



THE QUARTERLY NEWSLETTER OF
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earthquake ruptures in the Himalayas

EGU Awards & Medals: Recognising the best science

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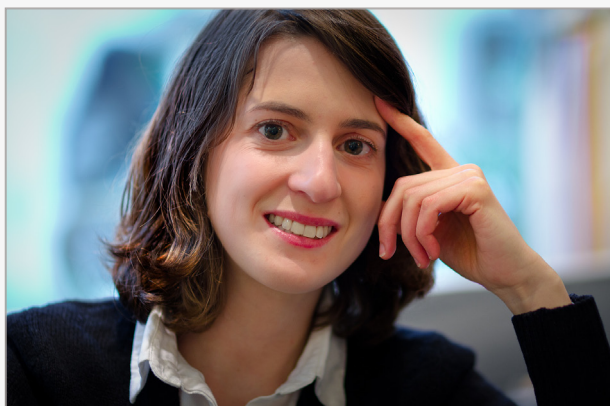


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EDITORIAL



This issue marks *GeoQ*'s first anniversary. It was in early March last year that the [first edition of the new EGU newsletter](#) was published, and I hope you have enjoyed reading our past issues as much as we enjoyed producing them at the EGU Munich Office.

I am particularly pleased with the content of this issue. One of the things that motivated the redesign and rethinking of the EGU quarterly newsletter was having a publication that not only brings Union news (often published in advance on our website or blog) to our members, but also includes other interesting and, crucially, original geoscientific content. We put a lot of time and effort in making sure the Articles section provides our readers their quarterly intake of pieces on Earth, planetary and space sciences research that are absorbing and accessible to the many scientists – comprising a variety of research areas – who read *GeoQ*, in addition to being *new*. In this issue, for the first time, the External News section also exclusively features pieces that have not been published elsewhere before, articles that are not only original but are also – if I may – informative and engaging.

We commissioned two articles to external organisations for this issue of *GeoQ*. Representatives of the International Council for Science teamed up with members of the Future Earth Transition Team to contribute a piece on [Future Earth](#), a new 10-year research initiative on global environmental change research for sustainability; this is of particular interest to Earth system researchers, who may be keen to join in this project. The other External News article is

brought to you by the American Meteorological Society who write about their [Policy Program](#), which is aimed at “helping scientists and policymakers effectively work together to address policy issues related to Earth system science and services.”

We have also changed the On the Web section, which we now use to highlight exciting websites and blogs in the Earth, planetary and space sciences. Have you heard about [Anthropocene.info](#), or the [Landslide](#) and [The Contemplative Mammoth](#) blogs? Read more about them [here](#)!

And make sure not to miss the ‘old classics’ such as the EGU Voice section, which includes an article from EGU’s Awards Committee Chair Alberto Montanari, or the Press Releases section, featuring a release on research on Andean glaciers published in EGU’s Open Access journal *The Cryosphere* that was widely covered in the media, including the [BBC](#).

If your organisation, or the research project you are part of, is interested in writing for *GeoQ*, please get in touch (media@egu.eu): we are always on the look out for interesting articles to publish in this newsletter. Also, if you know of a particularly engaging geosciences website or blog, please contact us and you may see it featured in a forthcoming issue.

Aside from submitting contributions, you can also help improve future editions of *GeoQ* by letting us know what you think about the newsletter. Please tell us who you are and what you like and dislike about this publication by completing the very short questionnaire at <http://bit.ly/GeoQfeedback> – it won’t take more than a few minutes!

Before I let you go on with your reading, I’d like to introduce and thank [Sara Mynott](#), the most recent member of EGU’s communication team. Sara has helped produce the very newsletter you have in front of you and taken over managing EGU blogs and social media channels, among other tasks. To find out more about Sara’s work, [follow the EGU online](#)!

Bárbara Ferreira
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: Low tide at the Conwy River estuary, Wales, UK. (Credit: Alma de Groot, distributed by EGU via imagegeo.net under a [CC licence](#))

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Hunting monsters

The search for earthquake ruptures in the Himalayas

Disaster struck in the summer of 1255. The people of Kathmandu valley had been enjoying the sunny June day when, suddenly, there was a deep rumbling noise and the birds took to the skies. The ground began to shake violently, temples tumbled to the ground, confusion reigned, and dust filled the air. Within minutes, more than 30,000 people had perished, killed by the collapsing buildings, and amongst them was none other than the king himself: King Abhaya Malla.

The 1255 earthquake is the oldest in Nepal's recorded history, but many earthquakes – both before and since – have shaken this region of the planet. Nepal sits astride the largest continental collision zone in the world, making it particularly vulnerable. As the Indian subcontinent moves northwards at nearly five centimetres per year, it collides with Asia, pushing up the Himalayas and forming the Tibetan Plateau. Whilst much of the resulting deformation occurs further to the north, two of the five centimetres per year are taken up along the edge of the Himalayas, where the Indian crust is thrust under Asia. It is here, on what is called the Main Frontal Thrust, that many of the deadliest Himalayan earthquakes have taken place.

During the nineteenth and twentieth centuries major Himalayan earthquakes occurred in 1803, 1833, 1897, 1905, 1934 and 1950 – and yet, until recently, none of these events were thought to have ruptured the surface. Many scientists assumed that these events had occurred on 'blind' thrusts within the crust: the earthquakes hid at depth, leaving no traces behind at the Earth's surface. If this were the case, scientists worried, that meant there was still strain to be released and even larger earthquakes could occur in the future. Furthermore, if an earthquake breaks the surface and the resulting scarp is buried by sediment, then the sediments just above and below the top of the scarp can be dated to bracket the age of the earthquake – but without surface ruptures, the timing of historical earthquakes can be hard to determine. In essence, the situation was, and to some extent still is, poorly understood. How often do earthquakes occur in the Himalayas? How big do we expect the next earthquake to be? Do these plate boundary megathrusts generate large earthquakes every few hundred years or giant earthquakes every few thousand years?

Some recent research, published last December in *Nature Geoscience* (Sapkota et al., 2012), has begun to address these problems. The team of scientists, from France, Singapore and Nepal, set out on a hunt for some of the elusive surface ruptures. Using satellite images and aerial photographs taken by helicopter, they honed in on a portion of the Main Frontal Thrust between the city of Bardibas and the eastern border of Nepal. They also chose this area for fieldwork because it lay within the zone of the most intense shaking during the 1934 Bihar–Nepal earthquake. Here they found



Helicopter view of the Sir River alluvial terraces and cumulate escarpment along the Main Frontal Thrust in eastern Nepal. The 1255 and 1934 earthquake scarp follow the sharp contact between the deeply incised Siwalik sandstone folds in the background and inset terraces in the foreground. The rivercut cliff and 43-m-long trench in which the surface breaks of the past earthquakes have been discovered are visible to the right of the river course. (Credit: Laurent Bollinger)

evidence of recent faulting at a site where the Sir River cuts across part of the thrust. They mapped the heights of river terraces, dug a 43-metre-long trench across the fault, and collected charcoal samples for radiocarbon dating. Reassuringly, their dates were consistent with an earthquake occurring here in the first half of the twentieth century.

In retrospect, they suggest, it's perhaps unsurprising that that 1934 rupture was never found at the time. The area was densely forested and sparsely populated: only two roads crossed the Main Frontal Thrust and malaria was endemic. After the earthquake, people were, understandably, more concerned about the damage on the Ganges plain (where sediments had amplified the shaking) than by the need to search for a rupture. Furthermore, in many places the fault scarp would have been rapidly obliterated by the monsoon rains.

But the 1934 rupture wasn't all. The team's trench investigations also revealed evidence of an older earthquake on the same portion of the fault. According to their logging and dating it was this event that was responsible for the death of King Abhaya Malla in 1255. The result is interesting: it implies that rather than one giant earthquake occurring every few thousand years, this portion of the Main Frontal Thrust has seen two slightly smaller earthquakes separated by an interval of just a few hundred years. "The discovery of two great earthquake ruptures, separated by 679 years, is unique in the Himalayas", explained Dr Bollinger, one of the authors on the recent paper, "although we are far from determining a mean recurrence interval or discussing the validity of a characteristic earthquake model with these two earthquake records, it is still nice information. It helps reduce the uncertainties we had on the great Himalayan earthquake sources in seismic hazard assessment studies."

Seismic hazard assessment is vital in this region of the world. One seventh of the entire global population lives on the Indo-Gangetic plain – the fertile strip of land that abuts the Himalayas. Since the great earthquake in 1905 the population has increased tenfold. The capital cities of Bangladesh, Bhutan, India, Nepal and Pakistan are all vulnerable. Today, more than 50 million people are at direct risk from the next great Himalayan earthquake: never has such a densely populated part of the world been in such danger.

This is why more research is urgently needed. "I am almost certain more surface ruptures are preserved along strike [in the] Himalayas", says Dr Bollinger. "It's currently what motivates us to persevere in the direction we've taken these last five years."

The hunt for other Himalayan monsters is definitely on.

Tim Middleton

Freelance science writer and PhD student at the University of Oxford

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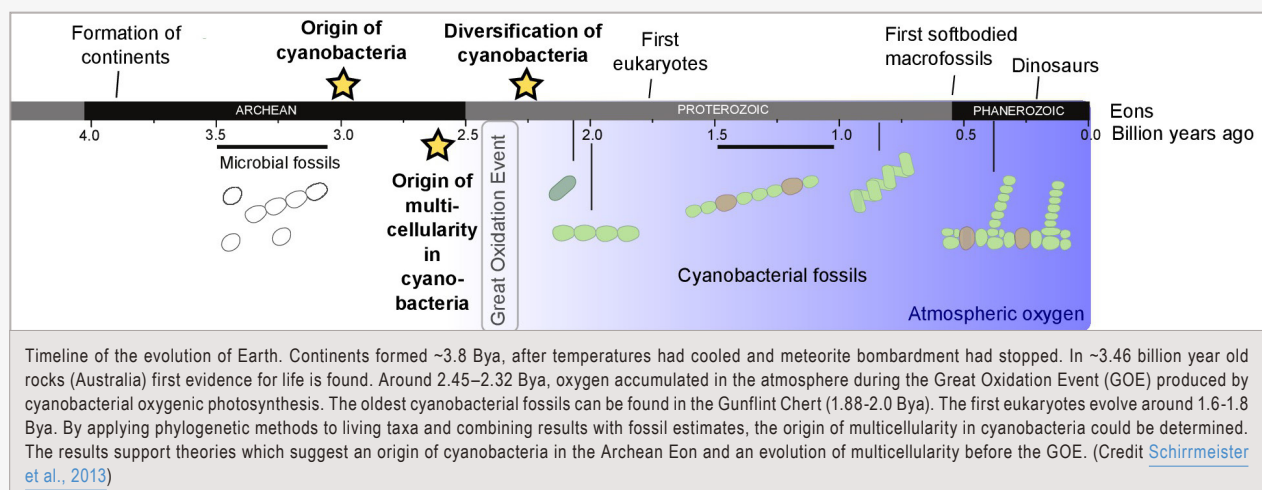
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Understanding the role of cyanobacteria in the Great Oxidation Event

One of the most significant events in Earth's history has been the oxygenation of its atmosphere 2.45–2.32 billion years ago (Bya). This accumulation of molecular oxygen in the Earth's atmosphere was so significant that it is now commonly referred to as the Great Oxidation Event (GOE). The long-reaching effects of the GOE were literally world-changing, altering not just the composition of the atmosphere and hydrosphere but, through various redox reactions,

the continents and climate also. However, and perhaps from an anthropocentric viewpoint, the most important effect would be upon the biosphere; the GOE paved the way for the evolution of aerobic (oxygen respiring) organisms, including ourselves.

Through various geochemical proxies, the effects of the GOE can be easily traced, but whether or not this event represents either a



sharp increase in oxygen production or a reduction in oxygen sinks still remains to be discerned. With so much ambiguity over the dynamics of the GOE, it may be surprising to discover that there is a long-standing consensus on how the oxygen was actually produced: photosynthetic organisms called cyanobacteria (blue-green algae).

Cyanobacteria represent one of the most morphologically diverse groups of prokaryotic organisms (bacteria and archaea). They are classically separated into their various biological groups by their morphology; some groups are unicellular, others are multicellular and then there are those that can produce differentiation between cells. However, genetic studies show that this morphological grouping is not representative of actual biological relationships between cyanobacteria and that morphological characteristics such as multicellularity evolved independently in several lineages.

Fortunately, relative to other prokaryotes, cyanobacteria have a well-studied fossil record. This has led to the realisation that much of the diversity in modern forms existed early on in the evolutionary history of the group; they have in fact changed very little in basic form over billions of years. This is best exemplified in the 2 Bya Gunflint Chert, where the first unequivocal evidence of cyanobacteria can be found. Single-celled (coccolidal) and multicellular (filamentous) forms are both present and show very little superficial variance from their modern counterparts. Prior to this, potential evidence for cyanobacterial existence is found in the form of trace-fossils, so called stromatolites. These are large sedimentary structures, formed by the interaction of photosynthetic bacterial mats (commonly, but not always, cyanobacteria) and sediment. The bacterial mats snare and concrete sediments around them, forming a consolidated calcareous structure. The photosynthetic bacteria then propagate through to the top surface and the cycle repeats eventually forming large columns. Stromatolites have been observed as long ago as ~3.45 Bya, persisting through to the modern day, suggesting that photosynthetic organisms were present at this time, even if not necessarily cyanobacteria.

