large amounts of methane (both as methane hydrates and in sediment pore waters), a greenhouse gas that may be destabilised as the oceans warm. If this happens, this methane could be released into the atmosphere where it would accelerate the rate of climate change. Even without this warming, though, methane is still being released from the sea floor, particularly in cold seep environments. Here, pore waters enriched in methane are forced upward through the sediments, where they release the gas into the water column.

Much of this methane is consumed by methane-oxidising bacteria (methanotrophs), which rely on it for their energy needs. With the possibility of large-scale release of this greenhouse gas in the future, scientists want to know whether methanotrophs are capable of combatting it, but the environmental controls on the process are not fully understood. Thankfully, there are several teams working to better understand methane release, many of whom presented their research in a <u>session on methane in the oceans and continents</u> at the EGU 2013 General Assembly.



Cold seeps are also associated with brine pools (shown here), gas hydrates, mud volcanoes and a variety of biogenic structures including microbial mats and carbonate mounds. (Credit: NOAA-OER/BOEMRE)

The first part of this session gave an excellent review of current knowledge and recent progress in the research on methane release off the coast of the Arctic archipelago of Svalbard. Here, methane is stable below 400 m, but as the seafloor shoals, the gas is unleashead as plumes of methane bubbles. These methane beds

have been active for hundreds of years, but research by Graham Westbrook (at the University of Southampton) and his collaborators suggests that the methane may have been stable at more shallow depths in the past and that methane hydrates were stable in the sediment 360 m below sea level only 30 years ago.

The concentration of methane in the Svalbard beds is greatest in the bottom waters (approximately 30 m above the sea floor) and decreases towards the surface as it is broken down through aerobic methane oxidation (MOx). Researchers can determine the fate of methane in the water column by measuring the methane oxidation rate. While there is a constant supply of methane in cold seep environments, MOx rates are highly variable, both temporally and spatially. They are particularly high in cool Arctic waters and much lower in the warmer current that runs to the West of Svalbard (the West-Spitsbergen Current). The reason for this lies in the distribution of methane oxidising bacteria.

Staining a filtered water sample with the chemical DAPI allows us to pin down the number of methanotrophs in a particular sample. DAPI is a fluorescent stain that binds to cell DNA and, because bacteria are single-celled organisms, the number of fluorescing bodies corresponds to the number of bacteria. Different strains can then be identified using stable isotope analysis. Lea Steinle and her colleagues from the University of Basel found that the warmer West-Spitsbergen Current contained fewer bacteria than the cooler Arctic waters. This explains the differences in MOx rates: the Arctic waters are associated with high MOx rates because they contain a high standing stock of methanotrophs and the converse is true for the West-Spitsbergen Current, which contains much fewer.



The reason why the standing stock of methanotrophs differs between the cooler Arctic bottom waters and warm West-Spitsbergen Current is unclear. It may be a function of temperature, salinity, competition with other microbes, or any number of other reasons. One thing is for sure, though: whatever the conditions are within each water body, ocean circulation is the dominant control on the abundance of methanotrophic bacteria in this region.

The West-Spitsbergen Current periodically displaces cold Arctic water with ocean flows that are warmer and less microbe rich. As the position of these water bodies shifts over the cold seep, so does the rate of methane oxidation. MOx in the Arctic Ocean off Svalbard is controlled oceanographically, but whether temperature is the dominant factor here remains to be seen.

If temperature is the dominant control on bacterial abundance, scientists anticipate ocean warming to negatively impact methanotroph populations in the Svalbard methane beds, which may lead to more methane reaching the atmosphere before it is oxidised. Even if temperature is not the main control on bacterial abundance, shifts in ocean circulation, expected as the climate changes, may alter the course of currents in this area. If the Arctic waters were to be diverted elsewhere, or the strength of this current was reduced, fewer methanotrophs would be available to break down the methane, which could also result in more of the gas reaching the atmosphere.

To better understand the risk of methane release to the atmosphere we need to comprehend the processes contributing to its breakdown, as well as those that liberate it from the sediment. Thanks to Steinle and her team, we now know there are strong oceanographic controls on methane's breakdown, but the case is not closed. What are the optimum conditions for methane oxidation? What makes methanotrophs thrive in these water bodies? And how will climate change influence the breakdown of methane in the oceans? Let the investigation continue!

> Sara Mynott EGU Communications Officer

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Scattered to the wind

How dust grains are integral to our future climate

Dust particles that make it into the atmosphere have much more potential than the ones in your home. Depending on their size, these dust grains cool our atmosphere by reflecting sunlight, or they can blanket the globe trapping heat and causing the Earth to warm. If there's lots of dust in the atmosphere, the small grains can seed water droplets, resulting in rainstorms. Or the particles can fall out into the oceans where their iron rich nature can cause blooms of algae that absorb carbon dioxide. In short, dust has the potential to transform our global climate and some of its effects could mitigate those of global warming.

But computer models trying to predict how our climate may change in the future are struggling to understand just how much dust could affect their calculations. Most models are tuned to dust measurements taken many miles from dust sources such as in Miami or the Bahamas. Unsurprisingly, though, this isn't where most of the dust in the global system originates.

That honour falls to the Bodélé depression, a huge dry seabed in Chad. This depression is covered by a thick layer of dead diatoms – a type of algae – left behind when the water evaporated. The lack of vegetation means there is nothing to secure sand grains on the surface of the dry seabed which, when blown by the wind, bombard into the diatom remains and whip them up into the atmosphere as a dust storm where they can travel for miles around the globe.

For a climate model, this flat pan should be the easiest type of landscape to make dust calculations for, as there's no vegetation or other factors to complicate matters. But even at this simple level the models struggle. On top of this, the political instability of the area makes it near impossible for scientists to gain access, so very few actual measurements exist. This makes it difficult to test how well the climate models are really predicting dust emissions, but researchers from Oxford University are trying to rectify this.

The <u>DO4 Models</u>: <u>Dust Observation</u> project is looking at dust emission sites around the globe to see what conditions cause dust to be emitted, and to try and produce dust models which will, in turn, help us to fine tune our climate models.

"We wanted to go to areas in deserts where dust is being emitted and find out why and how it is emitted in the first place. Is it moisture? Vegetation? Grain size? What?" asks Giles Wiggs, one of the co-investigators on the project.

One of these areas is the Makgadikgadi Pan in Botswana. The team visited it twice, once in 2011 and again in 2012, trekking through blistering heat and being blinded by dust storms to measure how and where the dust is being emitted. The Makgadikgadi Pan is almost 6,200 square miles (over 16,000 square kilometres) of perfectly flat, bright-white salty clay. Like the Bodélé depression, this would be interpreted by climate models as somewhere with no vegetation and not much moisture, meaning most models expect the whole pan to have a huge emission of dust from its surface.



Taking measurements in the Makgadikgadi Pan. (Credit: Giles Wiggs)

But the research shows that the pan only emits dust from small areas and at specific times. In particular, areas that were getting rained on late in the season emitted more dust, because the rains caused the soft, broken-up crust to be disrupted. The researchers now believe soil moisture could be the most useful measurement for dust emissions. Unfortunately, few people use soil moisture as a measurement of these dust sources. Instead, most people measure crust thickness or the strength of the crust (using a penetrometer to see how much strength is required before it cuts through the crust).

"We were trying to come up with a simple model to say: 'when the crust is like this, you can expect this much dust from it.' But, as it turns out, things are much more complicated – we found almost no relationship at all between either of these attributes and how much dust comes off of it. Nothing defines dust well," says Wiggs.

The data, presented at the EGU 2013 General Assembly, were collected in a 12×12 km square grid – a size chosen because it is the smallest resolution most climate models can make calculations for.

Some researchers don't think this resolution is high enough to provide accurate climate measurements. But for Wiggs' post-doctoral researcher, <u>James King</u>, who was required to trek almost two hundred kilometers to make observations over the four-month fieldwork period, it must have seemed huge, particularly in the harsh field conditions.

"When you're trekking up and down in temperatures of 42 °C and the wind starts to blow, it feels like you're standing in a fan oven, you can feel the moisture being sucked out of your skin. Then the dust erupts and you can only see a few metres in front of you," says Wiggs. King was required to battle these conditions to place a portable wind tunnel at the centre of each kilometer square in the grid, to test how different wind speeds and directions affected erosion of the crust.

The team are now conducting experiments in other dust source areas, such as dried up river beds in Namibia, and trying to make more precise measurements of soil moisture in relation to dust. New research suggests it may get more dusty in the future, meaning this team, and the <u>DO4 project</u>, will only become more important. But while the project can help us understand dust emissions today, it's still unclear how these will change in the future.

Reference

King, J. et al.: The role of moisture on controlling dust emissions from crusted supply-limited surfaces, Geophys. Res. Abstr., 15, EGU2013-12332, 2013 (conference abstract)

Harriet Jarlett Freelance science writer

Interview with climate scientist Andrew MacDougall

At the EGU 2013 General Assembly, press-assistant Becky Summers had the opportunity to interview <u>Andrew MacDougall</u>, a PhD candidate from the University of Victoria, Canada. He talked to her about his preliminary work, <u>presented at the conference</u>, on undoing climate change and restoring a Holocene-like climate.

Hi Andrew - could you tell us why you started this work?

Well it's about reversibility and a little bit of hope. Many of the climate scenarios are dismal and demoralising and this was a side project asking: can we ever fix this? And if so, what would be the realistic time scales involved. The idea is to look at future scenarios and map out how long it would take to get the Earth's climate back to a pre-industrial CO_2 levels (around 280 parts per million).

So how long will it take to restore?

Using the middle of the road scenario, a Holocene-like climate can be re-established by the late 24th or 25th century. However, surface temperatures remain above the pre-industrial temperature until at least the 30th century. In addition, due to carbon-cycle feedbacks the amount of carbon that has to be removed is larger by 15-90% than the original quantity the humanity emitted.

How did you look so far into the future?

We forced the University of Victoria Earth-System Climate Model with future atmospheric gas concentration pathways based on those used in the upcoming IPCC [Intergovernmental Panel on Climate Change] fifth assessment report. The carbon emissions reach zero in different years: the low scenario at 2050, medium at 2175 and high at 2250. So in that year, human emissions are eliminated and not only do we stop emitting carbon but we actively start to synthetically remove CO_2 from the atmosphere and store it in some geologically stable form.

The model was spun up over a time period of 1000 years with the equilibrium being at an 1850 climate. Carbon dioxide reduction is mirrored at the same rate it increased and we were looking at the gradual return back to pre-industrial atmosphere.

So we not only decarbonise but actually remove carbon too?

Yes, using technology such as carbon capture and storage. Scientists like David Keith from Harvard University are designing machines that could work at a commercial level to suck tens of



Andrew MacDougall (Credit: N. Roux)

thousands of tons – or more – of carbon out of the air, that can be moved into geological storage deep underground. More exotically, the carbon dioxide could be turned into limestone but this uses phenomenal amounts of energy.

But who decides the Earth's temperature? Do we really want the pre-industrial climate?

This was used as a baseline because this 20^{th} century figure implies you will have restored the climate that we have known in the previous few decades. If it were decided that people in the mid millennium wanted the temperature at a degree and half warmer, CO_2 would be stabilised at a higher level.

However, even though global temperature would be similar to today, by the 24th century you would still expect a different climate. This is because the oceans warm up and cool down slower than the continents. Imagine when you take a pot of water and put on stove, it warms up. When you take it off, it takes a long time for the water to cool down.

Is there any policy relevance here?

Not really – I mean politicians often have trouble thinking four years into the future let alone 400 years! But there's scientific value here. We've shown that, at civilisation timescales and with some monumental effort, the climate can be restored to a 20th-century-like climate. However, we have also shown that humanity will be living with the consequences of fossil fuel emissions for a very long time.