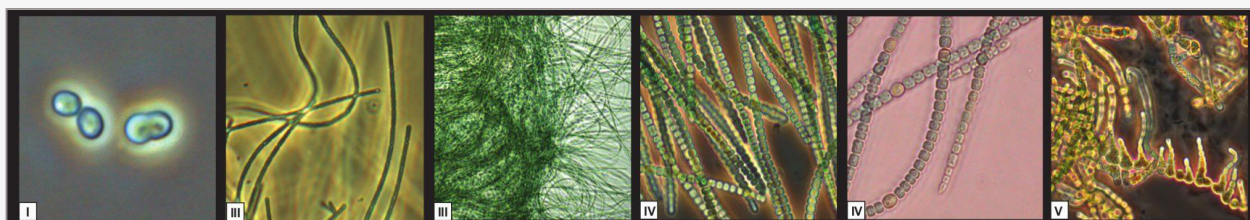
Although cyanobacteria are fairly well accepted as the main source of oxygen for the GOE, their role in the event remains unclear. Were they indirect contributors, having existed fairly unchanged for billions of years, when at 2.45 Bya tectonic events caused the cessation of oxygen sinks? Or were they the driving force behind the GOE representing a biological revolution in cyanobacterial forms? Without discovery of any direct fossil evidence older than the 2 Bya Gunflint Chert this may seem an impossible question to ask, yet a

team from the University of Zurich, led by Dr Bettina Schirrmeister, conducted a phylogenetic analysis of living and fossil cyanobacteria in the hope of providing an answer.

Phylogenetic analyses are statistical methods for testing relationships between any group of individuals based on their shared characteristics and the number of differences from one individual to the next. This provides not only a quantifiable hypothesis of relationships between organisms, but a hypothetical evolutionary 'pathway of least resistance' through which each organism evolved. Even though a hypothetical family tree, including all of its relationships and evolutionary branches, is produced, unless each branch has a temporal association, it is useless in answering the questions as to the relation of cyanobacteria to the GOE. This is where the fossil record of the cyanobacteria can be used. If you are able to assign a fossil to any particular group, then you can assign a minimum age of origin for that group. However, bearing in mind that the fossil record of cyanobacteria only exists from around 2 Bya, how could they estimate times of evolution for those groups beyond this point?

This is where genetic studies of extant cyanobacteria come into play: by determining the number of differences between cyanobacterial genomes and dividing this by the observed mutation rates in modern specimens, the point where different species diverged can be estimated. These divergence times can then be incorporated into our temporally constrained evolutionary tree. The [study](#) showed that all extant lineages of cyanobacteria existed from before the GOE in the Archaean Eon, a result that was repeated in all permutations of the analysis. This was not particularly surprising given the diversity of fossils already present in the 2 Bya Gunflint Chert and the rarity of fossil yielding localities. However, there were some significant coincidences between the GOE and hypothesised cyanobacterial divergence events. The evolution of multicellularity was resolved at, or just before, the onset of the GOE, with the emergence of the majority of the modern lineages shortly after the accumulation of atmospheric oxygen.

What this shows is that the cause of the GOE, at least in part, was not the ascendance of any particular group of cyanobacteria, but a revolution of form in multiple lineages. Multicellularity would have enabled an increase in motility and produced favourable metabolic economies of scale, both obvious advantages. As a respiratory by-product, oxygen would most likely have been toxic to much of the biota. Increased oxygen levels would likely have created an evolutionary pressure on the cyanobacteria, and in response, driving their evolutionary radiation into the diversity of forms we see today.



The morphologies of cyanobacteria (unicellular and multicellular taxa). Classically cyanobacteria have been grouped into five 'sections' according to their morphology, with sections I and II describing unicellular taxa and section III–V comprising multicellular species. However, molecular data have shown that none of these sections are representative of true biological diversity because multicellularity has evolved independently in many different groups. (Credit: [Schirrmeister et al., 2011](#)).

However, in identifying this concurrence, many more questions regarding the evolution of multicellularity are raised: why did it occur when it did? Was it the sole driving force behind the GOE? The one thing we do know is that this association exists and it paved the way for the evolution of the planet as we now know it.

Dave Marshall

Co-founder and co-host of [Palaeocast](#), a webseries exploring the fossil record and the evolution of life on Earth

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Piecing together the puzzle of past climates

Melting of the West Antarctic Ice Sheet and sea-level rise

Climate change – a buzzword for the media industry. They may choose to argue against it, or embrace it with visions of soaring or plunging temperatures, catastrophic flooding and disastrous hurricanes. It all makes for a terrific screenplay (remember [The Day After Tomorrow](#)?) but the truth, inevitably, is a little less dramatic.

While we don't yet fully understand how the world's complex climate system operates one thing is clear: current data series for rates of change are short – some of them 50 years or less – and if we are to predict how climate might change in the future with any degree of accuracy, then we need to better comprehend how it did in the past. Results of studies, such as that conducted by a multi-organisation team and led by the British Antarctic Survey's Claus-Dieter Hillenbrand (published in [Geology](#)), are vital additional pieces for the jigsaw of our understanding.

The West Antarctic Ice Sheet

The cryosphere plays a crucial role in the climate system through its close coupling with both the atmosphere and the hydrosphere. Numerous [recent studies](#) from the International Panel on Climate Change (IPCC) and others have shown that not only is Arctic summer ice cover shrinking rapidly but that land-based ice sheets in both the northern and southern hemispheres are melting at an increasingly high rate. Indeed, another large-scale international [study](#), led by Professor Andrew Shepherd of the University of Leeds, concluded that the ice sheets of Greenland and West Antarctica lost an average of approximately 298 Gt of ice annually over the period 2000–2011, compared to just 100 Gt/year between 1992–2000.

But is the rate observed in West Antarctica unprecedented, and if it is, how do we know?

Dr Hillenbrand and his team used sediment cores taken from the sea bed to identify the historic extent of the Western Antarctic Ice Sheet (WAIS). Evaluating the sediment structure of the cores revealed a depositional setting typical of the ice sheet edge and radiocarbon dating the calcareous microfossils within them enabled them to determine its maximum extent during the last glaciation. And the findings? The results, which covered a 10,000 year period roughly since the end of the last glacial maximum, revealed that the WAIS has retreated by up to 110 km.



RV Polarstern in Pine Island Bay, Antarctica. (Credit: Claus-Dieter Hillenbrand)

So what does this mean, and how does it compare with modern rates of retreat? According to Dr Hillenbrand 110 km or so “is just 3.5 times the distance it has retreated within the last 20 years.” Which means that the recent rate of melt (since 1992) is, as he says, “exceptional (but not necessarily unprecedented) during the last ten millennia.”

Why does the melting of the Ice Sheet matter?

Though we don't fully understand all the interactions and feedbacks which the cryosphere has with the climate system as a whole, the Antarctic ice sheet, along with those of Greenland and elsewhere, is crucial to the climate system. The United States Geological Survey [estimates](#) that in total land ice covers around 10% of the Earth's surface and holds around 69% of its freshwater.

At present the WAIS is estimated to contribute an increase of around 0.15–0.3 mm per year to global sea level – but, as Dr Hillenbrand

points out, the loss of the glaciers which flow into the Amundsen Sea alone would raise sea levels by around 1.5 metres. If the rate of melting identified here is representative of rates elsewhere then this is potentially catastrophic news for some areas of the world – not just island nations but those with extensive, densely-inhabited low-lying coastal plains. In Bangladesh, for example, the UN Development Programme [estimates](#) that a sea level rise of one metre would inundate an area of approximately 25,000 km², devastating the agriculture in coastal Bangladesh and increasing the potential for damaging storm surges.

There are, of course, other deleterious impacts. A sudden influx of cold, low-salinity water can affect the ocean's thermohaline circulation, driven by differences in temperature, density and salinity. An influx of cold water from the Greenland Ice Sheet, for example, might disrupt the Gulf Stream. This would cause climatic cooling in northern and western Europe – though the timescales for this are unlikely to be immediate.

Another piece in the jigsaw

The BAS-led study may seem a small one, with its focus on a single part of the ice sheet, but its findings do more than just demonstrate an extremely high rate of recent melting. By providing data on

past rates, it provides crucial information that feeds into predictive climate models. Dr Hillenbrand states that “If the models provide a reconstruction that is consistent with the real data about past ice-sheet behaviour we can be confident about the reliability of their results and then we can trust their predictions of future sea-level rise and respond accordingly.”

Comparing the exceptional recent rate of WAIS melting with the longer-term retreat identified by the study certainly gives cause for concern – but it also gives hope. With such information coming on stream, the accuracy of climate modelling can be improved and we may begin to equip ourselves with the tools to better understand, and possibly combat, climate change.

Jennifer Young
UK-based freelance science writer

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Interview with soil-scientist Jorge Mataix-Solera

[Jorge Mataix-Solera](#) (Environmental Soil Science Group, Miguel Hernández University of Elche, Spain) talks to us about his research into the effects of forest fires on soil properties and the importance of working with natural processes in forest fire management.

Could you tell us a little about yourself and your field of research?

I studied the modifications in soil properties as a consequence of forest fires during my PhD, and this continues to be my main research area. I often work in collaboration with research teams from around the world, in this and other lines of research, such as developing soil quality indices and the use of treated wastewaters for irrigation. Currently our research is especially focussed on soil water repellency and aggregate stability in fire-affected areas and in the post-fire management practices used to avoid soil degradation.

What are the oldest soils in the Mediterranean Basin, and how does their response to fire compare with that of other soil types?

In Mediterranean areas there are a wide diversity of soil types, one of the oldest are *terra rossa*, a reddish clayey to silty-clay material, which covers limestones or dolomites. The red colour is due to the iron oxides accumulated from the long-term weathering of the parent material. In contrast with other soils of the region, *terra rossa* has a very low susceptibility to becoming water repellent after burning. The factors that seem to control this behaviour are the relatively low ratio soil organic matter/clay content compared to other

forest soils in the region, and the high presence of kaolinite (due to the high stability of this mineral in Mediterranean soils). These very old soils have accumulated kaolinite through the dissolution of the rock over time, whereas other less stable minerals have been weathered away.

Our results suggest that the probability of finding water repellency in forest areas affected by fire with *terra rossa* is lower than in areas with other soil types. This means a forest with *terra rossa* is able to better regulate the absorption of water into the soil after a fire. For example, there is no increase in runoff rate as a consequence of water repellency, thus promoting the restoration of vegetation and preservation of the soil after a fire.

How do forest fires influence soil properties and what are their hydrological implications?

The changes in soil properties as a consequence of forest fires depend on factors such as fire intensity (a function of fuel type, quantity, degree of moisture, and weather patterns), soil type and its conditions at the moment of fire spread (e.g. soil moisture). All of this will control how severe the effect of the fire is on the soil properties. For example, fire usually induces water repellency in soils. This corresponds to a reduction in infiltration rates, increased runoff and erosion in fire-affected soils. The strength of these effects depends on the temperatures reached in the soil and the soil type, with some having a very low susceptibility to developing this



Jorge Mataix-Solera in Brecon Beacons, Wales, in 2012. (Credit: Jorge Mataix-Solera)

property. Another example of complex behaviour is soil aggregate stability (the resilience of the soil's structure in response to external mechanical forces) and many authors consider soil aggregation to be a parameter reflecting soil health, as it depends on chemical, physical and biological factors. The response of aggregate stability to forest fires is complex, since it depends on how fire has affected organic matter content, soil microbiology, water repellency and soil mineralogy. There are many different patterns of response to fires and for this reason it is important to know how fire affects different types of soil, and to develop specific protocols of assessment in fire-affected areas.

How must we manage fire-affected areas to avoid post-fire soil degradation?

In the months after a fire, and before vegetation begins the recovery of the soil surface, the soil must be considered as a very fragile system that can be degraded if we do not take care with the post-fire management practices. Actions involving the use of heavy machinery for the extraction of burned wood can be very harmful to the soil and vegetation that is sprouting and germinating.

In some burned areas it may be necessary to protect the soil against possible erosion by applying straw mulch to the soil surface. This has been very effective, but in some areas, weeks after the fire, scorched pine litter starts to fall and covers the ground to create a magnificent natural mulch. Where the soil and vegetation have been severely affected, reforestation could be unsuccessful, so we can apply an organic substrate, such as composted sewage sludge, which acts as an injection of nutrients and organic matter to improve soil properties.

Restoration of vegetation cover can also be carried out, but it is important to use non-aggressive strategies and avoid the use of a sole species, such as pines, that in a few years can lead to increased risk of a new fire. These decisions must be made after careful evaluation of the affected area and bearing in mind that, where possible, the best reforestation is the natural one, which in many cases occurs since fire is a natural process in the Mediterranean. The problem is not the fire but the alteration of the fire regimes (frequency and intensity).

How can we improve forest management to prevent catastrophic wildfires?

In Spain and other northern Mediterranean countries, the abandonment of farming activities and poor forest management has led to the development of large high-risk areas in the last five decades. Combining this with a few days of extreme weather risk and lower investment in fire prevention and fire fighting, we have an explosive cocktail. Big forest fires like those in the Valencia region last summer (more than 40,000 hectares affected after only two fires) have high environmental, socio-economic impacts, and what is worst, the loss of human lives. We need changes in forest policy and economic investment to carry out important prevention plans, by reducing the biomass in strategic high risk areas, using low intensity prescribed fires, and herbivores to maintain the land.

We must not be obsessed with the idea of trying to eradicate fire from the environment, as it is part of the natural environmental dynamics. Instead, we must use small fires as an ally that can help us, if well managed, to prevent major ones (the real problem). We must understand that all areas of forest in Mediterranean-type conditions eventually burn. We can only decide how we want them to burn in order to avoid the occurrence of catastrophic, high intensity fires.

With a greater frequency of forest fires being a possible consequence of climate change, how do you anticipate this will affect soils and ecosystems within the Mediterranean?

It is known that Mediterranean is a fire-dependent system, and that an increase in the recurrence of fires (higher frequency) causes soil and ecosystem degradation. Plant species are adapted to this perturbation but each one has its fire regime, and out of this regime (a change in frequency and intensity) its behaviour will be modified. The soil as a part of the environment will be affected, and for example it is expected that there would be a loss in the soil organic carbon – a significant change as most soil properties are related to organic matter quantity and quality. In summary a loss of soil quality and a degradation of the ecosystem could be expected with a higher frequency of forest fires.

You have developed an extensive teaching resource using your photographs in the field – how do you think resources like these can best be used to communicate science to the public?

Teaching in geoscience today is easier than it was decades ago. Lots of tools can be used to support the lectures in the classrooms, such as innovative [teaching web pages](#), portfolios, social networks pages, etc. – all of this can help teachers to explain geodynamic processes to their students, but also to communicate science to the public in general. A picture with a very short description can get the public interested in understanding and learning what forces and factors control the landforms. When you know how a landscape has been formed, it becomes more valuable to you.

*Email interview conducted by Sara Mynott
EGU Communications Officer*



Awarding the best science

Chairman of EGU Awards Committee Alberto Montanari explains the importance of the EGU's Awards & Medals Programme.

The wider public frequently finds out about important scientific discoveries when a scientist is awarded an important prize. In fact, while the scientific community learns through scientific papers, the general public is informed about science by the media. The latter gather information from scientific associations, often from their award programmes. This is the reason why leading scientific bodies like the EGU put much effort and care into establishing and delivering high-profile medals and awards. The [EGU's Awards & Medals Programme](#) gives voice to the best of geosciences in the world and brings the most important discoveries of contemporary research on the Earth, planetary and space sciences to the attention of society. The Awards & Medals Programme is also a means for EGU to recognise the excellence of its best members and to join together a leading group of EGU ambassadors. In this role, medalists and awardees are delegated to attend meetings hosted by other organisations and to offer special presentations and lectures labeled as EGU contributions. They are identified as role models for the next generation of young scientists to foster research in geosciences.

Every year, the EGU Awards & Medals Programme recognises eminent scientists for their outstanding research contributions. The Union's awards and medals include the Union Medals for senior scientists, which are the most prestigious awards given by the Union: the [Arthur Holmes Medal](#), focusing on solid Earth geosciences; the [Alfred Wegener Medal](#), dedicated to atmospheric, hydrological and ocean sciences, and the [Jean Dominique Cassini Medal](#), for planetary and space sciences. These are associated with an EGU Honorary Membership. The Union's [Alexander von Humboldt Medal](#) is reserved for scientists from developing countries.

The EGU Union Awards include the [Arne Richter Outstanding Young Scientists Award](#) as well as the [Union Service](#) and Diamond Service awards. The [programme](#) is completed by 27 Division medals for mid-career scientists and the Division Outstanding Young Scientists Awards.

Medals and awards are presented annually at the EGU General Assembly, during a solemn Award Ceremony where citations are delivered to mark the most important achievements of medalists and awardees. All Union and Division medalists, as well as Arne Richter Young Scientists awardees, are invited to deliver talks during the General Assembly. These [lectures](#) convey groundbreaking research results and perspectives and are well attended by young scientists, who are inspired by the awardees' achievements.

The selection of the medalists and awardees is an enormous challenge. Every year tens of excellent scientists are nominated by EGU members and supported by top level colleagues from all over the



Alberto Montanari (left) awards the 2011 [EGU Darcy Medal](#) to Ján Szolgay.

world. I am proud to say that all nominations are carefully scrutinised via a peer-review process which is excellently organised. Nominations are first reviewed by the EGU Office to check eligibility requirements. Then they are forwarded to the [Awards and Medals Committees](#), each one composed by four to six brilliant scientists, most of whom are past EGU medalists. Therefore, the peer review process involves some 150 scientists! I am in charge of overseeing and assisting their work and every year I am amazed by the careful attention that is dedicated to every detail. I think the scientific community and the society in general are indebted to these peers that carry out a laborious and often unnoticed work. I can really say that they are under-recognised! Finally, the outcome of the work of the Medals Committees is assessed by the EGU Council, who announces the winners through the EGU Office, bringing the good news to the wider public.

The EGU is proud of its medalists and awardees, and is proud of the quality of both their selection and the excellence of the message they deliver. I am convinced that the EGU Awards and Medals Programme is a very significant contribution to the whole community of geoscientists!

*Alberto Montanari
EGU Awards Committee Chair*

Division reports

News brought to you from four EGU divisions

In each edition of GeoQ, we select a few Division Presidents to contribute reports updating EGU members with news from their divisions. Issue 5 gives voice to Oksana Tarasova (AS President), Gert-Jan Reichart (BG President), Denis-Didier Rousseau (CL President), and G. Hilmar Gudmundsson (CR President).

Atmospheric Sciences

The Atmospheric Sciences (AS) Division is one of the largest EGU divisions. Its science addresses a wide spectrum of issues involving atmospheric processing and their interactions with climate. This short report reflects several important development and challenges in these areas.

I would like to start by highlighting the work of the winners of the AS Division Vilhelm Bjerknes Medal in 2012 ([Adrian Simmons](#)) and 2013 ([John Burrows](#)). Both bring up the value of global observations for the improved understanding of atmospheric processes, atmospheric chemistry and climate change, and the importance of this improved understanding for society.

Last year, Adrian Simmons gave a Medal Lecture on the assimilation of observational data for atmospheric monitoring and forecasting ([available online](#)). In this lecture, he showed that the forecasting skills of, for example, three days of operational forecast of pressure levels have improved from around 80% in 1980 to 97% in 2011. From 1980 to 2000, this improvement results mostly from advances in the forecasting system, while later on the progress is also due to observational improvements. In relation to this, it should be mentioned that the number of satellite-borne instruments from which data were assimilated routinely by the European Centre for Medium-Range Weather Forecasts (ECMWF) increased from about 10 in 1996 to more than 50 in 2010. The data on atmospheric composition are also used to improve weather forecasts.

Improved skills of weather forecasting systems are extremely important in the cases of severe weather events like superstorm Sandy, which hit the highly populated north-eastern US on 29–30 October 2012 causing over 100 fatalities and considerable damage to property and infrastructure. Forecasts from the ECMWF IFS (Integrated Forecasting System) provided considerable assistance to US forecasters responsible for predicting the track, intensity and impacts of the storm. A major cyclone was predicted to be close to the US east coast seven days before landfall and the predicted pressure levels were very close to the observed ones. More details on the Sandy forecast by ECMWF can be found in a paper by Tim Hewson published in the [ECMWF Newsletter No. 133](#) (2012).

It is clear that remote sensing plays an important role in atmospheric research: John P. Burrows will further highlight the applications of this technique during [his Medal Lecture](#) at the forthcoming EGU General Assembly. Satellite observations contribute to the global integrated observations, envisaged and required in the 2004

strategy on Integrated Atmospheric Chemistry Observations, but the rate of progress towards this system has slowed or reversed. Many currently exploited satellites used for atmospheric composition measurements have ended or are well beyond their design lifetimes. ESA's decision to decommission its European Remote Sensing ERS-2 satellite in July 2011, and the unexpected loss of Envisat in April 2012, have brought a sudden end to a pioneering age of European atmospheric observation. The loss of observations and the resulting gap in measurements of key atmospheric constituents is not fully realised yet – the community is still in shock. Some nadir measurements are continued in the ESA/METSAT Metop mission are still delivering some additional trace gas information. The Sentinel 3 mission, possible from 2016 onwards, will provide a follow on for the Advanced Along Track Scanning Radiometer and Medium Resolution Imaging Spectrometer Envisat instruments. However, there are now no European measurements of the dry columns of greenhouse gases such as carbon dioxide and methane, and no instruments to measure vertical profiles of trace constituents (trace gases aerosol and clouds) from the upper troposphere to the lower thermosphere. New missions and the use of platforms such as the international space station to demonstrate and evolve atmospheric observation instrumentation are urgently needed to create a system fit for purpose and in time for it to be of value.

In relation with the topics discussed above, I would like to highlight the recent project [ARISE](#) (Atmospheric dynamics Research Infrastructure in Europe) that aims to integrate complementary instrumentation to provide improved observations of atmospheric dynamics from the tropics to northern European regions for stratosphere-mesosphere-resolving climate models. The ARISE project intends to revive existing collaborations among European scientists while developing and integrating, for the first time, a large set of complementary topics such as infrasound, gravity and planetary waves, stratosphere and mesosphere disturbances, satellite atmospheric studies and modeling of the atmosphere, and atmospheric dynamics. Data collected by multiple networks will be analysed to extract optimised estimations of the evolving state of different atmospheric layers, which would help constrain the parameterisation of gravity waves and better initialise forecasts of the middle and upper atmosphere.

Networks involved in ARISE are the infrasound network developed for verification of the Comprehensive Nuclear-Test-Ban Treaty, the Network for the Detection of Atmospheric Composition Change using LIDAR (Light Detection and Ranging) and the Network for the Detection of Mesopause Change, dedicated to airglow-layer measurements in the mesosphere. National stations and networks complement the dataset.

Acknowledgments

I would like to thank Adrian Simmons, John Burrows and Alexis Le Pichon for their contribution to this AS Division news report.

Oksana Tarasova
AS Division President

Biogeosciences

This year the Biogeosciences (BG) Division is going to have a new president: Alina Stadnitskaia. Many regular BG participants of the General Assembly already know her, as she has organised sessions on extreme environments and methane cycling for many years. Obviously we are all very happy with her as our new president, more so even as she is the first female BG President.

The Division is also seeing changes amongst its science officers: Tina Treude followed up Antje Boetius and Caroline Slomp has replaced Jack Middelburg in the fields of marine biogeosciences and microbial biogeosciences. All interested EGU members are invited to the BG Division Meeting at the General Assembly to meet your new Division President and science officers.

This year the Biogeosciences Division award, the Vernadski Medal, is going to Han Dolman. We are very happy that over the years we have had such a list of prestigious Vernadski Medal winners as well as Outstanding Young Scientist Award winners. The list of awardees is available on the EGU website or the [BG Division page](#). For next year, please remember to nominate new people, both for the Vernadski Medal and the Outstanding Young Scientists Award. You can do so by contacting Michale Botcher who is chairing the BG medal committee, or submit your choices through the EGU website.

Finally I would like to thank all the conveners who have chaired sessions over the last five years and who have made my BG presidency to be the fun job it has been. Hope to see you all again in Vienna.

Gert-Jan Reichart
BG Division President

Climate: Past, Present & Future

The Climate: Past, Present & Future (CL) Division was very fortunate and proud to have its candidate, [Michael Ghil](#), receive the 2012 EGU Alfred Wegener Medal in addition to awarding two outstanding CL medalists: [Michael Mann](#), for the Hans Oeschger Medal, and [Wolfgang Berger](#), for the Milan Milankovic Medal. The climate community was also recognised by the AGU through the William Bowie Medal, which was awarded to Anny Cazenave last Autumn.

As a good start to 2013, Susan Solomon and Jean Jouzel shared the famous [Vetlesen Prize](#) and once more, a member of the climate community, [Edouard Bard](#), will receive the Alfred Wegener 2013 EGU Medal next Spring. In addition to these important awards celebrating colleagues from our community, the 2012 EGU meeting was really successful, with a great Union Symposium dedicated to Willi Dansgaard. Again in 2013, the division remains the third highest in the number of abstracts received.

The community dynamism remains high, with new sessions proposed and a very exciting program. New figures are appearing as conveners or co-conveners and some of them are young scientists, which is a very good sign to notice. This enthusiasm is endorsed by the large contribution of the climate community to the upcoming IPCC report, with many members leading important chapters.

In other publications news, the division journal [Climate of the Past](#) is also doing well with increasing number of papers and pages published, seating among the top established publications in its category.

The year 2012 saw the last International Partnerships in Ice Core Sciences (IPICS) meeting held in Giens, where the ice-core community met and discussed the very recent results obtained from both Greenland and Antarctica. This year is also filled with important meetings. [PAGES](#), the Past Global Changes programme of the International Geosphere-Biosphere Programme, organised two meetings, one dedicated to young scientists followed by another dedicated to Open Science, in Goa in February. The palaeoceanography community will also meet in Barcelona next Autumn for its regular international conference.

Last but not the least, the CL Division has a new president, Thomas Blunier from Copenhagen, who will take over at the next General Assembly. I would like to take this opportunity to thank you all for your input, contribution and great support during my two terms. I hope you will provide Thomas with equal support and contribution.

Denis-Didier Rousseau
CL Division President

Cryospheric Sciences

The EGU Division on Cryospheric Sciences (CR) provides a forum within the EGU on a range of topics related to the Earth's frozen regions. These include snow and ice, avalanches and permafrost, ice sheets, ice caps and sea ice. The field of cryospheric sciences has exploded and grown greatly in size over the past ten years or so as it has become increasingly clear how important the cryosphere is in the context of a warming world.

Judging by the positive feedback we received, last year's EGU General Assembly was very successful and possibly our best meeting to date. The EGU annual conference is now one of the pivotal meetings for scientists conducting research on various aspects of the cryosphere. Last year's highlights include the [Louis Agassiz Medal Lecture by Ian Joughin](#) of the Applied Physics Laboratory at the University of Washington.

The 2013 Louis Agassiz Medal is awarded to Florent Dominé for his outstanding contributions to snow and ice physics, including cross-disciplinary studies leading to a fundamental and quantitative understanding of how snow physical properties influence the uptake, retention, and reactivity of chemical species on snow and sea ice. Xavier Fettweis is presented with the Arne Richter Award for Outstanding Young Scientists for fundamental contributions to the understanding and quantifying the current and future surface mass balance of the Greenland ice sheet.