Interview conducted by Becky Summers Freelance science writer



GEO C EGU VOICE

Letter from the 2013 Programme Committee Chair

Chair of the EGU General Assembly Programme Committee Gert-Jan Reichart reports on this year's conference.

In my second year as programme chair of the EGU General Assembly, the meeting was still incredibly busy for me, but less hectic than last year. As the number of participants was nearly the same as in 2012, this must be mainly due to me getting used to the great organisational infrastructure that has been developed over the years. The result was a very successful meeting with over 11,000 participants, 4,684 oral presentations and 8,207 posters and, for the very first time, 452 <u>PICO</u> (Presenting Interactive COntent) presentations. Seeing the newest scientific developments, meeting colleagues from across the world to discuss science, that is what makes the EGU General Assembly the most important meeting of the year for me.

Science itself is constantly changing, and so is the way we communicate it. With this in mind, last year we started a working group to come up with new ideas and concepts for the General Assembly. One of the ideas that emerged was what we have called PICO. In this concept, we try to combine the best of two different ways of presenting science: fast and direct communication with the audience through oral presentations, highlighting the main findings, followed by the opportunity to present research in more depth on large touch screen displays. Reactions were mixed, as some groups easily adapted to the new concept and were able to take full advantage of the possibilities offered, and others still felt somewhat uneasy about presenting their science in a different way. We will use the much appreciated feedback to make organisational and technical changes to optimise next years' PICO sessions, allowing them to grow into a solid new presentation tool, in addition to the other wellestablished ways to present science.

One of the main challenges of being programme chair is allocating the right-sized rooms to the different programme groups we have within the EGU. This year we sub-divided our largest room into three rooms, which were better sized to accommodate the audiences that the various sessions generally attract at the General Assembly. This turned out to be a success as we were able to host more oral sessions than ever before. Still, scheduling sessions will remain a challenge because of the large number of parallel sessions we host (more than any other scientific conference in Europe at the moment), but this way we also offer more scientists than ever the opportunity to talk about their science.

At the Union level, we had the highly successful Great Debate 'Shale gas: to frack or not to frack?' this year. The room was completely packed and the large number of wireless devices in the audience, many of which were used for live tweeting and blogging of the debate, caused the only bottleneck of our improved internet setup during the week. The interest in this topical subject clearly showed that European geosciences are highly relevant to society. Although the topic of fracking is much larger than what can be addressed during a great debate, the event showed how the General Assembly can contribute to important issues by taking advantage of the full spectrum of geosciences present at the meeting. This is something to consider when you have similarly broad subjects you would like to see discussed. The General Assembly may very well be the best place to do so.

The organisation of next year's conference is already well underway with our first feedback meeting finished. I will do my best to make the 2014 Assembly a similar success. At the same time, I realise 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 2014!



Gert-Jan Reichart 2013 Programme Committee Chair

Participants at this year's General Assembly trying out the innovative presentation concept, PICO.

Division reports

News brought to you from two EGU divisions

In each edition of GeoQ division presidents contribute reports updating EGU members with news from their divisions. Issue 6 gives voice to Michael Schmidt (G President) and Christopher Juhlin (ERE President).

Geodesy

The 2013 General Assembly in Vienna was my first as president of the Geodesy (G) Division. I want to thank my predecessor, Markku Poutanen, for putting together a well-structured session schedule. The 15 Geodesy-related sessions were well attended and, for most of them, the lecture rooms were sufficiently large for the audience. Our programme group had 381 submitted abstracts which is 4% more than in 2012. As in the past, the most popular sessions (by number of abstracts and by number of participants) were related to gravity field research and gravity satellite missions. The session 'Geodesy in Antarctica' was scheduled as a PICO session, and the response was predominantly positive.

There was no awardee for the Outstanding Young Scientist Award this year, unfortunately. But Eszter Szücs and Grace Nield were presented with the Outstanding Student Poster Award for their 2012 contributions entitled 'Effect of the difference between surface and terrain models on gravity field related quantities' and 'The effect of recent accumulation changes in the Antarctic Peninsula upon glacial isostatic adjustment', respectively.

The 2013 Geodesy Division Vening Meinesz Medal was awarded to Zuheir Altamimi for his invaluable research in the development and improvement of the International Terrestrial Reference Frame and for his important contribution to space geodetic research.

During the Division Business Meeting, the two nominated candidates, Johannes Böhm (Vienna University of Technology, Austria) and Johannes Bouman (DGFI, Munich, Germany), were approved as the two vice-presidents.

The meeting also saw the approval of the various committees of the Geodesy Division. The Vening Meinesz Medal Committee, chaired by last-year's winner <u>Che-Kwan Shum</u>, consists of the four past medalists, as well as the ex officio Geodesy Division president and the EGU Award Committee chair (both non-voting). For 2014, Zuheir Altamimi, Che-Kwan Shum, Harald Schuh, Philip Woodworth, and non-voting members Michael Schmidt and Alberto Montanari make up the Committee.

The Outstanding Young Scientist Award Committee consists of the division president, the vice-presidents and the latest medalist (Xavier Collilieux), while the Outstanding Student Poster Award Committee has the division president and vice-presidents as members.

Finally, the Programme Committee for the 2014 General Assembly consists of the division president, vice-presidents, as well as one or two officers to cover the whole field of geodesy.

The preparation of the next EGU General Assembly within the Geodesy Division will start soon: the skeleton programme will be based on the successful sessions of the 2013 meeting, but might also include new sessions. Among other issues, the implementation of the oral slots depending on the number of submitted abstracts will be a point of discussion.

Michael Schmidt G Division President

Energy, Resources and the Environment

The Energy, Resources and the Environment (ERE) Division is concerned with one of humankind's greatest challenges: providing sustainable, reliable and adequate supplies of affordable energy and other resources. The importance of these challenges within the EGU were highlighted at the recent General Assembly, where contributions included topics such as wind and solar power, carbon capture and storage, geothermal energy, sustainable biomass utilisation, natural resources and socio-ecologic considerations. We had 398 contributions with our programme group in the lead and 90 additional ones that we co-organised with other programme groups. The 398 lead contributions are roughly equivalent to the 418 ones for the EGU 2012 General Assembly. The ERE also was involved in the organisation of the well-attended Great Debate 'Shale gas: to frack or not to frack?'

At the ERE Division Business Meeting, Tija Sile was presented with the Outstanding Student Poster Award for her 2012 contribution entitled 'Estimation of wind regime from combination of RCM and NWP data in the Gulf of Riga (Baltic Sea)'. Further, several new officers were approved during the meeting. These were Tim Tambach for 'Sub-surface', Viktor Bruckman for 'Above ground', Maria Ask for 'Outreach & education' and Hermann Held for 'Economics & integration'. The 'Economics & integration' position is a new one and is aimed at bringing a broader spectrum of activities into the division and ensuring that the original goals are not lost. Michael Kühn, the former president, is now vice-president of ERE. An informal poll was taken during the Division Business Meeting concerning PICO (Presenting Interactive COntent) presentations and the general response was that this new type of presentation is worthwhile to continue with and that most attendees had a positive experience at the PICO sessions.

In the months to come work will focus on preparing for the next EGU General Assembly by building a skeleton program and identifying new potential conveners. We will encourage younger researchers to take an active role in the EGU. Our aim is to have a similar number of contributions to the General Assembly as we have had in recent years. We will also initiate some new sessions that we hope will attract a wide interest, such as the role of fractures in reservoirs.

Christopher Juhlin ERE Division President

Looking back at the EGU 2013 General Assembly

This year's General Assembly, which took place from 7-12 April in Vienna, was rich in scientific achievements, international discussions and interesting new features. The <u>numbers</u> of presentations, over 13,300, and of participants, over 11,100 from <u>95 countries</u>, were similar to last year, but this year's novelties made the difference and greatly contributed to the success of the meeting, the most interactive to date.

PICO (short for Presenting Interactive COntent), an innovative type of presentation introduced at this year's Assembly, brought together the advantages of oral and poster presentations and allowed scientific discussions to be as rich and interactive as ever. Other novelties included the launch of the new EGU/Copernicus open access journal, <u>ESurf</u>, and the participation of the Austrian Federal Minister for Science and Technology at the EGU Award Ceremony.

The extremely popular Union Symposium on the Curiosity Mars mission and Great Debate on shale gas and fracking, which generated thousands of hits on their respective webstreams, also helped make the Assembly a success. The same can be said of the scientific sessions, medal lectures, poster summaries & discussions, and the many side events, which were of high scientific quality and interest.

It was also revealed at the meeting last week that the EGU has extended its contract with the Austria Center Vienna (ACV) to keep the General Assembly in the Viennese congress centre until 2019: "Vienna is a top international conference destination which stands out for its excellent transport links, good value for money and excellent mix of cultural attractions," said EGU President, Günther Blöschl, in an ACV press release.

The Assembly online

"One of the most impressive features of the EGU this year was the prevalence of social media usage," EGU 2013 participant Will Morgan wrote in his blog after the meeting. Indeed, the Assembly's online presence, particularly on Twitter, Facebook and the blogosphere, was more active than ever, thanks to the EGU Communications Officer Sara Mynott, the EGU network bloggers and the very interactive and social-media savvy participants.

Over 3,800 tweets featured the conference Twitter hashtag (#EGU2013) during the meeting and many used this and other session-specific hashtags, as well as the updates on the official EGU Twitter account (@EuroGeosciences), to follow the goings on at the Assembly. @EuroGeosciences gained over 170 new followers that week and some 130 new people 'liked' the EGU's page on Facebook.

The EGU official blog, <u>GeoLog</u>, and the <u>EGU network blogs</u> also saw a flurry of activity with over 25 posts published during the conference, thousands of views and many new subscribers. Most importantly, we received very positive feedback from young scientists about the EGU blogs. EGU 2013 participant Sam Illingworth said: "EGU blogs are one of the best things the EGU does for young scientists as it gives them a venue to share their research through guest posts."

Press activities

In addition to its scientific achievements and active online presence, the conference also saw keen media participation and reporting.



EGU flags outside the Austria Center Vienna during this year's General Assembly. (Credit: Sue Voice)

The Press Centre, run by the EGU Media and Communications Manager Bárbara Ferreira and four press assistants, welcomed over 40 media participants, including journalists, press officers, science writers and EGU bloggers. The ten press conferences hosted at the centre were well attended by the journalists at the Assembly and had over 10,000 views through their <u>webstreaming links</u> in the week of the Assembly.

The EGU conference has <u>featured</u> in over 250 online, print and radio articles published by the BBC, Nature, Discovery News, El Pais, among many others. News agencies such as Austria Presse Agentur, Russia's RIA Novosti and the Spanish Agencia EFE also extensively covered research presented at the General Assembly.

The Press Centre team was also in charge of producing and distributing the daily newsletter at the Assembly, <u>EGU Today</u>, of which over 12,000 copies were given away to participants.

Thank you and see you next year!

The Union is especially grateful to those who worked behind the scenes at the Assembly. We thank the ACV staff, all the conference assistants and our conference organiser Copernicus, particularly Katja Gänger, Mario Ebel, Katrin Krüger and Martin Rasmussen, for all their hard work before and at the meeting and for creating the excellent <u>EGU 2013 app</u>. Special thanks go out to the members of the Programme Committee, chaired by Gert-Jan Reichart, who worked tirelessly in coordinating the full scientific programme for the General Assembly.

The EGU is also thankful to all scientists, in particular abstract authors and session conveners, who participated in the meeting and were instrumental to its success, as well as to the hard-working journalists and exhibitors we had the pleasure to host. We hope to see you all next year in Vienna, Austria, at the EGU 2014 General Assembly, 27 April – 02 May 2014.