G. Hilmar Gudmundsson
CR Division President



New Science Communicator at the EGU Office

British Sara Mynott is the newest member of the Union's Munich Office, where she started working in January 2013. In addition to assisting with GeoQ writing and editing activities, she is managing [GeoLog](#) and the [EGU blog network](#), and running the [Union's social media channels](#). In the near future, she will also coordinate and develop EGU's networking activities for young scientists.

Sara completed a Masters in Environmental Geoscience at the University of Bristol, and a second in Marine Ecology, from Queen Mary University of London. During her studies, she investigated areas such as the use of microphones to monitor volcanoes, how crustacean fisheries can be managed effectively, and how warming climates may impact the fitness of cold-blooded animals.

Sara also has a keen interest in informal education, having volunteered at many science festivals, schools and exhibition centres. Before joining the EGU, she worked for [PLoS](#), which gave her a good grounding in the essentials of Open Access publishing and the merits of alternative ways to share and discuss research online.

Working with the EGU's Media and Communications Manager, Bárbara Ferreira, she will be sharing all things geoscience, while contributing to the EGU blog and developing communications with young scientists. "With all the tools we have for sharing science, I couldn't be more excited about the task at hand", Sara says.

Feel free to contact Sara at mynott@egu.eu if you have any questions about the EGU or its online communications. Or follow the



Sara Mynott is the newest member of EGU's communications team.

Union on Twitter ([@EuroGeosciences](#)), Facebook ([European Geosciences Union](#)) or the blog, [GeoLog](#), where Sara will be posting the most up-to-date information about the EGU and the Earth, planetary and space sciences.

An earlier version of this article was published on the [EGU blog](#)

The EGU is looking for an Educational Fellow

Job opportunity at the EGU Executive Office

The EGU intends to appoint a young scientist as an Educational Fellow to expand the Union's educational programme with activities targeted directly at school students. These activities will complement our current efforts, such as the Geosciences Information for Teachers workshops (GIFT), which are aimed primarily at teachers. The Fellow will further assist our Education Committee with an EGU–UNESCO collaboration intended to expand GIFT to Africa.

The successful applicant will be a good team player with excellent interpersonal, organisational, and communication skills. He/she will have a masters or PhD in the Earth, space or planetary sciences, experience in science education, flexibility to travel frequently (especially to France), and an expert command of English. Preference will be given to candidates who are also proficient in French, and who are familiar with film or web-based media.

More information about this vacancy, including application materials, salary and starting date, is available in [PDF format](#) or on the [EGU website](#).

Informal enquiries can be made to the Media and Communications Manager, Bárbara Ferreira at media@egu.eu or +49-89-2180-6703. Applications should be submitted in a **single PDF file**, with any video or audio files attached separately, to Bárbara Ferreira by **24 March**.

Interviews for this post will be conducted at the 2013 EGU General Assembly, taking place in Vienna, Austria, from 7–12 April.

An earlier version of this article was published on the [EGU website](#) and [blog](#)

Photo and moving image competitions at the EGU 2013 General Assembly

If you are pre-registered for the 2013 General Assembly (Vienna, 7–12 April), you can now [submit photos and moving images](#) to our annual competition. Winners receive a free registration to next year's General Assembly.

The fourth annual EGU photo competition is now open. Up until 26 March, every [pre-registered](#) participant of the General Assembly can submit up to two photos on any broad theme related to the Earth, planetary and space sciences. Short-listed photos will be exhibited at the conference and the winner will be voted for by General Assembly participants.

In addition, we will also be running a competition for the best moving image, for which we invite you to submit unedited films/footage no longer than three minutes in duration.

If you submit your images to the competition, they will also be included in the EGU's open access photo database, [Imaggeo](#). You retain full rights of use since photos submit to the database are licensed and distributed by the EGU under a [Creative Commons](#) licence. This means that Imaggeo content can be used by scientists for their presentations or publications, by the press for news articles, and others for education, blogs as long as they are attributed to the photographer.

You will need to [register on Imaggeo](#) so that the organisers can appropriately process your photos. For more information, please check the [photo competition page on Imaggeo](#). Previous winning photographs can be seen on the [2010](#), [2011](#) and [2012](#) winners' pages.

An earlier version of this article was published on the [EGU blog](#)



Last year's winning photo: Melt Stream. (Credite: Ian Joughin, distributed by EGU under a Creative Commons licence via [imaggeo.net](#))

Would you like to join the EGU Blog Network?

The time has come to expand the [EGU blog network](#). We currently feature blogs in palaeontology ([Green Tea and Velociraptors](#)), international development ([Geology for Global Development](#)) and geochemistry ([GeoSphere](#)) – we love them, but it simply isn't enough. With so much great geoscience out there, we'd love to hear from more fields within the Earth, planetary and space sciences!

The aim of the network is to share accurate information about geoscientific research in a language understandable not only to fellow scientists but also to the broader public. You, as an expert in your own area, are in a better position than we are to share recent development in your area of research.

The benefits: apart from your site gaining exposure by having its posts listed on the front page of the EGU website, we will also share highlights of your work on our social media channels (Twitter, Facebook, LinkedIn, Google+) and advertise the blog network at our [General Assembly](#), which has over 11,000 attendees.

If you'd like your blog to be considered for our network, fill out our [sign-up online form](#). Please note that only blogs in English will be considered.

Feel free to contact the EGU Communications Officer Sara Mynott at mynott@egu.eu if you have any questions.

An earlier version of this article was published on the [EGU blog](#)



Unprecedented glacier melting in the Andes blamed on climate change

EGU press release highlights research published in *The Cryosphere*

Glaciers in the tropical Andes have been retreating at increasing rate since the 1970s, scientists write in the most comprehensive review to date of Andean glacier observations. The researchers blame the melting on rising temperatures as the region has warmed about 0.7°C over the past 50 years (1950-1994). This unprecedented retreat could affect water supply to Andean populations in the near future. These conclusions are published today in The Cryosphere, an Open Access journal of the European Geosciences Union (EGU).

The international team of scientists – uniting researchers from Europe, South America and the US – shows in the new paper that, since the 1970s, glaciers in tropical Andes have been melting at a rate unprecedented in the past 300 years. Globally, glaciers have been retreating at a moderate pace as the planet warmed after the peak of the Little Ice Age, a cold period lasting from the 16th to the mid-19th century. Over the past few decades, however, the rate of melting has increased steeply in the tropical Andes. Glaciers in the mountain range have shrunk by an average of 30-50% since the 1970s, according to Antoine Rabatel, researcher at the Laboratory for Glaciology and Environmental Geophysics in Grenoble, France, and lead author of the study.

Glaciers are retreating everywhere in the tropical Andes, but the melting is more pronounced for small glaciers at low altitudes, the authors report. Glaciers at altitudes below 5,400 metres have lost about 1.35 metres in ice thickness (an average of 1.2 metres of water equivalent) per year since the late 1970s, twice the rate of the larger, high-altitude glaciers.

“Because the maximum thickness of these small, low-altitude glaciers rarely exceeds 40 metres, with such an annual loss they will probably completely disappear within the coming decades”, says Rabatel.

The researchers further report that the amount of rainfall in the region did not change much over the past few decades and, therefore, cannot account for changes in glacier retreat. Instead, climate change is to blame for the melting: regional temperatures increased an average of 0.15°C per decade over the 1950-1994 period.

“Our study is important in the run-up to the next IPCC report, coming out in 2013”, says Rabatel. The Intergovernmental Panel on Climate Change (IPCC) has pointed out that tropical glaciers are key indicators of recent climate change as they are particularly sensitive to temperature changes. The tropical Andes host 99% of all tropical glaciers in the world, most of them in Peru.

The research is also important to anticipate the future behaviour of Andean glaciers and the impact of their accelerated melting on the region. “The ongoing recession of Andean glaciers will become increasingly problematic for regions depending on water resources supplied by glacierised mountain catchments, particularly in Peru”, the scientists write. Without changes in precipitation, the region could face water shortages in the future.

The Santa River valley in Peru will be most affected, as its hundreds of thousands of inhabitants heavily rely on glacier water for agriculture, domestic consumption, and hydropower. Large cities, such as



The Pastoruri Glacier, located in Peru's Cordillera Blanca, is one of the Andean glacier monitored by the team of scientists in the new study published in *The Cryosphere*. (Credit: Edubucher/Wikimedia Commons)

La Paz in Bolivia, could also face shortages. “Glaciers provide about 15% of the La Paz water supply throughout the year, increasing to about 27% during the dry season”, says Alvaro Soruco, a Bolivian researcher who took part in the study.

In their comprehensive review of Andean glaciers, the scientists synthesised data collected over several decades, some dating as far back as the 1940s. “The methods we used to monitor glacier changes in this region include field observations of glacier mass balance, and remote-sensing measurements based on aerial photographs and satellite images for glacier surface and volume changes”, explains Rabatel.

The study takes into account data collected for glaciers in Colombia, Ecuador, Peru and Bolivia, covering a total of almost a thousand square kilometres. This corresponds to about 50% of the total area covered by glaciers in the tropical Andes in the early 2000s.

The research was conducted to provide the scientific community with a comprehensive overview of the status of glaciers in the tropical Andes and determine the rate of retreat and identify potential causes for the melting. But the authors hope the results can have a wider impact.

“This study has been conducted with scientific motivations, but if the insight it provides can motivate political decisions to mitigate anthropogenic impact on climate and glacier retreat, it will be an important step forward”, Rabatel concludes.

This press release was originally published on the [EGU website](#)

Reference

Rabatel, A. et al.: [Current state of glaciers in the tropical Andes: a multi-century perspective on glacier evolution and climate change](#), *The Cryosphere*, 7, 81–102, 2013

Kate Ravilious and Liz Kalaugher awarded EGU Science Journalism Fellowship

The European Geosciences Union (EGU) has named journalists Kate Ravilious and Liz Kalaugher as the winners of its second Science Journalism Fellowship competition for projects on reporting continental earthquakes and climate-change effects on ecosystems, respectively. Ravilious will receive €3,500 to join a research team travelling to central Asia, and Kalaugher €1,500 to cover expenses related to a trip to Finland.

Kate Ravilious proposal focuses on [Earthquakes without Frontiers](#), a project involving a team of scientists studying continental faults stretching from southern Europe to central Asia and China that could pose major risks to populations in these regions. She aims to “communicate how little we understand continental earthquakes, how dangerous they can be, and how projects like this one could save many lives in the future”, she writes in her winning proposal.

Liz Kalaugher proposes to report on field work at the Kilpisjärvi Biological Station in the north of Finland, a region where “the first effects of climate change are starting to bite”, she writes. She will follow scientists to the European Arctic to communicate their research on climate-change impacts on soils, vegetation and local fauna, and to understand how resilient ecosystems are to changes in temperature.

Both winners are invited to attend the EGU General Assembly, taking place in Vienna from the 7–12 April 2013.

More information

[Kate Ravilious](#) is an award-winning independent science journalist, based in York, UK. She writes about the latest discoveries in the scientific world and has a particular passion for earth sciences and archaeology. Her work is published in magazines and newspapers



Kate Ravilious (left) and Liz Kalaugher (right), 2013 EGU Science Journalism Fellows.

and on websites including, New Scientist, The Guardian, The Daily Telegraph, The Independent, National Geographic daily news, Archaeology and environmentalresearchweb.

[Liz Kalaugher](#) is editor of environmentalresearchweb. Liz has more than ten years' experience as a science writer and holds a degree in materials science from the University of Oxford, and a PhD in materials science and Certificate in Wildlife Biology, both from the University of Bristol, UK.

The EGU Science Journalism Fellowship is an annual competition open to professional journalists wishing to report on ongoing research in the geosciences. The winning proposals receive up to €5K to cover expenses related to the projects and assistance in liaising with scientists. This support is intended to allow the fellows to follow geoscientists on location and to develop in-depth understanding of their questions, approaches, findings, and motivation.

This press release was originally published on the [EGU website](#)



Atmospheric Chemistry and Physics

Radiative forcing of the direct aerosol effect from AeroCom Phase II simulations

Researchers report on the AeroCom Phase II direct aerosol effect (DAE) experiment where 16 detailed global aerosol models have been used to simulate the changes in the aerosol distribution over the industrial era. All 16 models have estimated the radiative forcing of the anthropogenic DAE, and have taken into account anthropogenic sulphate, black carbon and organic aerosols from fossil fuel, biofuel, and biomass burning emissions.

Reference

Myhre, G. et al.: [Radiative forcing of the direct aerosol effect from AeroCom Phase II simulations](#), *Atmos. Chem. Phys.*, 13, 1853–1877, 2013

Application of the Statistical Oxidation Model (SOM) to Secondary Organic Aerosol formation from photooxidation of C₁₂ alkanes

This research applies the Statistical Oxidation Model of Cappa and Wilson (2012) to model the formation of the secondary organic aerosol from the formation of the four C₁₂ alkanes, dodecane, 2-methyl undecane, cyclododecane and hexylcyclohexane, under both high- and low-NO_x conditions, based upon data from the Caltech chambers.

Reference

Cappa, C. D. et al.: [Application of the Statistical Oxidation Model \(SOM\) to Secondary Organic Aerosol formation from photooxidation of C₁₂ alkanes](#), *Atmos. Chem. Phys.*, 13, 1591–1606, 2013

Aerosol decadal trends – Part 1: In-situ optical measurements at GAW and IMPROVE stations

Since the aerosol variables are not normally distributed, three different methods (the seasonal Mann-Kendall test associated with the Sen's slope, the generalised least squares fit associated with an autoregressive bootstrap algorithm for confidence intervals, and the least-mean square fit applied to logarithms of the data) were applied to detect the long-term trends and their magnitudes.

Reference

Collaud Coen, M. et al.: [Aerosol decadal trends – Part 1: In-situ optical measurements at GAW and IMPROVE stations](#), *Atmos. Chem. Phys.*, 13, 869–894, 2013

Aerosol decadal trends – Part 2: In-situ aerosol particle number concentrations at GAW and ACTRIS stations

This article describes an analysis of the trends of total aerosol particle number concentrations (N) measured at long-term measurement stations involved either in the Global Atmosphere Watch (GAW) and/or EU infrastructure project ACTRIS. The work provides a useful comparison analysis for modelling studies of trends in aerosol number concentrations.

Reference

Asmi, A. et al.: [Aerosol decadal trends – Part 2: In-situ aerosol particle number concentrations at GAW and ACTRIS stations](#), *Atmos. Chem. Phys.*, 13, 895–916, 2013

Efficient determination of vehicle emission factors by fuel use category using on-road measurements: downward trends on Los Angeles freight corridor I-710

Researchers describe how they developed an alternative method that links real-time on-road pollutant measurements from a mobile platform with real-time traffic data, and allows efficient calculation of both the average and the spread of vehicle emission factors for light-duty gasoline-powered vehicles and heavy-duty diesel-powered vehicles.

Reference

Hudda, N. et al.: [Efficient determination of vehicle emission factors by fuel use category using on-road measurements: downward trends on Los Angeles freight corridor I-710](#), *Atmos. Chem. Phys.*, 13, 347–357, 2013



Traffic jams, and associated vehicle emissions, are a present problem in the Los Angeles area. (Credit: Coolcaesar/Wikimedia Commons)

Atmospheric Measurement Techniques

The effect of hygroscopicity on eddy covariance estimates of sea-spray aerosol fluxes: a comparison of high-rate and bulk correction methods

This paper describes a method of correcting aerosol spectra for relative humidity induced size variations at the high frequency (10 Hz) measurement timescale, where counting statistics are poor and the spectral shape cannot be well represented by a simple power law.

Reference

Sproson, D. A. J., Brooks, I. M., and Norris, S. J.: [The effect of hygroscopicity on eddy covariance estimates of sea-spray aerosol fluxes: a comparison of high-rate and bulk correction methods](#), *Atmos. Meas. Tech.*, 6, 323–335, 2013



Sea-spray aerosol, generated through bubble bursting in whitecaps, is one of the most important natural aerosol systems. (Credit: Ioannis Daglis, distributed by EGU under a Creative Commons licence via imggeo.net)

Biogeosciences

High-latitude cooling associated with landscape changes from North American boreal forest fires

In this paper, researchers simulated changes in forest composition due to altered burn area using a stochastic model of fire occurrence, historical fire data from national inventories, and succession trajectories derived from remote sensing.

Reference

Rogers, B. M., Randerson, J. T., and Bonan, G. B.: [High-latitude cooling associated with landscape changes from North American boreal forest fires](#), *Biogeosciences*, 10, 699–718, 2013

Identifying urban sources as cause of elevated grass pollen concentrations using GIS and remote sensing

This paper examines the hypothesis that during flowering, the grass pollen concentrations at a specific site reflect the distribution of grass pollen sources within a few kilometres of this site. Researchers perform this analysis on data from a measurement campaign in the city of Aarhus (Denmark) using three pollen traps and by comparing these observations with a novel inventory of grass pollen sources.

Reference

Skjøth, C. A. et al.: [Identifying urban sources as cause of elevated grass pollen concentrations using GIS and remote sensing](#), *Biogeosciences*, 10, 541–554, 2013

Management, regulation and environmental impacts of nitrogen fertilization in northwestern Europe under the Nitrates Directive; a benchmark study

Implementation of the Nitrates Directive (NiD) and its environmental impacts were compared for member states in the northwest of the European Union (Ireland, United Kingdom, Denmark, the Netherlands, Belgium, Northern France and Germany). The main sources of data were national reports for the third reporting period for the NiD (2004–2007) and results of the MITERRA-EUROPE model.

Reference

van Grinsven, H. J. M. et al.: [Management, regulation and environmental impacts of nitrogen fertilization in northwestern Europe under the Nitrates Directive; a benchmark study](#), *Biogeosciences*, 9, 5143–5160, 2012

Internal respiration of Amazon tree stems greatly exceeds external CO₂ efflux

This article presents a study of gas exchange from stems of tropical forest trees using a new approach to better understand respiration in an ecosystem that plays a key role in the global carbon cycle.

Reference

Angert, A. et al.: [Internal respiration of Amazon tree stems greatly exceeds external CO₂ efflux](#), *Biogeosciences*, 9, 4979–4991, 2012

Climate of the Past



Biomass burning in southern Ecuador (Credit: Sandro Makowski, distributed by EGU under a Creative Commons licence via [imagegeo.net](https://www.imagegeo.net))

What could have caused pre-industrial biomass burning emissions to exceed current rates?

Recent studies based on trace gas mixing ratios in ice cores and charcoal data surprisingly indicate that biomass burning emissions over the past millennium exceeded contemporary emissions by up to a factor of 4 for certain time periods. This paper analyses how emissions from several landscape biomass burning sources could have fluctuated to yield emissions that are in correspondence with recent results based on ice core mixing ratios of carbon monoxide and its isotopic signature measured at South Pole station.

Reference

van der Werf, G. R. et al.: [What could have caused pre-industrial biomass burning emissions to exceed current rates?](#), *Clim. Past*, 9, 289–306, 2013

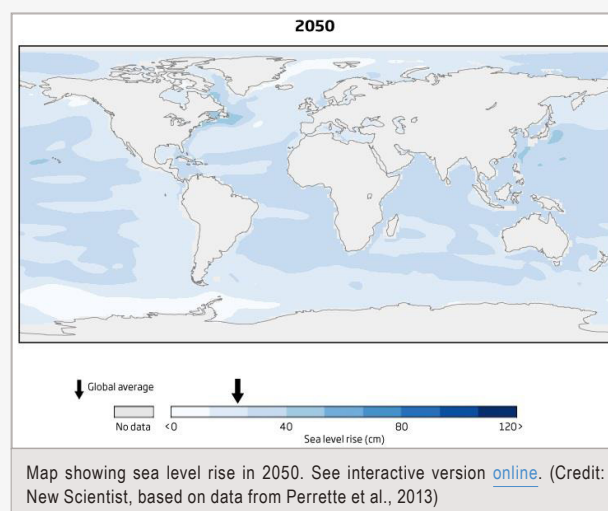
Earth System Dynamics

A scaling approach to project regional sea level rise and its uncertainties

This paper presents an alternative approach to derive regional sea level changes for a range of emission and land ice melt scenarios, combining probabilistic forecasts of a simple climate model (MAGICC6) with the new CMIP5 general circulation models. These regional sea level projections and the diagnosed uncertainties provide an improved basis for coastal impact analysis and infrastructure planning for adaptation to climate change.

Reference

Perrette, M. et al.: [A scaling approach to project regional sea level rise and its uncertainties](#), *Earth Syst. Dynam.*, 4, 11–29, 2013



Geoscientific Instrumentation, Methods and Data Systems

Development of stroboscopic muography

Conventional muon radiography has concentrated on non-destructive studies of stationary objects with relatively long exposure times required to achieve sufficient muon statistics. A muon detection system with real time readings and a high spatial resolution detector,

enables the investigation of dynamic processes in a stroboscopic mode, where image frames are synchronised with the phases of the dynamic target.

Reference

Tanaka, H. K. M.: [Development of stroboscopic muography](#), *Geosci. Instrum. Method. Data Syst.*, 2, 41–45, 2013

Hydrology and Earth System Sciences

The importance of glacier and forest change in hydrological climate-impact studies

Changes in land cover alter the water balance components of a catchment, due to strong interactions between soils, vegetation and the atmosphere. Therefore, hydrological climate impact studies should also integrate scenarios of associated land cover change. To reflect two severe climate-induced changes in land cover, researchers applied scenarios of glacier retreat and forest cover increase that were derived from the temperature signals of the climate scenarios used in this study.

Reference

Köplin, N. et al.: [The importance of glacier and forest change in hydrological climate-impact studies](#), *Hydrol. Earth Syst. Sci.*, 17, 619–635, 2013

On the nature of rainfall intermittency as revealed by different metrics and sampling approaches

Results of this work may be useful to improve the calibration of stochastic algorithms used to downscale coarse rainfall predictions of climate and weather forecasting models, as well as the parameterization of intensity-duration-frequency curves, adopted for land planning and design of civil infrastructures.

Reference

Mascaro, G., Deidda, R., and Hellies, M.: [On the nature of rainfall intermittency as revealed by different metrics and sampling approaches](#), *Hydrol. Earth Syst. Sci.*, 17, 355–369, 2013

Similarity of climate control on base flow and perennial stream density in the Budyko framework

Perennial stream density (D_P), which is obtained from the high-resolution National Hydrography Dataset for 185 watersheds declines monotonically with climate aridity index, and an inversely proportional function is proposed to model the relationship between D_P and the ratio of potential evaporation to precipitation.

Reference

Wang, D. and Wu, L.: [Similarity of climate control on base flow and perennial stream density in the Budyko framework](#), *Hydrol. Earth Syst. Sci.*, 17, 315–324, 2013

Prediction, time variance, and classification of hydraulic response to recharge in two karst aquifers

Many karst aquifers are rapidly filled and depleted and therefore are likely to be susceptible to changes in short-term climate variability.

This paper explores methods that could be applied to model site-specific hydraulic responses, with the intent of simulating these responses to different climate scenarios.

Reference

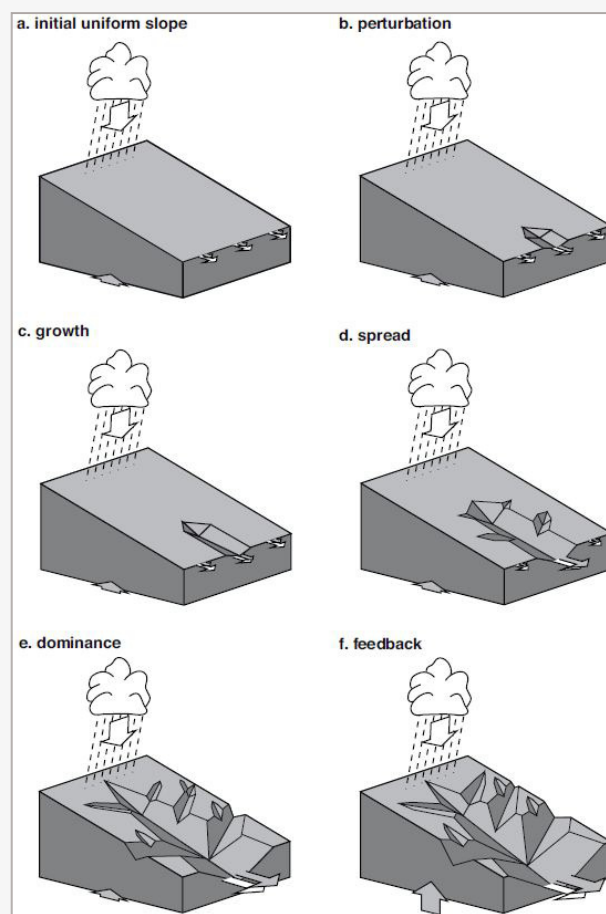
Long, A. J. and Mahler, B. J.: [Prediction, time variance, and classification of hydraulic response to recharge in two karst aquifers](#), *Hydrol. Earth Syst. Sci.*, 17, 281–294, 2013

Thermodynamics, maximum power, and the dynamics of preferential river flow structures at the continental scale

The article describes the organisation and dynamics of drainage systems using thermodynamics, focusing on the generation, dissipation and transfer of free energy associated with river flow and sediment transport.

Reference

Kleidon, A., et al.: [Thermodynamics, maximum power, and the dynamics of preferential river flow structures at the continental scale](#), *Hydrol. Earth Syst. Sci.*, 17, 225–251, 2013



Six stages of structure formation that reflect increasing levels of disequilibrium and ability to generate free energy and drive sediment transport. (Credit: Kleidon et al., 2013)

Natural Hazards and Earth System Sciences



English Channel from above. (Credit: NASA)

Tide-surge interaction in the English Channel

The English Channel is characterised by strong tidal currents and a wide tidal range, such that their influence on surges is expected to be non-negligible. In order to better assess storm surges in this zone, tide-surge interactions are investigated.

Reference

Idier, D., Dumas, F., and Muller, H.: [Tide-surge interaction in the English Channel](#), *Nat. Hazards Earth Syst. Sci.*, 12, 3709–3718, 2012

Nonlinear Processes in Geophysics

Time scale of the largest imaginable magnetic storm

The depression of the horizontal magnetic field at Earth's equator for the largest imaginable magnetic storm has been estimated (Vasyliunas, 2011a) as $-Dst \sim 2500$ nT. The obvious related question, analysed in this paper, is how long it would take the solar wind to supply the energy content of this largest storm.

Reference

Vasyliunas, V. M.: [Time scale of the largest imaginable magnetic storm](#), *Nonlin. Processes Geophys.*, 20, 19–23, 2013

Stratospheric winds, transport barriers and the 2011 Arctic ozone hole

This paper considers the issue of what constitutes suitable environmental conditions for the formation and maintenance of a polar ozone hole. The discussion focuses on the importance of the stratospheric wind field.