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

Austrian Science and Research Minister at the EGU General Assembly

Karlheinz Töchterle, the Austrian Federal Minister for Science and Research, attended the EGU Award Ceremony on 10 April 2013 where he gave a presentation on the future of geosciences in Europe. The full speech is available from the EGU website.

During his visit, Töchterle met with the EGU President Günter Blöschl, who is also the Head of the Department of Hydrology and Water Resources Management at the Vienna University of Technology. Blöschl said, prior to this meeting: "I am very pleased that Minister Töchterle accepted our invitation to attend the EGU 2013 General Assembly, the largest geosciences meeting in Europe. The topic he is presenting on, the future of European geoscience, is fitting at a conference attended by a large percentage of young scientists."

The EGU has strong connections with Austria having organised its annual General Assembly in Vienna since 2005.

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



Minister Karlheinz Töchterle (left) at the EGU Award Ceremony with the EGU President Günter Blöschl (centre) and Vice-President Don Dingwell (right).

Launching a new EGU open access journal, ESurf

Earth Surface Dynamics (ESurf) is the newest international scientific journal of the EGU. It is dedicated to the publication and discussion of high-quality research on the physical, chemical and biological processes shaping Earth's surface and their interactions on all scales. The main subject areas of ESurf comprise field measurements, remote sensing and experimental and numerical modeling of Earth surface processes, and their interactions with the lithosphere, biosphere, atmosphere, hydrosphere and pedosphere.

Earth Surface Dynamics



Detail of the cover of the ESurf journal

"We're really excited to be launching ESurf, which provides a unique forum for the publication of multi-disciplinary work on the processes shaping the Earth's surface. EGU's two-stage open access and discussion process makes this one of the most dynamic and interactive places to publish research on Earth surface processes and geomorphology," says Managing Editor Tom Coulthard. "We are thankful to Copernicus Publications and the EGU Publications Committee for their support."

With ESurf, the EGU now publishes a suite of <u>15 peer-reviewed</u> <u>open access journals</u> through Copernicus Publications. Like the majority of these journals, ESurf is an interactive two-stage journal with public peer-review and interactive public discussion. The discussion and peer-review of submitted papers are handled in an open access discussion forum (Earth Surface Dynamics Discussions, ESurfD), while final papers, upon acceptance, appear in ESurf.

The journal was officially launched at the EGU 2013 General Assembly in early April.

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

Links

Journal website: http://www.earth-surface-dynamics.net/ Follow ESurf on Twitter, @EGU_ESurf: https://twitter.com/EGU_ESurf

Tweeting at a conference: the magic of a hashtag

Following the General Assembly, EGU Communications Officer Sara Mynott, in charge of running the Union's social media channels, found herself wondering about how useful social media, particularly Twitter, has become at conferences. This year's General Assembly was known on Twitter as #EGU2013, a hashtag used by Sara, as well as by conference participants, to mark Twitter updates (tweets) related to the meeting.

While having a hashtag for a conference with 4,684 oral, 8,207 poster, and 452 <u>PICO</u> presentations (#EGU2013) won't give you an insight into what's going on in all the sessions – there's simply too much science – it provides a guide to what's happening next (as speakers share their sessions) and is a real-time indicator of the 'hot topics' as multiple media-savvy participants share their experience of particular sessions. More importantly though, it gives people attending the conference an opportunity to interact and extend their discussion online.

When there's over 3,800 tweets on the #EGU2013 hashtag during the General Assembly, curating a scintillating story that also falls

into the category of 'short and sweet' no longer seems achievable. But do we need it? Perhaps it's better to preserve the discussion that surrounds topical sessions such as the Great Debate on fracking and shale gas and short courses that can be used as a resource for hints and tips later.

Making something public via Twitter can bring up the subject of potentially being 'scooped' on science before it's published. But at a conference you are already communicating your work externally, so this is not an issue. Instead, it presents an opportunity to communicate your research with the wider public and scientific community. Here are some of the benefits.

Enriched discussions

Twitter provides opportunities for a much richer discussion during a conference – not only are you listening to the speaker's insights on a topic, but you can tune in to the knowledge and experience of others in the audience. The knowledge gathered in a scientific



conference is phenomenal and, in the case of the EGU General Assembly, with over 11,000 brilliant scientific minds at your fingertips, why wouldn't you ask a question?! Okay, so they aren't all on Twitter, but the chance of a well-informed reply is high, so it's still worth asking!

Remote participation

To add to the already enriched discussion, when something is being broadcast on Twitter, anyone can follow the goings on – be it the colleagues you left back in the lab, the geologist whose fieldwork

clashed with the event, or the interested twitterer, who happens upon the hashtag! If a talk is being live tweeted (someone is tweeting updates about the speaker's presentation) then it's even easier for others to participate in the conference online and ask their own guestions of the audience and the speaker.

Leaving a legacy

So we have a rich discussion, that involves members of the audience and connects with the wider public, potentially sharing the science with individuals across the globe – is there more to gain from a conference Twitter feed? Yes. The online discussion can be condensed and curated using a tool called Storify, which leaves a legacy of the discussion that people can return to later. Take the #EGUjobs session for example, Sarah Blackford and Helen Goulding gave an excellent talk on how to apply for jobs both in and out of academia last week and you can return to their recommendations on the respective Storify available online.

What did you gain from the conference Twitter feed? Fancy more of the same next year? Less? Or an even bigger online presence in 2014? <u>Email Sara</u> with your comments and we'll do our best to make it a reality.

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

Winners of the 2013 Imaggeo Photo Competition

Congratulations to Philipp Stadler, Yiming Wang and Eva van Gorsel, winners of this year's EGU Imaggeo Photo Competition! Stadler's photo <u>'Frost'</u>, showing night frost on a street lamp in Vienna, was the most voted photograph. Wang got second place with <u>'Icebear rising'</u>, a picture of glacial ice resembling a polar bear, and van Grosel came third with <u>'Regrowth after fires'</u>, showing trees in fire-affected Canberra, Australia.

The selection committee received close to 200 photos for this year's EGU Photo Competition, in most areas covered by EGU activities. The 11 finalist photos were exhibited at the General Assembly, where participants voted on their three favourites. The Special Moving Image Prize went to Pavlo Kochkin.

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



Winners of this year's Imaggeo photo competition by Philipp Stadler (left, 1st place), Yiming Wang (centre, 2nd place) and Eva von Gorsel (right, 3rd place). All photos are distributed by EGU under a Creative Commons licence via imaggeo.net.

GEO PRESS RELEASE

GPS solution provides three-minute tsunami alerts

EGU press release on research published in Natural Hazards and Earth System Sciences

Researchers have shown that, by using global positioning systems (GPS) to measure ground deformation caused by a large underwater earthquake, they can provide accurate warning of the resulting tsunami in just a few minutes after the earthquake onset. For the devastating Japan 2011 event, the team reveals that the analysis of the GPS data and issue of a detailed tsunami alert would have taken no more than three minutes. The results were published on 17 May in Natural Hazards and Earth System Sciences, an open access journal of the European Geosciences Union (EGU).

Most tsunamis, including those in offshore Sumatra, Indonesia in 2004 and Japan in 2011, occur following underwater ground motion in subduction zones, locations where a tectonic plate slips under another causing a large earthquake. To a lesser extent, the resulting uplift of the sea floor also affects coastal regions. There, researchers can measure the small ground deformation along the coast with GPS and use this to determine tsunami information.

"High-precision real-time processing and inversion of these data enable reconstruction of the earthquake source, described as slip at the subduction interface. This can be used to calculate the uplift of the sea floor, which in turn is used as initial condition for a tsunami model to predict arrival times and maximum wave heights at the coast," says lead-author Andreas Hoechner from the German Research Centre for Geosciences (GFZ).

In the new Natural Hazards and Earth System Sciences paper, the researchers use the Japan 2011 tsunami, which hit the country's northeast coast in less than half an hour and caused significant damage, as a case study. They show that their method could have provided detailed tsunami alert as soon as three minutes after the beginning of the earthquake that generated it.

"Japan has a very dense network of GPS stations, but these were not being used for tsunami early warning as of 2011. Certainly this is going to change soon," states Hoechner.

The scientists used raw data from the Japanese GPS Earth Observation Network (GEONET) recorded a day before to a day after the 2011 earthquake. To shorten the time needed to provide a tsunami alert, they only used data from 50 GPS stations on the northeast coast of Japan, out of about 1200 GEONET stations available in the country.

At present, tsunami warning is based on seismological methods. However, within the time limit of 5 to 10 minutes, these traditional techniques tend to underestimate the earthquake magnitude of large events. Furthermore, they provide only limited information on the geometry of the tsunami source (see note). Both factors can lead to underprediction of wave heights and tsunami coastal impact.



Boat dragged inland in Japan by the 2011 tsunami. (Credit: Stephen Vaughan)

Hoechner and his team say their method does not suffer from the same problems and can provide fast, detailed and accurate tsunami alerts.

The next step is to see how the GPS solution works in practice in Japan or other areas prone to devastating tsunamis. As part of the GFZ-lead German Indonesian Tsunami Early Warning System project, several GPS stations were installed in Indonesia after the 2004 earthquake and tsunami near Sumatra, and are already providing valuable information for the warning system.

"The station density is not yet high enough for an independent tsunami early warning in Indonesia, since it is a requirement for this method that the stations be placed densely close to the area of possible earthquake sources, but more stations are being added," says Hoechner.

This press release was originally published on the EGU website

Note

Traditional tsunami early warning methods use hypocentre (the point directly beneath the epicentre where the seismic fault begins to rupture) and magnitude only, meaning the source of the earthquake and tsunami is regarded as a point source. However, especially in the case of subduction earthquakes, it can have a large extension: in Japan in 2011 the connection between the tectonic plates broke on a length of about 400 km and the Sumatra event in 2004 had a length of some 1500 km. To get a good tsunami prediction, it is important to consider this extension and the spatial slip distribution.

Reference

Hoechner, A. et al.: Instant tsunami early warning based on real-time GPS – Tohoku 2011 case study, Nat. Hazards Earth Syst. Sci., 13, 1285-1292, 2013



GEO Q JOURNAL WATCH

Annales Geophysicae (ANGEO)

The Geminid meteor shower during the ECOMA sounding rocket campaign: specular and head echo radar observations

The ECOMA (Existence of Charge state Of meteoric smoke particles in the Middle Atmosphere) sounding rocket campaign was conducted during the Geminid meteor shower in December 2010 to explore whether there is a change of the properties of meteoric smoke particles due to the stream. The results are reported here.

Reference

Stober, G. et al.: The Geminid meteor shower during the ECOMA sounding rocket campaign: specular and head echo radar observations, Ann. Geo-phys., 31, 473-487, 2013



Geminid meteorover the Mojave Desert in 2009 (Credit: <u>Wally Pacholka</u>, <u>The</u> World at Night)

Atmospheric Chemistry and Physics (ACP)

Recent variability of the solar spectral irradiance and its impact on climate modelling

Researchers summarise the current knowledge of solar spectral irradiance (SSI) variability and its impact on Earth's climate. They present a detailed overview of existing SSI measurements and provide thorough comparison of models available to date.

Reference

Ermolli, I. et al.: Recent variability of the solar spectral irradiance and its impact on climate modelling, Atmos. Chem. Phys., 13, 3945-3977, 2013

Oxidation of SO₂ by stabilized Criegee intermediate (sCl) radicals as a crucial source for atmospheric sulfuric acid concentrations

The effect of increased reaction rates of stabilised Criegee intermediates (sCls) with SO₂ to produce sulfuric acid is investigated in this paper using data from two different locations, SMEAR II, Hyytiälä, Finland, and Hohenpeissenberg, Germany.