Reference

Olascoaga, M. J. et al.: [Brief communication "Stratospheric winds, transport barriers and the 2011 Arctic ozone hole"](#), *Nonlin. Processes Geophys.*, 19, 687–692, 2012

The Cryosphere

Expansion of meltwater lakes on the Greenland Ice Sheet

Forty years of satellite imagery reveal that meltwater lakes on the margin of the Greenland Ice Sheet have expanded substantially inland to higher elevations with warming. These lakes are important because they provide a mechanism for bringing water to the ice bed, causing sliding.

Reference

Howat, I. M. et al.: [Brief Communication "Expansion of meltwater lakes on the Greenland Ice Sheet"](#), *The Cryosphere*, 7, 201–204, 2013

The stability of grounding lines on retrograde slopes

The stability of marine ice sheets grounded on beds that slope upwards in the overall direction of flow is investigated numerically in two horizontal dimensions. This paper gives examples of stable grounding lines on such retrograde slopes illustrating that marine ice sheets are not unconditionally unstable in two horizontal dimensions.

Reference

Gudmundsson, G. H. et al.: [The stability of grounding lines on retrograde slopes](#), *The Cryosphere*, 6, 1497–1505, 2012



A step change for Earth system research: Future Earth – research for global sustainability

Members of the Future Earth Transition Team present a new 10-year international initiative on integrated global environmental change research.

Human activities are altering the Earth system and impacting the environment at the local, regional and global scale in ways that, on one hand, threaten human well-being but, on the other hand, provide ample new opportunities for innovative sustainable development. Changes in the Earth's climate and loss of biodiversity are undermining poverty alleviation, as well as food, water, energy and human security. The challenge of achieving a transition to global sustainability is urgent given the potentially catastrophic and irreversible implications for human societies.

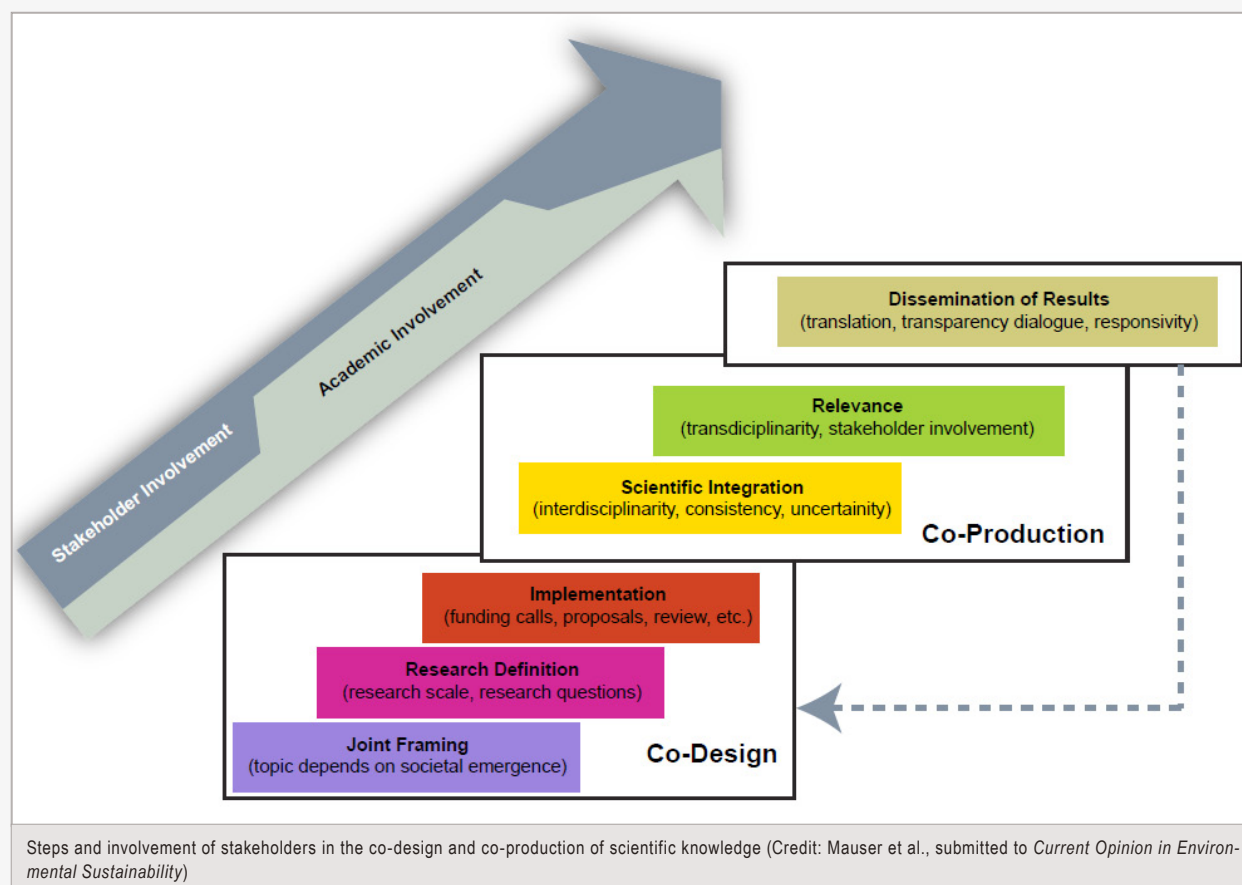
Future Earth is a 10-year international research programme which will provide the knowledge required for societies to face the challenges posed by global environmental change and to identify opportunities for a transition to global sustainability. It will support science of the highest quality, integrate the natural and social sciences, as well as engineering, the humanities and law. It will be co-designed and co-produced by academics, governments, business

and civil society, encompass bottom-up ideas from the wide scientific community, be solution-oriented, and inclusive of existing international Global Environmental Change projects and related national activities.

Connecting research and responses to societal challenges

Future Earth will address issues critical to poverty alleviation and development such as food, water, energy and human security, governance, tipping points, economic implications of inaction and action, natural capital, technological transformations including a low-carbon economy, the sustainable use and conservation of biodiversity, lifestyles, ethics and values with an increased regional emphasis.

Future Earth provides an opportunity to refocus research priorities and open up new research frontiers co-designed by researchers and users. It will establish new ways to produce research in a



more integrated and solutions-oriented way. [Recent foresight exercises](#) on the challenges facing Earth system research and its funding converged on the need for a step change. More disciplines and knowledge fields need to be engaged, bringing both disciplinary and interdisciplinary excellence; the close collaboration with stakeholders across the public, private and voluntary sectors to encourage scientific innovation and address policy needs is essential.

At the Rio+20 Earth Summit last June, governments agreed to develop a set of Sustainable Development Goals (SDGs) that will integrate environment and development goals for all nations. Future Earth will provide the integrative environmental knowledge needed to underpin the SDGs and sustainable development more broadly. To produce relevant knowledge for action on these critical issues, Future Earth will build upon and integrate the existing Global Environment Change Programmes – the World Climate Research Programme (WCRP), the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme (IHDP), Diversitas, and the Earth System Partnership (ESSP).

The research and other capacity building and outreach activities of Future Earth will be co-designed by the broad community of researchers in partnership with the users of knowledge, such as governments and business, to close the gap between environmental research and policies and practices (see figure on previous page). Researchers will be responsible for the scientific approaches, but the articulation of the research priorities and the final dissemination of results will be a joint responsibility. Future Earth will deliver a step-change in making the research more useful and accessible for decision-makers by, inter-alia, communicating uncertainty, developing useful tools for applying knowledge, respecting and including local/traditional knowledge and supporting innovation.

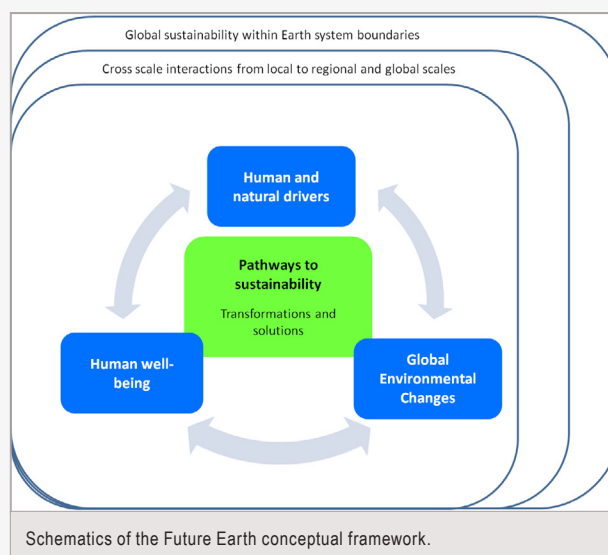
The conceptual framework

The conceptual framework for Future Earth (see figure above), which will guide the formulation of research themes and projects, recognises that humanity is an integral part of the dynamics and interactions of the Earth system. It also encompasses the cross-scale spatial and temporal dimensions of the social-environmental interactions and their implications for global sustainability.

The conceptual framework illustrates the fundamental interconnections between natural and human drivers of change, the resulting environmental changes and their implications for human wellbeing within the Earth system boundaries. These interactions take place across a range of time and spatial scales, and are bounded by the limits of what the Earth system can provide. This fundamental, holistic, understanding is the basis for the identification of transformative pathways and solutions for global sustainability.

The initial research themes

The conceptual framework guides Future Earth research towards addressing key research challenges, expressed as a set of three broad and integrated research themes:



Dynamic Planet

Understanding how planet Earth is changing due to natural phenomena and human activities through intensified and novel research on mapping, understanding and projecting global change processes and interactions between social and environmental changes across scales. The Future Earth research emphasis will be on observing, explaining, understanding, projecting Earth environmental and societal trends, drivers and processes and their interactions, anticipating global thresholds and risks.

Global Development

Providing the knowledge for sustainable, secure and fair stewardship of food, water, biodiversity, health, energy, materials and other ecosystem functions and services. The emphasis of Future Earth research will be on determining the impacts of human activities and environmental change on human well-being, people and societies through integrated social-environmental research and the identification of sustainable solutions.

Transformations toward Sustainability

Understanding transformation processes and options, assessing how these relate to human values, emerging technologies, and economic development pathways, and evaluating strategies for governing and managing the global environment across sectors and scales. The emphasis of Future Earth research will be on solution-oriented science that enables societal transitions to global sustainability, such as how to anticipate, avoid and manage global environmental change through research on transformative pathways and scenarios, innovation pathways, and what institutional, economic, social, technological and behavioural changes can enable effective steps towards global sustainability and how these changes might best be implemented.

These research themes will be the main organisational units for Future Earth research and they will build on the success of existing Global Environmental Change (GEC) programmes and projects.

Cross-cutting capabilities

Addressing the proposed integrated research themes will depend on core capabilities such as observing networks, high performance computing, Earth system models, data management systems and research infrastructures. These capabilities are essential to advance the science of global environmental change and translate it into useful knowledge for decision making and sustainable development. Many of these capabilities lie beyond the boundaries of the Future Earth initiative, residing in national and international observing systems, modelling centres, training programmes, and disciplines. It will be important that Future Earth works in partnership with the providers of these capabilities for mutual benefit.

Education and capacity building

Future Earth will partner with programmes and networks that already work in the educational sector to ensure rapid dissemination of research findings and support science education at all levels. Targeted audiences will include primary, secondary and tertiary education and engagement with youth through social networks. Approaches will include online education, engagement with media, science and technology centres, and use of existing GEC research programmes that support graduate and post-graduate education.

Future Earth has identified capacity building as a basic principle of all its activities and will develop a multi-tiered exercise in scientific capacity building, with both explicit capacity building activities and capacity building that occurs as a by-product of its many activities. Future Earth's dedicated capacity building activities will include generating a strong international network of scientists committed to international interdisciplinary and trans-disciplinary research, with a particular focus on early-career scientists, and the development of institutional capacity, including developing functional regional nodes and international networks.

The governance structure

The Science and Technology Alliance for Global Sustainability is responsible for establishing Future Earth and will promote and support its development as its scientific sponsors. Its members are the International Council for Science (ICSU), the International Social Science Council (ISSC), the Belmont Forum, the United Nations Educational, Scientific, and Cultural Organization (UNESCO), the United Nations Environment Programme (UNEP), the United Nations University (UNU), and the World Meteorological Organization (WMO) in an observer capacity.

The governance structure of Future Earth embraces the concept of co-design. It involves a Governing Council responsible for setting the strategic direction of the programme supported by co-equal engagement and science committees. The science committee will provide scientific guidance, ensuring quality of the research and suggest new projects. The engagement committee will provide leadership and strategic guidance on involving stakeholders throughout the entire research chain from co-design to dissemination and ensure that Future Earth produces the knowledge that society

Town Hall Meeting on Future Earth at the EGU 2013 General Assembly

On Tuesday 9 April 2013 from 19:00 to 20:00 (room B6), the EGU will host a town hall meeting to present and discuss Future Earth.

This discussion will address international coordination of research and funding; co-designing research with funders, scientists, and users; and the role of science in bridging policy and practice.

More information to come on the [conference website](#) and [ICSU's webpage](#).

needs. An Executive Secretariat which will perform the day-to-day management of Future Earth, ensuring the coordination across themes, projects and regions.

Current GEC programmes have national committees that ensure that these initiatives are strategically linked with national research communities and priorities. These national committees will be asked to play a vital role in implementing Future Earth at the national level, and should be encouraged to work together on a regional basis. They need to be encouraged to transition away from being programme-specific and assist in the development of Future Earth communities.

Towards a funding strategy

Future Earth will require innovative funding mechanisms and increased coordination to secure the enhanced levels of funding needed for the continuation of current GEC activities as well as new activities. This will require the strengthening of funding bases for disciplinary and trans-disciplinary research and coordination activities. The Alliance will work with the Governing Council and Executive Director to secure new and enhanced sources of funding. Already, the Belmont Forum has launched in 2012 a new open and flexible process to support international collaborative research actions through annual multi-lateral calls to support environmental research. In addition, members of the Belmont Forum and the Informal Group of Funding Agencies (IGFA), who have been very supportive of GEC activities, will need to proactively engage with funders at national and regional levels, including non-traditional government funding agencies, as well as reach out to foundations and the private sector.

Towards a new model of communications and engagement

Future Earth will position itself as a lead provider of independent, impartial and innovative research for global sustainability. It will provide a vibrant, dynamic platform that encourages dialogue, accelerates knowledge exchange, and fosters innovation. Future Earth will develop a comprehensive and flexible communications strategy to engage all relevant stakeholders at the local to global level, by combining the traditional top-down expert information sharing approach with a demand-driven approach based on stakeholder needs.

*Robert Watson, Martin Visbeck and Steven Wilson
On behalf of the [Future Earth Transition Team](#)*

Helping scientists and policymakers work together

An American example

Writing from the other side of the Atlantic, the American Meteorological Society Policy Program team introduces their project and describes their efforts in strengthening the connection between public policy and Earth system science.

In the heart of downtown Washington, DC, nestled between the White House and Capitol Hill, stands the headquarters building for the American Association for the Advancement of Science (AAAS). On the fourth floor you can find a group whose vision is to benefit society by building bridges between the science and policy communities: the [American Meteorological Society \(AMS\) Policy Program](#).

The Program is a division of the Boston-based scientific and professional society that promotes the development of the atmospheric and related oceanic and hydrologic sciences and the advancement of their professional applications. With a membership of 14,000 professionals, students, and weather enthusiasts, AMS publishes eleven peer-reviewed journals, sponsors more than 12 conferences annually, and offers numerous programmes and services.

In America's capital city, the AMS Policy Program promotes informed and thoughtful decision-making through analysis, communication, creative problem solving, research, and activities that enhance working relationships between policymakers and scientists.

Core principles

Program staff believe public policy advances the interests of society most effectively when grounded in the best available knowledge and understanding. According to them, there is room for

improvement for scientists to become more effective at conveying their knowledge beyond the scientific community and recognising how value judgments and perspectives that lay outside their areas of expertise also affect policy. Members of the Program also help ensure that policy makers are armed with best available scientific understanding so they can more effectively account for competing economic, ethical, and philosophical concerns that influence policy choices. The Policy Program strives to provide policy-relevant options and analysis that are unbiased and non-prescriptive.

The Policy Program's effectiveness routinely depends on collaborations and partnerships with a wide range of groups, including those who share its vision and those who hold different views. The Program's staff aims to establish strong collaborations and partnerships in pursuit of using Earth science for societal benefit. To the maximum extent possible, they focus on partnerships that are collaborative, solution-oriented, inclusive, and that transcend disciplinary boundaries.

What we do

The AMS Policy Program (APP) is taking steps to ensure that current and future scientists are prepared to handle weather and climate policy issues that directly affect our safety, health, economy, environment, and national security. Public policy impacts the Earth system (i.e., climate change, air quality), shapes our sensitivity to weather, climate, water and the near-space environment (i.e., electricity deregulation, land use), and can either enhance or constrain the utility and value of Earth system science information (i.e., managing watersheds). Policy can also affect the viability of these



The 2012 Summer Policy Colloquium participants, as part of the 10-day curriculum, visited Capitol Hill to meet Congressional staffers and learn how they assist in the policy process.

sciences (i.e., budgets, data sharing, education, immigration policy, public-private partnerships).

From the local to the federal level, US policymakers confront daily and long-term decisions on scientific issues. The AMS Policy Program (APP) helps them keep abreast of advances in Earth system science, as they relate to public health and safety, national security, the economy and the environment.

APP is working to build the field of policy research with respect to Earth system science and services, in several ways. First, the Policy Study Series is an important tool for the development of policy analyses with respect to major challenges facing society. However, that body of policy analysis by itself will not cover all facets of this subject. The APP is therefore working to build the capacity of the field of policy research as a whole, by educating Congress about areas in need of additional research, rather than only performing the needed research in-house.

To truly make an impact, however, the APP communicates developments involving the Program to the media, AMS members and the scientific community, to ensure that the group's ideas, policies, and goals are implemented through stakeholders, decision makers and the general public.

Summer Policy Colloquium

As part of its mission to prepare scientists to engage the policy process, every June the AMS Policy Program holds its [Summer Policy Colloquium](#), a training programme that brings a select group of students, faculty, mid-level managers and scientists to Washington, DC for an intense, 10-day immersion in policy. The Colloquium, which began in 2001, provides an overview of policy basics and how decisions are made governing the course and future of Earth system science. Participants gain knowledge about the policy process and training to engage in science policy effectively and responsibly.

Participants have the opportunity to interact with US federal officials, Congressional staffers, and others who make policy decisions. This activity helps participants build skills, experience and contacts they can use throughout their careers to understand and influence the

policy process. The participants can gauge their aptitude for and interest in the challenges of matching Earth and atmospheric science to societal priorities and scientific programme leadership.

To date, the Colloquium has more than 400 alumni, who are moving up into leadership and policy-level positions. The alumni continue to network at the AMS Annual Meeting, through collaborations, and will be benefiting the field as a whole.

The 2013 Summer Policy Colloquium will be held in Washington, DC, June 2–11. Earth and atmospheric scientists from academia, government and the private sector will have access to high-level US Executive Branch and Congressional decision makers. Participants learn from leaders in the federal agencies and Executive Office of the President, Congressional staff members from both major US political parties and other leaders engaged in the policy process. They also build a network of contacts and resources that will help them engage in science policy. The Colloquium also includes visits to Capitol Hill, hands-on workshops, and case studies of current issues in the earth and atmospheric sciences. For example, the 2013 Colloquium will cover the federal budget process, communicating research to non-scientific audiences, government affairs for the university, federal government and private sector, and the different roles of the scientist when engaging in the policy process.

Registration is open to all those interested, regardless of country of citizenship. Financial assistance is available from the National Science Foundation (NSF). To be eligible for NSF support, students, postdoctoral fellows and faculty must be currently affiliated with a US institution or university and be AMS (student) members, or applicants. To submit an application, visit the [Colloquium website](#). This site also includes agendas from previous years and details on the application process. The deadline to register is Sunday, March 31, 2013. Participation is limited to 50 individuals.

Prospective applicants may contact Caitlin Buzzas at cbuzzas@ametsoc.org with questions about the AMS Summer Policy Colloquium. For general inquiries about the AMS Policy Program, please contact Dr William H. Hooke at hooke@ametsoc.org.

Ellen Klicka

On behalf of the AMS Policy Program team

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Micropalaeontology: from the seafloor into your classroom

In this edition of GeoQ, we asked school teacher and former participant in EGU's Geosciences Information for Teachers workshop Helder Pereira to share his classroom experiences. He describes two laboratory activities that he has conducted with his students since he took part in the Teachers at Sea programme in 2008, co-sponsored by EGU. He hopes other teachers will follow suit!

When I ask my students to mention an example of a fossil they know, the answer is invariably the same: dinosaur bones and other large fossils. Although, like most of my students, many people associate palaeontology with the study of dinosaurs, there are other fields of palaeontological research almost unknown to the general public, but of great importance for the understanding of our dynamic planet. In addition to the large specimens, there are other fossils that require palaeontologists to use microscopes, to identify their features and recognise species, and are therefore referred to as microfossils (minute remains of organisms found in rocks and sediment). There are different groups of microfossils. Marine microfossils include diatoms, foraminifera, ostracods, radiolarians and silicoflagellates, while pollen and spores are examples of terrestrial microfossils (see box).

Microfossils are very useful to scientists. They can use them to determine the relative age of sediments and rocks, to establish biostratigraphical correlations, for studying past environments and climates, to establish where oil and gas may be found, and more.

Extracting and observing microfossils from marine sediments

Scientists can extract microfossils from almost all fossiliferous sedimentary rocks, but it is easier to recover them from unconsolidated marine sediments (learn how you can get samples to use in your classroom in IODP's, Integrated Ocean Drilling Program, [website](#)).

Method 1 – Wet sieving

While using soft sediments wet sieving is the simplest and most efficient method to prepare a sample. Foraminifera, usually called 'forams' by scientists, are amongst the most abundant marine microfossils and are quite easy to extract using this method. And depending on the sample, with some luck, your students also will be able to find some ostracod valves too!

Materials

- 63 µm mesh sieve
- gridded picking tray or Petri dish
- fine sable paintbrush (size 000 or 0000 recommended)
- card slides divided into numbered squares with sliding glass covers and hair gel (optional)

Diatoms are microscopic unicellular algae (cells range in size from about 2 to about 500 µm) with silicified walls that form a frustule, comprising two valves, one overlapping the other like the lid of a box. There are two different groups, the pen-shaped pennate diatoms and the radial or cylindrical species, known as the centric diatoms.

Foraminifera are an important group of single-celled protozoa (usually sand-sized) that live either on the sea floor or amongst the marine plankton. The cytoplasm of these organisms is mostly enclosed within a shell that consists of a single or multiple chambers interconnected by one or several openings. Benthic foraminifera have evolved a wide spectrum of architectures pending on their life style (in or on the sediment) and are often flat and have depressed chambers. The planktonic foraminifera generally have spherical chambers.

Ostracods are small, bivalved crustacea, with two chitinous or calcareous valves (usually less than 1-mm long) that hinge above the dorsal region of the body form their carapace.

Radiolarians are a group of single celled protozoa (average between 50 and 200 µm in diameter) that live amongst the marine plankton. A mineralised silica-rich skeleton is usually present within the cell and includes extensions that resemble spikes. There are two groups: the cone-shaped nassellarian radiolarians and the lace-like spumellarian radiolarians. They occur in spherical, discoid, conical, radial arm-like or ring-like forms.

Silicoflagellates are a group of unicellular algae (usually from 20 to 100 µm in diameter) found in marine environments. A skeleton of hollow rods, composed of opaline silica, supports the cytoplasm internally. Their shape may vary from a simple ring-like structure with spines to elongated geometrical forms and relatively more complex dome-shaped structures. In smear slides they have a distinctive open lattice, usually more open than most radiolarians.

Spores and pollen are produced during the life cycle of plants – spores by the bryophytes and ferns, and pollen by the conifers and angiosperms. These microscopic grains are produced in vast numbers, and can travel widely and rapidly in wind or water, eventually settling on the bottom of ponds, lakes, rivers and even on the ocean floor.

Examples of marine and terrestrial microfossils, with description.



Photomicrograph of fossil planktonic foraminifera assemblage under a microscope: 40x magnification. (Credit: H. Pereira)

Suggested procedure

This method basically consists of the following steps: disaggregating the sample (about 10 cm³), removing fine sediment by soaking and washing it with water through a 63 µm mesh sieve, drying the sand sized fraction in an oven (at 40 to 50 °C) and observe it under a binocular stereo microscope (with a magnification of 10x to 40x).

The dried sand sized fraction should be poured onto a picking tray so that no sediment grains cover other grains and your students can examine the sample. They can manipulate the sediments on the tray using a fine sable paintbrush and try to distinguish planktonic from benthic foraminifera species based on their shell morphology (see figure on previous page).

A simple quantitative analysis to estimate the planktonic/benthic ratio and infer water depth at the time of deposition can also be undertaken using the following regression:

$$\text{Depth} = e^{3.59 + (0.04 \times \%P)}$$

where the planktonic fraction $\%P = 100 \times P/(P + B)$, with P being the amount of planktonic foraminifera and B the amount of benthic foraminifera.

In scientific studies, to ensure statistical validity, usually 300 specimens are counted in randomly chosen grid squares from the tray, but counts of about 100 specimens should be sufficient.

Lastly, students can use the fine sable paintbrush to pick out a selection of specimens from the tray. The selected specimens can then be mounted, using hair gel as glue, for permanent reference in card slides divided into numbered squares with sliding glass covers.

Method 2 – Preparing smear slides

An alternative method to observe not only foraminifera, but also other groups of microfossils like diatoms, radiolarians and silicoflagellates, and that requires an extremely small sample (no bigger than a head of a pin), is the preparation of smear slides.

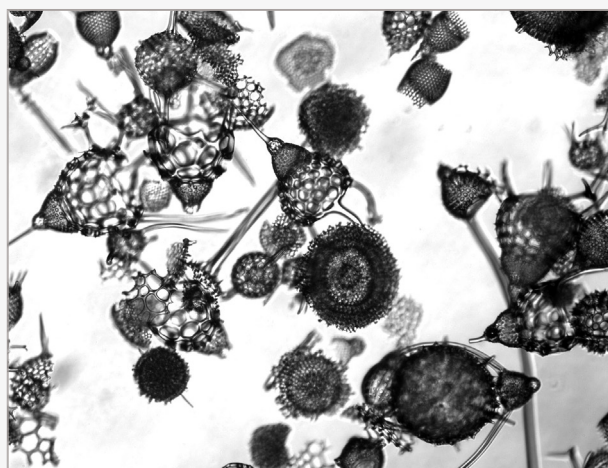
Materials

- glass slides
- labels
- toothpicks
- cover slips

Suggested procedure

Take a microscope glass slide in hand, label it with information about the sediment sample and place a few drops of distilled water in its center. Collect a tiny fraction of the sediment sample with a toothpick, and mix it into the water on the glass slide. Spread the wet sediment with the toothpick until it forms a thin translucent coat across the glass slide, and then carefully place a cover slip on the slide.