Reference

Boy, M. et al.: Oxidation of SO₂ by stabilized Criegee intermediate (sCI) radicals as a crucial source for atmospheric sulfuric acid concentrations, Atmos. Chem. Phys., 13, 3865-3879, 2013 Meteorological observations on the northern Chilean coast during VOCALS-REx

The authors report on surface coastal observations from two automatic weather stations at Paposo (~25° S) and radiosonde observations at Paposo and Iquique (~20° S) carried out during VOCALS-REx (VAMOS Ocean-Cloud-Atmosphere-Land Study Regional Experiment).

Reference

Rutllant, J. A., Muñoz, R. C., and Garreaud, R. D.: <u>Meteorological observa-</u> tions on the northern Chilean coast during VOCALS-REx, Atmos. Chem. Phys., 13, 3409-3422, 2013

A unified approach to infrared aerosol

remote sensing and type specification

In this paper, the researchers use high resolution infrared measurements for aerosol type differentiation, exploiting, in that part of spectrum, the dependency of their refractive index on wavelength. They review existing detection methods and present a unified detection method based on linear discrimination analysis.

Reference

Clarisse, L. et al.: A unified approach to infrared aerosol remote sensing and type specification, Atmos. Chem. Phys., 13, 2195-2221, 2013

Quantifying the uncertainty in simulating global tropospheric composition due to the variability in global emission estimates of Biogenic Volatile Organic Compounds

In this study researchers examine the contribution of biogenic volatile organic compounds towards global tropospheric composition using the global 3D chemistry transport model TM5 and the recently developed modified CB05 chemical mechanism.

Reference

Williams, J. E., van Velthoven, P. F. J. and Brenninkmeijer, C. A. M.: <u>Quantify-</u> ing the uncertainty in simulating global tropospheric composition due to the variability in global emission estimates of Biogenic Volatile Organic Compounds, Atmos. Chem. Phys., 13, 2857-2891, 2013 Host model uncertainties in aerosol radiative forcing estimates: results from the AeroCom Prescribed intercomparison study

In this AeroCom Prescribed intercomparison study, researchers sytematically isolate and quantify host model uncertainties on aerosol forcing experiments through prescription of identical aerosol radiative properties in twelve participating models.

Reference

Stier, P. et al.: Host model uncertainties in aerosol radiative forcing estimates: results from the AeroCom Prescribed intercomparison study, Atmos. Chem. Phys., 13, 3245-3270, 2013

Atmospheric Measurement Techniques (AMT)

The CM SAF SSM/I-based total column water vapour climate data record: methods and evaluation against re-analyses and satellite

The European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) Satellite Application Facility on Climate Monitoring (CM SAF) aims at the provision and sound validation of well documented Climate Data Records (CDRs) in sustained and operational environments. In this study, a total column water vapour path climatology from CM SAF is presented and inter-compared to water vapour data records from various data sources.

Reference

Schröder, M., et al.: The CM SAF SSM/I-based total column water vapour climate data record: methods and evaluation against re-analyses and satellite, Atmos. Meas. Tech., 6, 765-775, 2013

Biogeosciences (BG)

Surface pathway of radioactive plume of TEPCO Fukushima NPP1 released ¹³⁴Cs and ¹³⁷Cs

¹³⁴Cs and ¹³⁷Cs were released to the North Pacific Ocean by two major likely pathways, direct discharge from the Fukushima Nuclear Power Plant 1 (NPP1) accident site and atmospheric deposition off Honshu Islands of Japan, east and northeast of the site. High density observations of ¹³⁴Cs and ¹³⁷Cs in the surface water were carried out by 17 cruises of cargo ships and several research vessel cruises from March 2011 until March 2012. The results are reported here.

Reference

Aoyama, M. et al.: Surface pathway of radioactive plume of TEPCO Fukushima NPP1 released ¹³⁴Cs and ¹³⁷Cs, Biogeosciences, 10, 3067-3078, 2013 Bacteriohopanepolyols record stratification, nitrogen fixation and other biogeochemical perturbations in Holocene sediments of the central Baltic Sea

The team studied bacteriohopanepolyols, lipids of specific bacterial groups, in a sediment core from the central Baltic Sea (Gotland Deep) and found considerable differences between the distinct stages of the Baltic Sea's history.

Reference

Blumenberg, M. et al.: Bacteriohopanepolyols record stratification, nitrogen fixation and other biogeochemical perturbations in Holocene sediments of the central Baltic Sea, Biogeosciences, 10, 2725-2735, 2013

Nitrous oxide emissions from European agriculture - an analysis of variability and drivers of emissions from field experiments

Nitrous oxide emissions from a network of agricultural experiments in Europe were used to explore the relative importance of site and management controls of emissions. At each site, a selection of management interventions were compared within replicated experimental designs in plot-based experiments.

Reference

Rees, R. M. et al.: Nitrous oxide emissions from European agriculture - an analysis of variability and drivers of emissions from field experiments, Biogeosciences, 10, 2671-2682, 2013

Vertical distributions of plutonium isotopes in marine sediment cores off the Fukushima coast after the Fukushima Dai-ichi Nuclear Power Plant accident

To obtain the vertical distribution of Pu isotopes in marine sediments and to better assess the possible contamination of Pu from the Fukushima Dai-ichi Nuclear Power Plant accident in the marine environment, the researchers determined the activities of ²³⁹⁺²⁴⁰Pu and ²⁴¹Pu as well as the atom ratios of ²⁴⁰Pu/²³⁹Pu and ²⁴¹Pu/²³⁹Pu in sediment core samples collected in the western North Pacific off Fukushima from July 2011 to July 2012.

Reference

Bu, W. T. et al.: Vertical distributions of plutonium isotopes in marine sediment cores off the Fukushima coast after the Fukushima Dai-ichi Nuclear Power Plant accident, Biogeosciences, 10, 2497-2511, 2013



The damaged Fukushima I Nuclear Power Plant after the 2011 Tohoku earthquake and tsunami. (Credit: Digital Globe)

Inverse estimation of source parameters of oceanic radioactivity dispersion models associated with the Fukushima accident

With combined use of the ocean-atmosphere simulation models and field observation data, we evaluate the parameters associated with the total caesium-137 amounts of the direct release into the ocean and atmospheric deposition over the western North Pacific caused by the accident of Fukushima Dai-ichi nuclear power plant that occurred in March 2011.

Reference

Miyazawa, Y. et al.: Inverse estimation of source parameters of oceanic radioactivity dispersion models associated with the Fukushima accident, Biogeosciences, 10, 2349-2363, 2013

Short- and long-term consequences of larval stage exposure to constantly and ephemerally elevated carbon dioxide for marine bivalve populations

Experiments were performed to assess the short-term (days) and long-term (months) consequences of larval stage exposure to varying CO₂ concentrations for calcifying bivalves. The findings suggested that high CO₂ has a cascading negative physiological impact on bivalve larvae stemming in part from lower calcification rates.

Reference

Gobler, C. J. and Talmage, S. C.: Short- and long-term consequences of larval stage exposure to constantly and ephemerally elevated carbon dioxide for marine bivalve populations, Biogeosciences, 10, 2241-2253, 2013

An unknown oxidative metabolism substantially contributes to soil CO₂ emissions

The respiratory release of CO₂ from soils is a major determinant of the global carbon cycle. It is traditionally considered that this respiration is an intracellular metabolism consisting of complex biochemical reactions carried out by numerous enzymes and co-factors. Here the researchers show that the endoenzymes released from dead organisms are stabilised in soils and have access to suitable substrates and co-factors to permit function.

Reference

Maire, V., et al.: An unknown oxidative metabolism substantially contributes to soil CO₂ emissions, Biogeosciences, 10, 1155-1167, 2013



14 Open Access Journals

& newly launched: Earth Surface Dynamics

Climate of the Past (CP)

Earth System Dynamics (ESD)

Direct linking of Greenland and Antarctic ice cores at the Toba eruption (74 ka BP)

In this work, the authors suggest a direct synchronisation of Greenland and Antarctic ice cores at the Toba eruption based on matching of a pattern of bipolar volcanic spikes. Annual layer counting between volcanic spikes in both cores allows for a unique match.

Reference

Svensson, A. et al.: Direct linking of Greenland and Antarctic ice cores at the Toba eruption (74 ka BP), Clim. Past., 9, 749-766, 2013.



Lake and supervolcano Toba in Sumatra, Indonesia (Credit: NASA Landsat)



The global mean temperature response to various climate scenarios (Credit: Booth et al., 2013) Scenario and modelling uncertainty in global mean temperature change derived from emission-driven global climate models

In this work, the authors compare future changes in global mean temperature in response to different future scenarios which, for the first time, arise from emission-driven rather than concentrationdriven perturbed parameter ensemble of a global climate model.

Reference

Booth, B. B. et al.: Scenario and modelling uncertainty in global mean temperature change derived from emission-driven global climate models, Earth Syst. Dynam., 4, 95-108, 2013

Geoscientific Instrumentation, Methods and Data Systems (GI)

Interpreting muon radiographic data in a fault zone: possible application to geothermal reservoir detection and monitoring

In this report, the data taken by Tanaka et al. (2011) are reanalysed to estimate the porosity distribution as a function of a distance from the fault gouge. The result shows a similar pattern of the porosity distribution as measured by borehole sampling at Nojima fault. There is a low porosity shear zone axis surrounded by porous damaged areas with density increasing with the distance from the fault gouge. Applications of this work include drilling of geothermal exploration wells and geothermal exploration and monitoring.

Reference

Tanaka, H. K. M. and Muraoka, H.: Interpreting muon radiographic data in a fault zone: possible application to geothermal reservoir detection and monitoring, Geosci. Instrum. Method. Data Syst., 2, 145-150, 2013

Hydrology and Earth System Sciences (HESS)

Reducing cloud obscuration of MODIS snow cover area products by combining spatio-temporal techniques with a probability of snow approach

This study develops a rule-based, multistep method (including combining images from more than one satellite and other techniques) for removing clouds from MODIS snow cover area images.

Reference

López-Burgos, V., Gupta, H. V., and Clark, M.: <u>Reducing cloud obscura-</u> tion of MODIS snow cover area products by combining spatio-temporal techniques with a probability of snow approach, Hydrol. Earth Syst. Sci., 17, 1809-1823, 2013

Elusive drought: uncertainty in observed trends and short- and long-term CMIP5 projections

The results presented here highlight the inherent difficulty of drought quantification and the considerable likelihood range of drought projections, but also indicate regions where drought is consistently found to increase.

Reference

Orlowsky, B. and Seneviratne, S. I.: <u>Elusive drought: uncertainty in observed</u> trends and short- and long-term CMIP5 projections, Hydrol. Earth Syst. Sci., 17, 1765-1781, 2013

Comparative assessment of predictions in ungauged basins – Part 1: Runoff-hydrograph studies

The objective of this assessment is to compare studies predicting runoff hydrographs in ungauged catchments. The aim is to learn from the differences and similarities between catchments in different locations.

Reference

Parajka, J., et al.: <u>Comparative assessment of predictions in ungauged</u> <u>basins – Part 1: Runoff-hydrograph studies</u>, Hydrol. Earth Syst. Sci., 17, 1783-1795, 2013

McMaster Mesonet soil moisture dataset: description and spatio-temporal variability analysis

This paper introduces and describes the hourly, high-resolution soil moisture dataset continuously recorded by the McMaster Mesonet located in the Hamilton-Halton Watershed in Ontario, Canada.

Reference

Kornelsen, K. C. and Coulibaly, P.: <u>McMaster Mesonet soil moisture dataset:</u> <u>description and spatio-temporal variability analysis</u>, Hydrol. Earth Syst. Sci., 17, 1589-1606, 2013 Flood-initiating catchment conditions: a spatio-temporal analysis of large-scale soil moisture patterns in the Elbe River basin

Here, the authors propose classifying soil moisture as a key variable of pre-event catchment conditions and investigating the link between soil moisture patterns and flood occurrence in the Elbe River basin.

Reference

Nied, M., Hundecha, Y., and Merz, B.: Flood-initiating catchment conditions: a spatio-temporal analysis of large-scale soil moisture patterns in the Elbe River basin, Hydrol. Earth Syst. Sci., 17, 1401-1414, 2013

Local and global perspectives on the virtual water trade

This paper presents and discusses the assessment of virtual water fluxes between a single country and its network of trading partners, delineating a country's virtual water budget in space and time (years 1986-2010).

Reference

Tamea, S., et al.: Local and global perspectives on the virtual water trade, Hydrol. Earth Syst. Sci., 17, 1205-1215, 2013

A generalized Damköhler number for classifying material processing in hydrological systems

This paper focuses on the dynamic balance between transport and material transformation, and defines material connectivity as the effective transfer of material between elements of the hydrological cycle.

Reference

Oldham, C. E., Farrow, D. E., and Peiffer, S.: <u>A generalized Damköhler num-</u> ber for classifying material processing in hydrological systems, Hydrol. Earth Syst. Sci., 17, 1133-1148, 2013

A statistical analysis of insurance damage claims related to rainfall extremes

In this paper, a database of water-related insurance damage claims related to private properties and content is analysed. The aim is to investigate whether the probability of occurrence of rainfall-related damage is associated with the rainfall intensity.

Reference

Spekkers, M. H., et al.: <u>A statistical analysis of insurance damage claims</u> related to rainfall extremes, Hydrol. Earth Syst. Sci., 17, 913-922, 2013

Natural Hazards and Earth System Sciences (NHESS)

Possible effects on avionics induced

by terrestrial gamma-ray flashes

Terrestrial gamma-ray flashes (TGFs) are impulsive (intrinsically sub-millisecond) events associated with lightning in powerful thunderstorms. This article addresses the issue of the possible susceptibility of typical aircraft electronics exposed to TGF particle, gamma ray and neutron irradiation.

Reference

Tavani, M. et al.: Possible effects on avionics induced by terrestrial gammaray flashes, Nat. Hazards Earth Syst. Sci., 13, 1127-1133, 2013 The influence of climate change on flood risks in France – first estimates and uncertainty analysis

This paper proposes a methodology to project the possible evolution of river flood damages due to climate change and applies it to mainland France.

Reference

Dumas, P., et al.: <u>The influence of climate change on flood risks in France –</u> <u>first estimates and uncertainty analysis</u>, Nat. Hazards Earth Syst. Sci., 13, 809-821, 2013

Nonlinear Processes in Geophysics (NPG)

Ion motion in the current sheet with sheared magnetic field – Part 1: Quasi-adiabatic theory

This paper presents a theory of trapped ion motion in the magnetotail current sheet with a constant dawn-dusk component of the magnetic field. Particle trajectories are described analytically using the quasi-adiabatic invariant corresponding to averaging of fast oscillations around the tangential component of the magnetic field.

Reference

Artemyev, A. V., Neishtadt, A. I., and Zelenyi, L. M.: <u>Ion motion in the current</u> sheet with sheared magnetic field – Part 1: Quasi-adiabatic theory, Nonlin. Processes Geophys., 20, 163-178, 2013



Ocean Science (OS)



Areas where MERIS (MEdium Resolution Imaging Spectrometer) data were extracted from ESA's MERCI, the MERIS Catalogue and Inventory, database. (Credit: Wernand et al., 2013)

MERIS-based ocean colour classification with the discrete Forel–Ule scale

Researchers present a new algorithm that uses the full spectral information in the visible domain to characterise natural waters in a simple and globally valid way.

Reference

Wernand, M. R., Hommersom, A. and van der Woerd, H. J.: MERIS-based ocean colour classification with the discrete Forel–Ule scale, Ocean Sci., 9, 477-487, 2013

Solid Earth (SE)

Application of soil quality indices to assess the status of agricultural soils irrigated with treated wastewaters

In this work two soil quality indices were used to evaluate the effects of irrigation with treated wastewater in soils. The indices were developed studying different soil properties in undisturbed soils in southeast Spain, and the relationships between soil parameters were established using multiple linear regressions.

Reference

Morugán-Coronado, A., et al.: <u>Application of soil quality indices to assess</u> the status of agricultural soils irrigated with treated wastewaters, Solid Earth, 4, 119-127, 2013



The Cryosphere (TC)

Ice-shelf buttressing and the stability of marine ice sheets

Ice-shelf buttressing and the stability of marine-type ice sheets are investigated numerically. Buttressing effects are analysed for a situation where a stable grounding line is located on a bed sloping upwards in the direction of flow.

Reference

Gudmundsson, G. H.: Ice-shelf buttressing and the stability of marine ice sheets, The Cryosphere, 7, 647-655, 2013

Mechanisms causing reduced Arctic sea ice loss in a coupled climate model

The fully coupled climate model HadGEM1 produces one of the most accurate simulations of the historical record of Arctic sea ice seen in the IPCC AR4 multi-model ensemble. In this study, the researchers examine projections of sea ice decline out to 2030, produced by two ensembles of HadGEM1 with natural and anthropogenic forcings included.

Reference

West, A. E., Keen, A. B., and Hewitt, H. T.: Mechanisms causing reduced Arctic sea ice loss in a coupled climate model, The Cryosphere, 7, 555-567, 2013 Estimating the Greenland ice sheet surface mass balance contribution to future sea level rise using the regional atmospheric climate model MAR

To estimate the sea level rise originating from changes in surface mass balance of the Greenland ice sheet, we present 21st century climate projections obtained with the regional climate model MAR (Modèle Atmosphérique Régional), forced by output of three CMIP5 (Coupled Model Intercomparison Project Phase 5) general circulation models.

Reference

Fettweis, X., et al.: Estimating the Greenland ice sheet surface mass balance contribution to future sea level rise using the regional atmospheric climate model MAR, The Cryosphere, 7, 469-489, 2013

Surface undulations of Antarctic ice streams tightly controlled by bedrock topography

In this work researchers use recently acquired airborne radar data for the Rutford Ice Stream and Evans Ice Stream, and show that the surface response of fast-flowing ice is highly sensitive to bedrock irregularities with wavelengths of several ice thicknesses.

Reference

De Rydt, J. et al.: Surface undulations of Antarctic ice streams tightly controlled by bedrock topography, The Cryosphere, 7, 407-417, 2013



Climate4impact: a new gateway for the global climate impact community

Over the years, the community of climate researchers has made great efforts to make their global climate models (GCM) comparable and usable by many. An important step in this process is the development of a data portal from which all these models can be easily accessed. Recently, a team within the European Network for Earth System Modelling (ENES) developed the Portal Interface for the Climate Impact Communities to do just that. While the website, <u>http://climate4impact.eu/</u>, is still in its evaluation phase, researchers throughout the world can already use and search the data made available through the portal.

Meteorological and research institutes have collected impressive amounts of climate data, but when researchers want to access that information, they have to contact each organisation separately. Further, some institutions lack a gateway from which data can be properly downloaded.

The <u>climate4impact</u> website, a web interface for climate data built on the Earth System Grid Federation (<u>ESGF</u>) infrastructure, offers a distributed search which gives the user the possibility to look at different databanks in a single session. The portal allows users to access and download data from over eighty global and (to a lesser extent) regional climate impact models. Since a lot of data is involved, researchers can target a search using filters. For example, they can search for data from a particular CMIP5 (Coupled Model Intercomparison Project Phase 5) experiment or specify the realm (such as 'atmosphere' or 'ocean') to which the data belongs to. The website also has options to visualise the models so that a researcher can get a quick grasp of the predictions provided.

Although still a prototype, there are a few organisations already making use of the climate4impact portal. The hydrological consultancy firm Deltares, for instance, uses climate impact scenarios for their models on sea level rise and flooding risks and use the climate4impact portal to extract data.

Easiness

The website is the result of collaboration within the European FP-7 project Infrastructure for the European Network for Earth System Modelling or IS-ENES (pronounced 'easiness'). It is a joint effort of several ENES members, from research centres to meteorological institutes. They are: the European Centre for Research and Advanced Training in Scientific Computation in France, CNRS' Institute Pierre Simon Laplace, also in France, Italy's Euro-Mediterranean Center on Climate Change, Wageningen University in the Netherlands, the French National Centre for Meteorological Research, the Dutch Royal Netherlands Meteorological Institute (KNMI), the Romanian National Institute of Hydrology and Water



Management and the Swedish Meteorological and Hydrological Institute.

According to KNMI's Wim Som de Cerff, in charge of setting up climate4impact, there are virtually no GCM portals available that offer the same kind of overview as the ENES portal. "Other climate impact portals have a regional focus or are specialised for a certain type of research. The ENES portal has a much broader scope."

The ESGF, which – in addition to the data infrastructure – provides search services and security infrastructure for the website, also has its own gateway, but the climate4impact portal offers additional features that make it easier for users to handle the data. "We offer tools to visualise the data, documentation that gives researchers an idea of what they are looking at and make the downloading process as simple as possible."

One of the biggest advantages of the data portal is that researchers require less time to analyse data, allowing them to devote most of their attention to looking into multiple climate models. "A typical climate impact researcher spends most of their time collecting and converting data and making a cut out of an area he or she is interested in; there is simply no time for more than one or two model runs. As a result, a scientist would not necessarily choose the best model that is most suitable for their question." Som de Cerff emphasises that there can be significant differences between models and some models are more useful to predict certain phenomena than others. "That's something we really want to bring into perspective with the data portal."



Next steps

Though the portal offers great possibilities to researchers, there is still room for improvement. One of the issues the team in charge of the project intends to solve is to make the search more specific so that it results in fewer records. "With a portal search, a user can bring the amount of data back from a million to 30,000 records," says climate4impact developer Maarten Plieger. "While that is a big step forward, a lot of researchers still can't work with that amount

of data." Because of this, at present the portal is more useful for climate modellers than for researchers coming from other fields, though this is something the team wants to see changed in the near future.

The team also wants to imbed processing tools into the portal to allow users to extract an even smaller subset of data than at present. These new tools should also allow researchers to derive data from the values used in the models so that the extracted information better answers the specific questions they are looking into.

Another improvement is the enrichment of the data portal with regional climate data models from the CORDEX group. CORDEX (Coordinated Regional Climate Downscaling Experiment) is an initiative with a goal similar to ENES': exchanging and comparing climate impact models to pinpoint the main differences. "They're involved with a lot more institutions and are at the phase where they have to describe metadata in order to make the models comparable", says Som de Cerff. "By joining the ESGF infrastructure, we all can benefit from the lessons learned and their data will become available in the same way as the GCM data in our portal."

For more information on climate4impact, please contact Maarten Plieger (plieger@knmi.nl) or Wim Som de Cerff (sdecerff@knmi.nl).

> Bram Semeijn Semeijn Teksten (<u>bram@semeijnteksten.nl</u>), for the climate4impact team

From the bottom up: helping geologists lead the way for global development

Jane Robb, Communications Officer for Geology for Global Development, writes about the organisation's goals and activities.

The natural hazards course I took as part of my geology degree at university was relatively comprehensive, or so I thought. We covered a diverse range of hazards which occur from Earth processes and climate, in a diverse range of countries, and we learnt about mitigation of these hazards including the pros and cons of each strategy. At the time, I was vaguely aware that geologists are employed by government or non-governmental organisations to help mitigate disaster events, to assess earthquake hazard potential and help those affected after the disaster has hit. It didn't occur to me that there was much more than this to the geologists' role in disaster risk prediction, mitigation and management. So when I heard about Geology for Global Development I was intrigued.

Geology for Global Development (GfGD) was set up in the UK as a direct response to this disconnect encountered by students of geology in university and the realities of geology's role in global development issues. Recognising the significant contribution good geoscience can make to international development and the fight against severe poverty, founding-director Joel Gill set up GfGD. His aim was to encourage and support young geoscientists in the growth of the skills and knowledge that they will need to make a positive, effective and greater contribution to international development throughout their careers.

One of the core concepts of the organisation is that geologists should be aware, from an early stage, of how they can help people and the environment. Crucially, scientists can do this through understanding and appreciating the social and cultural aspects of their roles and responsibility in sustainable and effective development, especially in the developing world.

Although Gill highlighted this issue back in 2011 with the start of GfGD, acknowledgement of the issue regarding the disconnect of geology and sociocultural issues is nothing new. Thankfully, UK universities can now be seen making changes to their geoscience curriculums to account for this. Keele University, the University of Edinburgh, Plymouth University and King's College London all offer

geoscience or geography courses that provide a focus on socioeconomic systems, the environment, sustainable development and insights on human settlement, planning and policy in specific relation to the study of natural hazards.

It is with this in mind that GfGD aims to influence the future of young geoscientists tangentially, through offering short placements in collaboration with organisations such as <u>CAFOD</u> and <u>Tearfund</u>, to be undertaken during university. These placements establish opportunities to gain practical work experience in the development sector and (in the future) in developing countries. The volunteering opportunities allow young geoscientists to develop an understanding of issues such as development and community vulnerability, as well as inter-personal and communication skills, to promote both better cross-cultural and cross-disciplinary work.

At two years old, the UK-based non-profit organisation has over 150 members, predominantly based in <u>student groups</u> in universities across the UK including University College London, Imperial College, Leicester, Cambridge and Oxford. GfGD works with these student groups on the development of resources that explain aspects of geoscience in a simple, accessible manner for use by non-governmental organisations aimed at developing greater appreciation of how good geoscience can be integrated into development projects. Talks and social events are also arranged by the student groups independently. The aim is to outwork the core objectives of GfGD and alert young geoscientists to their role in global development with the help of expertise in the wider geoscience community. Currently, the university groups and placements are only available to UK students, but this is something Gill hopes to expand in coming years.

The fast growth of the organisation has led to the formation of its first national committee, made up of eight geoscience students or recent graduates – including the director Gill – passionate about the goals of GfGD. The organisation also has an advisory board made up of professional geoscientists with knowledge and experience from working in non-governmental organisations, consultancies, geological surveys and universities.

Appointment of the UK-wide committee has allowed GfGD to expand on its work across a range of fronts including its university groups, education and careers, publications, communications



Geologists learn many of their technical skills in the field, such as these students mapping an active fault in Greece. GfGD recognises the importance of similar experiential learning opportunities for the wide range of inter-personal/ communication skills required in development work. (Credit: Joel Gill)



An understanding of ground conditions helps this Tanzanian water technician make an informed choice about sites for protected water sources (e.g. pumps and wells). (Credit: Joel Gill)

and advocacy. As communications officer for GfGD, I am proud to represent such an organisation and personally relate strongly to its objectives.

Looking to the future, GfGD hopes to develop its own overseas placement scheme that will give students and recent graduates the opportunity to spend time working in less-developed countries. We would like these placements to involve close collaboration with those in host countries, including with local universities, government surveys or charitable organisations. This focus on strengthening local technical capacity can bring benefits to both the students and the hosts, while the opportunities for dialogue, skill sharing and knowledge exchange can help the mutual fostering of both soft and technical skills essential for successful and sustainable development projects.

Rather closer on the event horizon is our first <u>National Conference</u> that will be taking place on the 23rd October 2013 at the Geological Society of London, UK. This one-day event will bring together geology students and recent graduates with professionals from across the global development sector. The conference will explore if and how geologists can contribute to the fight against global poverty, providing a 'big picture' of the opportunities and careers available. Hearing from a range of specialists, the conference will explore the skills young geologists will need to develop to contribute to development in an effective and sustainable manner throughout their careers.

The call for papers and registration will be opening soon, and we would love it if you could join us.

Jane Robb GfGD Communications Officer

More information

Visit the GfGD website at http://www.gfgd.org

Visit, comment and contribute with stories on your experience with geology and global development on the GfGD blog, hosted by the EGU, at http://blogs.egu.eu/gfgd/

Like the organisation and keep up to date with events on GfGD's Facebook group https://www.facebook.com/gfgd.org

Follow GfGD on Twitter https://twitter.com/Geo_Dev



Interviews with GIFT 2013 participants

In this edition of GeoQ, dedicated to the EGU 2013 General Assembly, we interview two teachers about their experiences taking part in the GIFT (Geosciences Information for Teachers) Workshop at this year's conference.

Ana Sousa, Portugal



Teacher Ana Sousa at the registration desk of the EGU 2013 General Assembly. (Credit: Anabela Santos)

Could you introduce yourself and let us know a bit about your work as a teacher in Portugal (Azores)?

My name's Ana Sousa and I'm a 36-year-old geography teacher at Ribeira Grande High School, in the São Miguel Island, Azores. I have been in the Azores since 2001 and I really love living and teaching here because of the breathtaking nature and the endless sea. I teach 12-18-year-old students and my school is situated on the north coast of the island, in Ribeira Grande, With almost 1500 students and over 150 teachers and 60 caretakers, this is a big school, and its population is somewhat heterogeneous... In our daily routines we face the normal problems schools face nowadays, but my school is a very dynamic one, with teachers developing several projects beyond classes, interacting not only with students but also with the local community. Apart from teaching, I also belong to a small group of teachers, psychologists, nurses and doctors, who develop several activities related to our students' health and wellbeing. I really enjoy what I do because it gives me the opportunity to learn new things all the time and to get to know many interesting people everywhere! I think this comes from the several teachers who influenced me, specially my high school geography teacher, who taught me to see the world eagerly, i.e., wider and deeper. My parents also had a big role in my quest to learn new things, by travelling with me around the country and by filling the shelves of my childhood home with books and encyclopaedias!

How did you hear about the GIFT Workshop at the EGU General Assembly and why did you decide to take part?

I first heard about the GIFT Workshop through Hélder Pereira, an enthusiastic and very dynamic biology teacher who I met some years ago in a national contest about Charles Darwin. Last October, he sent me an e-mail mentioning not only the GIFT Workshop, but also sharing his previous experience, encouraging me to apply for it. I had never heard about this workshop before but, as soon as I looked through its website, I realised it would be an excellent opportunity to get very close to real science, real scientists and new ideas! When I received the confirmation by [the Chair of the EGU Committee on Education] Carlo Laj that I was accepted to GIFT, I couldn't believe that I was really going to Vienna! I felt very happy and special for being one of the GIFT Workshop attendants.

How would you describe your experience attending the GIFT Workshop in Vienna?

The four days at the GIFT Workshop were of intense learning about natural hazards (the topic of this year's event) but, above all, it was an opportunity to meet new people and find out about different ways of teaching, of working, of encouraging new learning possibilities. It was very stimulating to get to know all of the members of the EGU Committee on Education, whose dedication and enthusiasm are very contagious. Their perseverance and, at the same time, their regard for each of us, school teachers, during the GIFT Workshop were priceless. I feel really grateful for the opportunity we were given to grow, both in terms of our knowledge of natural hazards and our enthusiasm for teaching. It was also very stimulating to experience the General Assembly and to get in touch with so many scientists. Carrying an EGU badge made me such a proud teacher and human being!

What talk or activity at did you find most stimulating and why?

All lectures were hugely diverse, yet very interesting. I felt closer to the ones about volcanology because in São Miguel, a volcanic island, such natural hazards happen on a regular basis. Therefore, I really enjoyed listening and having the opportunity to exchange ideas with Professor Franco Barberi, who spoke about this topic. I also cannot forget the afternoon of hands-on activities GIFT teachers took part in – such incredible work the Committee must have put into preparing all those materials and organising the activities! I also attended the study visit to the Danube Island, a very an interesting place where I had the opportunity to get to know how flooding is controlled. I also loved the guided tour of the Vienna Natural History Museum, where I'll have to go back with more time. The poster session was, however, the most stimulating one as it gave me the opportunity to learn from other teachers and to exchange ideas with them. I realised, once more, that extra-curricular events promote and encourage children and teachers to go way beyond the basics... And by doing that we, teachers, are helping to raise future scientists and conscious citizens!

In your opinion, how important is it for teachers to learn about science directly from the scientists?

I find it very important to learn directly from scientists as they are familiar with the latest scientific discoveries, as well as the biggest gaps in scientific knowledge. They are great examples of people who are always questioning everything and aiming to know more. With workshops like GIFT, school teachers have the opportunity to gather information that we would otherwise only come across much later, once the new scientific discoveries are published in textbooks.

Will you change any aspect of your teaching based on what you learnt during the GIFT Workshop? If so, in what way?

Being part of the GIFT network made me feel like a ring of an international 'geo-chain', as if the world and science can only be better if we're all connected. This chain is only possible through the positive contribution and motivation I experienced at the GIFT Workshop. It will encourage me to keep on being the enthusiastic teacher I've been so far. I'm sure my words will be meaningful to the ones I'll talk to, be it my students or my peers. By reaching them, I'll reach myself too, daily.

The GIFT Workshop was a much-needed breath of fresh air, as we are currently facing very difficult times in Portugal due to the national (and international) economic crisis. So it's inevitable that we teachers feel the the negative mood and the needs of the school kids and their families, which affects our daily life, routine and motivation. I learned new ways of teaching, new ways of learning, new activities that can be done in the classroom at low cost, among many other important issues. I now tell my students that we, in the Azores, are very well prepared to deal with natural hazards (due to the work we do all year long), which is very important for their self-esteem. I tell them that they should study because we need many geoscientists to help the world grow better! And I tell them that they need to learn new languages to go abroad and meet new, interesting people like I did. Seeing different landscapes, breathing new air, tasting new flavours, listening to different sounds are goals to aim for. I know this may seem commonplace but, to my students, many who have never left São Miguel, it is very difficult to imagine the world of possibilities beyond the boundaries of this island ... For the breath of fresh air and renewed enthusiasm I got from four days in Vienna, I can only thank the Committee on Education.

On the other hand, I hope I'll be able to transmit the same motivation to my peers in the beginning of September when I will convey the main guidelines of the GIFT Workshop to all geosciences teachers at my school. This activity will take place at the Azores University and Professor João Luís Gaspar, a volcanologist, will be helping me with it by presenting a lecture about natural hazards in the Azores. I think it will be a great opportunity to talk about the main theme we discussed at the GIFT Workshop and to share some of the main ideas and activities that I experienced in Vienna, hoping that new seeds of science flourish among us.

Maria Barbera, Italy

European Geosciences Union



Maria Barbera (far left) with other teachers at the entrance to the EGU 2013 General Assembly. (Credit: Maria Barbera)

Could you introduce yourself and let us know a bit about your work as a teacher in Italy?

My name is Maria Barbera and I teach Biology, Chemistry and Geography in a secondary school in Villafranca di Verona, Italy. I teach 14–15-year-old students, who are not always particularly keen on science, in fact, as they attend an economics school where science is taught only during the first two years.

Two years ago I decided to start using my student's interest in foreign languages (English in particular) as a means to catch their attention and occasionally transmit some scientific contents directly in English, in accordance with the Content and Language Integrated Learning (CLIL) Programme that has recently been introduced in Italy, and whose methodologies I'm approaching at the moment. It's a quite demanding job, for my students and for me too, as they have to focus on the language and on the content at the same time, which is a rather unusual task for them. On the other hand, I have to work hard to refresh both my English and my way of teaching, but I think it's a stimulating experience and it's worth it.

How did you hear about the GIFT Workshop at the EGU General Assembly and why did you decide to take part?

I received the information by reading the newsletter sent by the ANISN, our National Association of Natural Science Teachers, last October. Immediately, I realised that it would be a great and stimulating opportunity to update my knowledge about natural hazards, the thread running through the workshop, which represent a widely discussed topic during our science classes. At the same time, I was sure that, by participating, I would open my mind and my teaching to a wider, European, dimension.



Packed GIFT room during one of the lectures on natural hazards, the theme of this year's workshop. (Credit: Ana Sousa)

How would you describe your experience attending the GIFT Workshop in Vienna?

Some days ago I wrote to [the Chair of the EGU Committee on Education] Carlo Laj, thanking him for organising the GIFT Workshop, which represented an extraordinary professional experience for me. It also gave me the opportunity to establish new relationships, with Italian as well as European colleagues. I'm still in touch with teachers from France and England, and I hope these new friendships could bring some form of collaboration in the future...it would be an amazing opportunity for our students, too!

In Vienna the atmosphere was both professional and pleasant – and welcoming too, thanks to the members of the Committee on Education. I still have Friedrich Barnikel's and Herbert Summesberger's sympathy in my mind and in my heart, Eve Arnold's exquisite kindness, Carlo Laj's warm humanity... and the effective presence of all the Committee members who worked so hard to make this event so special.

What talk or activity did you find most stimulating and why?

I can hardly choose among the talks, I really found all of them very interesting and absorbing. If I have to express some preference, I found very clear the talk by Stefano Tinti, who opened our workshop and featured its general guidelines: I think that his talk will probably be quite easy to transmit to my students. I particularly appreciated the presentation by Franco Barberi about the risks related to the activity of the Vesuvio volcano and the relative planning

for protecting people who live on its slopes. I also can't forget the impressive talk given by Bruce Malamud about landslides, their causes and effects. Apart from the interesting content of his speech, he also highlighted how important it's for a teacher to communicate in a brilliant and expressive way to his or her students – what a great scientific communicator!

In your opinion, how important is it for teachers to learn about science directly from the scientists?

It's... intriguing! When you go around the halls at the EGU General Assembly, meet scientists and have the opportunity to look through the number of posters shown every day, you can feel that you are exactly where science is made and shared, you are somehow a part of it. You know, sometimes teaching consumes your energy... after a while you keep on thinking that you're only a science-teller. You absolutely must 'come to the roots' to recharge.

Furthermore, I think that all teachers need someone who recognises and appreciates their efforts, especially in my country, where governments in the last two decades declared their intent to improve and support science teaching, but we now have got poorer programmes, fewer science classes, emptier laboratories... Fortunately we have got opportunities like GIFT to revitalise our enthusiasm and to become aware that scientists (not politicians) still trust in us and believe (yes, they do!) that teachers can still play an important role in leading young people to science.

Will you change any aspect of your teaching based on what you learnt during the GIFT Workshop? If so, in what way?

This experience has intensified my purpose to open my teaching to a wider dimension: I'll go on with my studies on the CLIL Programme and will try to establish relationships with all colleagues who would like to share their teaching experience with me – so, please, write to me!

I would also thank François Tilquin, of the Lycée Marie Curie of Echirolles, France, who was kind enough to gift us with one of the equipments he set up for his students to experiment the effects of earthquakes on the ground and the buildings: I'm looking forward to starting using it with my own students!

Email interviews conducted by Bárbara Ferreira GeoQ Chief Editor & EGU Media and Communications Manager





GEO C BOOKS

Impacts of Climate Change on Rainfall Extremes and Urban Drainage Systems

A book review



Edited by P. Willems, J. Olsson, K. Arnbjerg-Nielsen, S. Beecham, A. Pathirana, I. B. Gregersen, H.Madsen, V.-T.-V. Nguyen

IWA PUBLISHING

238 pages | Paperback 1st edition | September 2012 ISBN 978-1-78-040125-6

Price: €120.15

Impacts of Climate Change on Rainfall Extremes and Urban Drainage Systems deals with an interesting and practical area of climate science: its effect upon rainfall in urban areas. It is commonly difficult to assess the impact of this, as it requires increased downscaling of global climate models, which are typically of a much coarser resolution than that needed for fine scale urban applications.

There are seven contributing authors, all professors and lecturers from various global institutions, for example Patrick Willems of the University of Leuven and Jonas Olsson of the Swedish Meteorological and Hydrological Institute. Their main intention is to provide both a review of current methods of assessing climate change impact upon urban rainfall extremes, and a practical guide on these methods. The volume is comprised of eleven chapters, progressing from technical methods used to analyse a problem to ways of addressing them in future developments.

It is suited primarily to scientists and researchers in hydrology, but is also applicable to practitioners in the field of urban drainage, engineers and designers, for example. It is highly technical in nature, but does a good job of reinforcing key ideas with the reader, so that those unfamiliar with the subject matter would be able to grasp the core concepts after the first few chapters. In this respect it is suitable for students of climatology, meteorology and statistics.

The first part of the book takes a look at the current methods of determining rainfall extremes, from stochastic generation to multifractal processes. It then puts this into a temporal context, to account for the fact that rainfall patterns follow trends over time. Following this is a discursion into global and regional climate models and how these models can be downscaled to fit into non-stationary models, used for more localised rainfall predictions. Accompanying these are numerous examples where such analyses and processes have been applied to real datasets in various locations throughout the world.

The discussion of multi-decadal oscillations and the issues facing researchers in distinguishing climate change trends from them was particularly interesting. This has an impact for urban drainage design as although a particular phase of an oscillation pattern may cause there to be less frequent rainfall events, the effects of climate change may mean the rainfall extremes for these few events are higher. Designing an urban drainage system based on a cumulative rainfall average (as predicted by a model that accounts for climate oscillations) could underestimate extreme values and lead to increased runoff and flooding during a storm. This is just one of the many complications faced by modellers in dealing with integrating climate change and urban issues.

The statistics on combined and parallel drainage systems and their use per country provides food for thought. Parallel systems, where storm runoff and wastewater is treated separately, are now increasing in use, but many cities are still built on the older combined system, which has implications for health and sanitation should overflow become a problem.

There is also something to be said for the adaptive approach to design solutions, which are often used in ecology, an area that typically has high levels of uncertainty. This approach advocates a gradual departure from large drainage infrastructures to more compartmentalised, easily altered and more responsive infrastructures. The book gives numerous examples of possible design solutions for the practitioner to incorporate.

Finally, the authors make a point that climatology is a rapidly updating field of study, recommending the aforementioned adaptive, flexible approach to future urban design, and advising against relying on one method alone. Re-evaluating techniques and progressing the science even further is necessary as opposed to merely upgrading technical solutions.

All in all, this is a very thorough volume and worth having on the shelf, especially if you deal with the practical side of weather modelling for urban applications. Again, it is very heavy on the technical side and is highly process oriented, but it does provide some important insights into the field.

> Holly Ferrie Geosciences student, Department of Environment, Earth and Ecosystems, Open University, UK

Earth Materials: Introduction to Mineralogy & Petrology

A book review



By C. Klein and A. Philpotts

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Price: £40 (~€47)

It is increasingly common, particularly in introductory undergraduate and graduate courses, to have to cover a wide variety of contents within the area of petrology and mineral sciences in the same module. Earth Materials is a high quality textbook and the ideal resource for such courses. This profusely and beautifully illustrated book offers an even balance of the most fundamental concepts in mineralogy, crystallography and petrology and concentrates in a single volume what would otherwise only be found in several handbooks of these disciplines.

The book is authored by two individuals who, in addition to a professional career teaching mineralogy and petrology, have a wealth of experience authoring some of the most relevant textbooks in both these disciplines. Cornelis Klein, Emeritus Professor at the University of New Mexico is co-author of the latest five editions of the notorious Manual of Mineral Science (Manual of Mineralogy) after J.D. Dana, a modern classic textbook in mineralogy. Similarly, Anthony Philpotts, Emeritus Professor at the University of Connecticut, has authored reference textbooks in petrology such as <u>Principles of</u> Igneous and Metamorphic Petrology and <u>Petrography of Igneous</u> and Metamorphic Rocks.

The book gathers this experience authoring textbooks on mineralogy and petrology and provides a concise but comprehensive introduction to these foundational topics for any geosciences student. Furthermore, the book is not a mere juxtaposition of textbooks on mineralogy and petrology, but a handbook which is well framed into the wider picture of Earth sciences as it highlights the relationships between these disciplines and tectonics, environmental sciences and economic geology.

The contents of the book are shown in a clear and sequential way. After two general introductory chapters, chapters 3 to 6 constitute

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the core mineralogy part of the book, including a comprehensive look into crystal structures and crystallography in addition to a complete description of optical crystallography and polarising optical microscope methods and observations. Descriptive mineralogy is interwoven with the petrological contents in chapters 7 to 14, highlighting the link between both disciplines. These chapters describe minerals and rocks, following, for each wide rock group (igneous, sedimentary and metamorphic) the sequence: 'rock-forming minerals', 'how do rocks form' and 'classification and plate tectonic significance'. The last chapters (15-17) focus on economic minerals and rocks, environmental issues, human health and risks derived from the use of Earth materials.

Text boxes in each chapter highlight complementary information related to the main body of the chapter, such as historical notes or analytical techniques. Some of these boxes refer to web resources, such as the one in chapter 6 on the US National Institutes of Health ImageJ free software, which can be used to make modal analysis of thin sections. This information, the possibility of viewing crystal structures in 3D with CrystalViewer, a free software available from the book's website, and the online resources provided at the end of each chapter constitute, in my opinion, an added value to the textbook. However, in future editions of this book, it would be nice to see this information on web resources and online tools extended.

The 'Summary and review questions' sections at the end of each chapter are especially relevant from the point of view of teaching. This is where students can find excellent bullet-point summaries of the main concepts in each chapter and test their knowledge after studying.

This book is, therefore, a highly recommendable textbook for the amplitude of its contents (shown in a very structured and interconnected way), the amount of learning resources and the use of a simple but accurate and engaging language. These characteristics make it useful not only to geology students but also to students from other disciplines within geosciences and beyond. The book is also attractive and very useful for the senior Earth scientist who wants to have a clear and concise reference text covering the most fundamental concepts in mineralogy, crystallography and petrology.

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EGU 2013 on the blogosphere

The 'Assembly online', on blogs and other social media channels such as Twitter and Facebook, received much praise at this year's EGU meeting. Professor <u>Ellie Highwood</u>, for example, <u>highlighted</u> the benefits of following the conference on Twitter: "Tweets allowed those of us who would have liked to have been in two places at once to keep up with the goings on in parallel sessions."

If you are missing Vienna, you want to look back at the multitude of scientific talks presented in early April or be reminded of the special events and activities at this year's meeting, it is indeed online that you'll find the best record of the conference. You may find yourself getting lost searching through the thousands of tweets marked with the meeting's hashtag (#EGU2013) but, fortunately, there are other online sources of material related to the General Assembly. The official website, http://www.egu2013.eu/, is a good place to start, but much 'virtual ink' was shed about the Assembly elsewhere on the internet, particularly on the blogosphere (the blogging universe).

In this quarter's On the Web section, we feature some of the many bloggers who covered this year's General Assembly. We briefly review their blogs and highlight the #EGU2013 blog posts they published.

We will start by mentioning two excellent blogs, written by professional science journalists, on science and policy. <u>Environmentalresearchweb</u> is a community website from the Institute of Physics Publishing providing informative briefs on environmental issues. Their <u>Planet blog</u> features "comment and analysis from [Environmentalresearchweb's] editorial staff and professionals in the field." The website editor Liz Kalaugher reported extensively on the <u>EGU</u> <u>meeting on the Planet blog</u> with short, to-the-point posts that neatly summarise important research presented at the Assembly.

The Carbon Brief is another page by professional science writers who describe it as a "blog dedicated to analysis and fact checking of energy policy and climate science, with a focus on the UK." Their regular reports of what goes on in the world of energy, climate and science policy – which include reporting on the EGU 2013 Great Debate and a post on 'Five hot topics' from the 2013 conference – are authoritative and informative. They further specialise in fact-checking energy and climate stories in the press by writing reliable, accurate and well-researched articles on matters often not well covered by traditional media.

If journalists can write clearly and concisely about a range of science topics, scientists can also be second-to-none when it comes to science writing, particularly when it comes to blogging about their own field of research. An example of a great blog by scientists at the University of Liverpool, UK is <u>Geomagnetism.org</u>, an account of the researchers' investigations into the Earth's magnetic field. While geomagnetism is the blog's main subject area, there is also space for posts on other topics, including a two-part diary (Part 1, Part 2) of this year's EGU General Assembly featuring not only geomagnetism sessions but also research on continental collisions, super-Earths and other topics.

Equally passionate about science are the bloggers at <u>G-Soil</u>, the blog of EGU's Soil System Sciences (SSS) Division. The multinational G-Soil co-editors, researchers working in Spain, Portugal and Australia, promote SSS activities and enthusiastically communicate soil sciences, from new research to scientific conferences. General Assembly related posts included a <u>letter from the SSS president</u> highlighting soil sciences events at the conference and a note about the soils and human health interdisciplinary session at EGU 2013.

A very special mention goes to another type of web-logging: a series of podcasts by researchers at the University of Manchester Centre for Atmospheric Science (UK) called <u>The Barometer</u>. The topics covered include all things atmospheric science and climate and the audio posts are informative, creative and often humorous. Audio diaries of scientific conferences and events are a regular feature: the EGU conference inspired <u>no less than five podcasts</u>, which are well worth a listen!

We could not write an article about EGU 2013 on the blogosphere without mentioning the official EGU blog, GeoLog, and the network blogs. Though we have featured them in the past, it is worth high-lighting their excellent coverage of the General Assembly. GeoLog has a few dozens of posts labeled under 'EGU GA 2013', including about 15 posts published on the week of the conference on research presented at the meeting and on other activities of interest. And we couldn't be more pleased with our bloggers who wrote extensively about scientific talks, poster sessions, press conferences, the Great Debate, and much more. Check out their posts at: http://blogs.egu.eu/galaeoblog/category/egu/. http://blogs.egu.eu/geosphere/category/egu2013/.

Bárbara Ferreira GeoQ Chief Editor & EGU Media and Communications Manager





GEO CEVENTS

This section advertises conferences, summer schools and workshops submitted to the EGU online <u>meetings calendar</u>. Meetings co-sponsored by the Union are highlighted with an EGU logo.

4th International Summit on Hurricanes

and Climate Change

13-18 June 2013, Kos, Greece

The meeting is designed to serve as a forum to discuss the most recent progress in hurricanes and climate change.

Website: http://www.aegeanconferences.org/conferenceFront.do

10th IAA Low-Cost Planetary Missions Conference (LCPM-10)

18-20 June 2013, Pasadena, CA, USA

The focus of this conference is on planetary missions of scientific exploration that are conducted at a fixed cost. This includes spacecraft and science payload development, launch, operations, science data analysis, and all relevant mission-specific technology development.

Website: http://lcpm10.caltech.edu/

Global Energy Systems 2013

26-28 June 2013, Edinburgh, UK

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Global Energy Systems will focus on providing the key insights required by companies, organisations and investors under pressure from the changing energy situation. This information will inform risk assessments and strategic decision-making in light of current high energy prices and energy system vulnerabilities.

Website: http://globalenergysystemsconference.com/

5 11th International Precipitation Conference

01-03 July 2013, Ede-Wageningen, The Netherlands

The conference's goal is to promote interdisciplinary discussions of the present state of knowledge in research and applications related to precipitation. The main topics include: precipitation physics, modelling, observations, statistics and climatology, and hydrology.

Website: http://bit.ly/11precipitation

Summer schoool on natural environment of Arctic and Alpine areas: relief, soils, permafrost, glaciers and biota as indicators of climatic changes

04-19 July 2013, Tomsl-Altay Mountains-Tomsk, Siberia, Russia

This research-educational school will start in Tomsk. It will be followed by a three-day field trip to the High Altai (1200 km south of Tomsk), which will cross different landscape zones. The main part of the school will be at the Aktru Research Station, and will involve various field excursions as well as lectures at the station and in its surroundings. It will end with a two-day journey back to Tomsk.

Website: http://bit.ly/actrusummerschool

17th Conference of the International Soil Conservation Organization

08-12 July 2013, Medellín, Colombia

The 17th edition of the ISCO conference will gather academics and experts from all over the world to share experiences and develop results that will enable them to implement better practices.

Website: http://www.iscocolombia2013.com/ingles/index.html

The Urbino Summer School in Paleoclimatology

10-30 July 2013, Urbino, Italy

This school will focus on past climate dynamics with special emphasis on the analysis of long-term carbon cycling and its implications in the understanding of present and future climates. It will integrate lectures, symposia, fieldtrips and exercises on the many different areas of paleoclimatology.

Website: http://www.urbinossp.it/

10th International Conference on Fluvial Sedimentology

14-19 July 2013, Leeds, UK

The 10th ICFS will debate fluvial processes and deposits across the full range of spatial and temporal scales and highlight research that uses theoretical, experimental, field and numerical techniques. The conference will have six broad themes each with a series of specific sessions offered and chaired by individuals.

Website: http://www.icfs10.co.uk/

UK Shale 2013: Making It Happen

17-18 July 2013, London, UK

This conference is designed specifically to drive forward shale gas development in the UK. Leading operators will be talking about their plans and methodology for exploring British shale. Other presentations will review how to operate in an environmentally acceptable manner without sacrificing cost-efficiency.

Website: http://www.shale-uk-2013.com/

C Understanding Earth-Surface Processes in the Alpine Environment from High Resolution Topography

28 July - 04 August 2013, San vito Di Cadore, Italy

This summer school will provide training in field acquisition, processing and interpretation of high resolution topographic data with ground-based and airborne instruments, for the recognition of geomorphic signatures (erosion, landslides, channel heads, channel networks) and for the understanding earth-surface processes.

Website: http://www.tesaf.unipd.it/cms/summerEGU2013/

Summer School on Speleothem Science

29 July – 02 August 2013, Heidelberg, Germany

Speleothems are secondary cave deposits and valuable terrestrial climate archives. This training school will provide a comprehensive overview of the most current and innovative techniques in this field.

Website: http://www.speleothem2013.uni-hd.de/

12th Society for Geology Applied to Mineral Deposits (SGA) Biennial Meeting

12-15 August 2013, Uppsala, Sweden

This meeting will provide excellent opportunities to present and exchange knowledge within the field of mineral deposit research.

Website: http://www-conference.slu.se/sga2013/

Conference on Innovative Approaches in Marine Environment Modelling (AIMEN)

19-23 August 2013, Brest, France

Supported by the Labex MER (Laboratory of Excellence), this thematic school aims at strengthening our knowledge and the

understanding of the functioning of the marine ecosystems within the framework of global change.

Website: http://aimen.sciencesconf.org/



20-24 August 2013, Merida, Mexico

The summer school aims to increase the visibility and attractiveness of IAGA (International Association of Geomagnetism and Aeronomy) to young researchers, providing them with an overview of the activities carried out within this association.

Website: http://www.iaga2013.org.mx/

Goldschmidt 2013

25-30 August 2013, Florence, Italy

The Goldschmidt Conferences are the foremost forum for the presentation and discussion of the most recent advances in geochemistry and related areas. They are sponsored by both the European Association of Geochemistry and the Geochemical Society.

Website: http://goldschmidt.info/2013/



Supposium (ITS-2013)

25-28 August 2013, Göcek, Turkey and Rhodes Island, Greece

The meeting will cover all aspects of tsunami science, including tsunami generation, tsunami wave dynamics, modelling, hazard assessment, operational warning and forecast, engineering approaches, social science aspects of tsunami resilience and other tsunami-related topics.

Website: http://tsunami2013.org/

5 8th IAG International Conference on Geomorphology: Geomorphology and Sustainability

27-31 August 2013, Paris, France

The main topic of this 8th International Association of Geomorphologists Conference is Geomorphology and Sustainability. Organised by the Groupe Français de Géomorphologie and open to all scientists and practitioners, this conference will include 26 scientific sessions, five keynote lectures and one workshop for young geomorphologists.

Website: http://www.geomorphology-iag-paris2013.com/

() 11th International Conference on Paleoceanography: Long-term perspectives on ocean and climate dynamics - Three decades of ICP

01-06 September 2013, Barcelona, Spain

Following the tradition set by previous ICPs, the conference will be organised along five broad session themes, addressed through plenary sessions and oral presentations in the mornings, accompanied by extensive poster sessions in the afternoons.

Website: http://www.icp2013.cat/

30th IAS Meeting of Sedimentology

..... 02-05 September 2013, Manchester, UK

A meeting on new frontiers in sedimentological research, from the micro to planetary scale. Authors are invited to present their work as a talk or poster presentation within the themes specified on the conference website. The abstract deadline is 3 June 2013.

Website: http://www.sedimentologists.org/meetings/ims

Glacial landforms

03 September 2013, Loughborough, UK

The aim of this workshop is to compare glacial geomorphological mapping by different interpreters for statistically representative synthetic drumlins within a real landscape.

Website: http://www.mappingworkshop.co.uk/

Emile Argand Conference on Alpine Geological Studies

07-14 September 2013, Schladming, Austria

This workshop aims to further interdisciplinary research on Alpinetype orogens through a series of presentations, posters and discussions. Contributions are sought on state-of-the-art research and operational developments in Alpine Geology, in particular related to the evolution of the Alps and neighbouring Mediterranean orogens.

Website: http://alpine-workshop2013.uni-graz.at/

Conference on Advances in Extreme Value Analysis and Application to Natural Hazards (EVAN2013)

18-20 September 2013, Siegen, Germany

The aim of this meeting is to bring together and stimulate discussions between scientists, practitioners and stakeholders working in

natural hazards science, where the analysis of rare events is a crucial task.

Website: http://www.uni-siegen.de/evan2013/

Italian Society for Climate Sciences, First Annual Conference

23-24 September 2013, Lecce, Italy

The conference, on climate change and its implications on ecosystem services and society, aims to involve researchers and policy makers whose activities closely affect aspects of climate change and their relation to environmental and socio-economic systems.

Website: http://www.sisclima.it/conferenza-annuale/?lang=en

🥱 Air-Sea Gas Flux Climatology: Progress and **Future Prospects**

24-27 September 2013, Brest, France

Internationally renowned scientists will present overviews of key initiatives from the Ocean Flux Project, building a picture of the existing capability in air-sea gas flux climatology. More importantly, the workshop will look ahead to new challenges and opportunities.

Website: http://www.oceanflux-ghg.org/Workshop

VI International Conference on Fractals and Dynamic Systems in Geoscience

26 September – 02 October 2013, Perugia, Italy

Fractals, non-linear processes and chaotic dynamical systems are becoming increasingly fundamental for analysing data and understanding processes in the geosciences. This conference will present the latest research and techniques in the application of fractals and dynamic systems to Earth systems, with emphases on predictability of geological risks, natural resources and climate change.

Website: http://www.fractgeosci2013.unipg.it/Conference_Info.html

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Soils in Space and Time

30 September – 04 October 2013, Ulm, Germany

This is the conference of the International Union of Soil Science Division I 'Soild in Space and Time'. It aims to bring together disciplines like soil morphology, micromorphology, soil genesis, soil geography and soil classification.

Website: https://iuss-division1.uni-hohenheim.de/