Smear slides can then be examined under a common or a petrographic light microscope (see figure on top of this page). While the identification of microfossils is not easy, you can ask your students to identify and label each microfossil on the slide using the descriptions in the box on the previous page and the educational resources provided at the end of this article.



Photomicrograph of fossil radiolarians under a microscope: 100x magnification (Credit: H. Pereira)

By doing any of these lab activities your students will realise that, as incredible it might seem, by studying the fossilised remains of these tiny organisms, scientists can obtain important information about our planet at the time of their deposition on the seafloor.

Acknowledgments

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Hélder Pereira

Teacher at Escola Secundária de Loulé, Portugal

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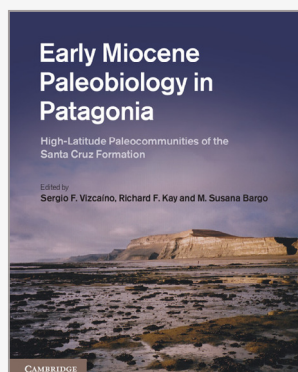
Online educational resources on marine sediments and microfossils

- [Teachers at Sea programme](#) aboard the R/V Marion Dufresne during the MD168 AMOCINT cruise
- IODP [sample request](#) for teaching and educational purposes
- [Microfossils: The Ocean's Storytellers](#) poster, with activities on the back
- Fossil Fun: A Microfossil Matching [game](#), [fact sheet](#) and [microfossil key](#)
- [Microfossil Image Recovery And Circulation for Learning and Education](#)
- [Diatom identification guide & ecological resource](#)
- [Foraminifera Gallery](#) – illustrated catalog
- [Radiolaria.org](#) online database
- [Sédiments océaniques et paléoclimats](#) (in French)
- [Projecto Laboratório Oceano \(LABO\)](#) (in Portuguese)



Early Miocene Paleobiology in Patagonia

High-Latitude Paleocommunities of the Santa Cruz Formation



Edited by Sergio F. Vizcaíno,
Richard F. Kay and M.
Susana Bargo

CAMBRIDGE UNIVERSITY
PRESS

378 pages | Hardback
1st edition | October 2012
ISBN 978-0-52-1194617

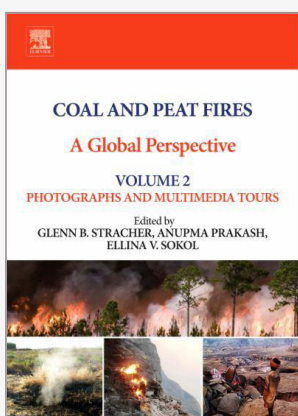
Price: £99 (~€115)

Publisher's summary

Coastal exposures of the Santa Cruz Formation in southern Patagonia have been a fertile ground for recovery of Early Miocene vertebrates for more than 100 years. [This volume](#) presents a comprehensive compilation of important mammalian groups which continue to thrive today. It includes the most recent fossil finds as well as important new interpretations based on 10 years of fieldwork by the authors. A key focus is placed on the palaeoclimate and palaeoenvironment during the time of deposition in the Middle Miocene Climatic Optimum (MMCO) between 20 and 15 million years ago. The authors present the first reconstruction of what climatic conditions were like and present important new evidence of the geochronological age, habits and community structures of fossil bird and mammal species. Academic researchers and graduate students in palaeontology, palaeobiology, palaeoecology, stratigraphy, climatology and geochronology will find this a valuable source of information about this fascinating geological formation.

Coal and Peat Fires: A Global Perspective

Volume 2: Photographs and Multimedia Tours



Edited by Glenn B. Stracher,
Anupma Prakash and Ellina
V. Sokol

ELSEVIER

584 pages | Hardback
1st edition | September 2012
ISBN 978-0-44-4594129

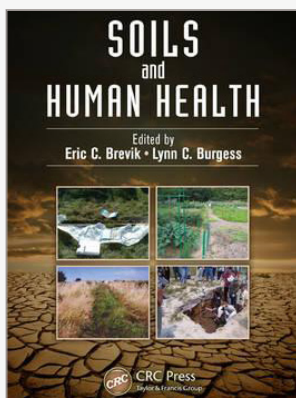
Price: €200 (currently
reduced to €140)

Publisher's summary

[Coal and Peat Fires: A Global Perspective](#) is a compelling collection of research conducted by scientists and engineers around the world. It presents the scientific and industrial communities as well as the interested lay reader with studies about prehistoric as well as historic coal and peat fires and magnificent illustrations of such fires and related research from countries around the world—a totally new contribution to science. The second of four volumes in the collection, Photographs and Multimedia Tours features stunning photographs from around the world, including Australia, Canada, Northern China, India, Borneo, Italy, Poland, Portugal, Russia, the United States, and more. This essential reference also includes a companion website with a collection of slide presentations and videos about coal and peat fires.

Soils and Human Health

A book review



Edited by Eric C. Brevik and
Lynn C. Burgess

CRC PRESS (TAYLOR &
FRANCIS)

408 pages | Hardback
1st edition | December 2012
ISBN 978-1-43-984454-0

Price: £76.99 (~€90.00)

Soils and Human Health covers a wide range of topics clearly addressed to soil scientists, agronomists and human nutritionists but at the same time includes topics of potential interest to environmental scientists, geologists and physicians of different specialties. The book describes a common scientific basis and several specific scientific topics to a wide variety of readers, including experts, identifying areas to be further studied and investigated. It reaches this aim by using an accessible, although technical, language that is understandable by professionals across multiple disciplines.

The editors, Eric C. Brevik and Lynn C. Burgess, both have a solid academic position, with several years of experience teaching and communicating soil science, biology, environmental health and related disciplines. Their particular focus is on the philosophical, historical and sociological aspects of soil science and environmental health, and on the toxicological impact of environmental pollution to both human and animal health.

The editors guide the authors of this comprehensive and inter-disciplinary work throughout a communicative and cooperative product, extremely rich in figures, tables and several case studies. Their ability is to strongly connect extremely specialised and focused disciplines, which traditionally lack direct communication, using distinct methodologies and impressive language.

Three main sections complete the work, starting with an introduction to general aspects of soil science that offers the reader an overview of soil and human health interactions. In Section II, the book describes the main classes of pollutants, toxic elements occurring in soil and water environments and their connection to human exposure and health. Soils have always been important repositories and

sinks of inorganic and organic agents generated by both natural and anthropogenic processes. Consequently, they have been recognised as physical media of direct toxicity and indirect exposure through agricultural products. In addition, in recent decades, soil biology has also revealed the role of microorganisms in transmitting diseases to humans through the close relationship of humans with soils.

Section III of the book examines the aspects of the use of soil and/or soil portions for human purposes and describes the close relationship between soil and the health and wealth of humans. A key aspect of this interaction is agriculture, especially organic farming, which is commonly believed to stimulate soil biology, overall quality of food products and indirectly affect nutritional quality and human health. The section closes with the mission of promoting soil conditions that protect and advance human health, the complex concept of soil quality, how human exposure to soil-related hazards can be reduced, and the promotion of measures that prevent toxic chemicals and contaminants from reaching the soil.

This last section balances the theme of food security, which is declining through processes that threaten soil functions and reduce its ability to support plant growth and food products for the world population, and the increase in the global population combined with the decline in arable land. The adaptation of humans to climate change is also described for various geographical areas and society cradles.

Theoretical and practical aspects of the connections and the relationships between soils and human health and wealth are still far from being exhaustively disclosed but this book is the first attempt to show the key issues and scientific topics that still need to be investigated. It guides both students and scientists to understand the physical, chemical and biological complexity of different issues throughout the book. Soils are more often used (or abused) as environmental sinks of all kind of products generated by modern society and therefore soil systems tend to accumulate all kinds of chemicals and living organisms that are potentially very harmful to humans in the short or long term. A deep dive through the chapters will surely stimulate the reader to think about the overall concerns that are going to affect human beings in the future.

Teodoro Miano

Professor of Soil Chemistry, University of Bari, Italy

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Featured website

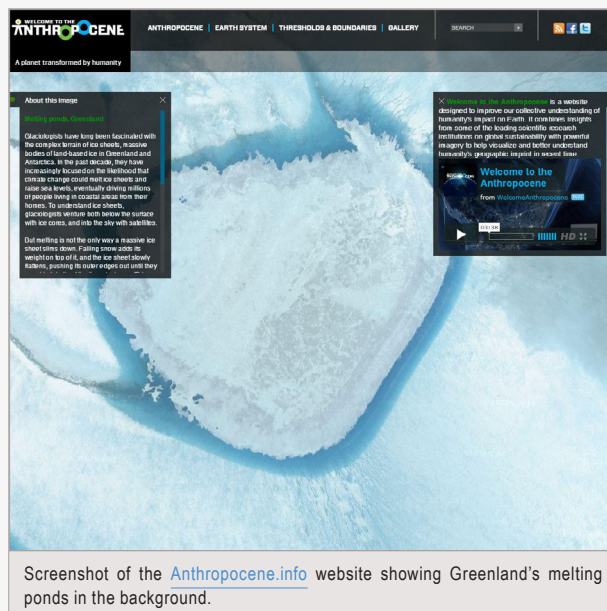
Anthropocene.info

Last summer, the United Nations Conference on Sustainable Development (Rio+20) opened with a stunning and scary animated film showing how humans have impacted our planet over the past 250 years. [Welcome to the Anthropocene](#) explains in three minutes how we have entered “a new geological epoch dominated by humanity” and highlights the benefits and dangers of living in such a time.

The global sustainability message of the film is carried on in its accompanying website. Anthropocene.info is an educational tool designed to inform people in more detail about this new epoch in the Earth's history where humans are the main driver of global environmental change. The page's [About](#) section states that “[The site's] unique combination of high-level scientific data and powerful imagery will help people visualise and better understand humanity's geographic imprint in recent time” and it does just that.

The high-resolution satellite images, accessible from the [Gallery](#) section, are indeed one of the strongest features of the website. In this section, the user can zoom in into various highlighted locations on planet Earth where human-made environmental change is particularly evident. Almeria, for example, is the Spanish province with the largest concentration of greenhouses in the world, and the white plastic they are made of reflects so much sunlight into the atmosphere that the region has, in contrast with the rest of the country, cooled down in the past 30 years. Another example is the Arabian Desert, which features circular green crops contrasting their sandy and dry surroundings – an agricultural venture made possible by humans tapping fossil groundwater, a finite resource. Some of the world's megacities and Greenland's melting ponds are also highlighted in this attractive and curious gallery.

But there is much more to Anthropocene.info than powerful imagery. The website includes informative sections on the [Anthropocene](#), the [Earth System](#), and [Thresholds & Boundaries](#), which teach the user about the planet's geological time scale, the Earth's complex



Screenshot of the Anthropocene.info website showing Greenland's melting ponds in the background.

interconnected systems, and environmental tipping points, respectively. The [Anthropocene](#) page is the most complete, also including instructive material on significant events in humanity's history such as [The Dawn of Agriculture](#) and [The Industrial Revolution](#).

The site, a project coordinated by the International Geosphere-Biosphere Programme (IGBP), is a collaborative effort between scientists from leading research institutions on sustainability and science communicators. At the time of writing, the page was still showing its beta version, with the fully developed site expected soon.

Bárbara Ferreira

EGU Media and Communications Manager and Chief Editor of GeoQ

Featured blogs

[The Contemplative Mammoth and The Landslide Blog](#)

What better way to highlight exciting geoscience on the web than featuring some fantastic blogs? In this issue, we're focusing on the [The Contemplative Mammoth](#) by ecologist and biogeographer, Jacquelyn Gill and, from the AGU's blogosphere, [The Landslide Blog](#) by Dave Petley, a geoscientist at Durham University.

[The Contemplative Mammoth – Jacquelyn Gill](#)

Jacquelyn, a doctor of ice-age megaherbivores, plant-climate interactions and extinction, regularly writes about palaeoecology and her experience as an academic scientist.

She is currently completing a post-doc in ecological tipping points and the conservation lessons of Quaternary extinctions at Brown University, so is more qualified than most to blog about this field. Her posts don't stop there though – in fact, Jacquelyn's [past posts](#) provide a great resource for any scientist hoping to better communicate their work with the public. From using social media tools to aid academic productivity, to the quirks of scientific debate, and how science online can be used to crowd-fund projects.

Perhaps the best part of her blog is that it is so fantastically personal. So much so, that at the end of each story, you don't even realise that you've been taught the marvels of megafauna, or the dispersal routes of a palaeo-plant, but leave feeling warm and enlightened – or, in my case, stay and repeatedly refresh the screen for the next post!

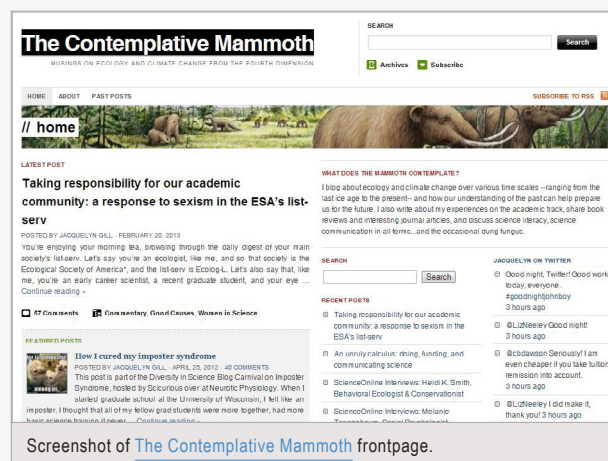
From interviewing eminent scientists to posting witty and insightful posts on the latest developments in palaeoecology, The Contemplative Mammoth is not one to miss – so start [here](#)!

The Landside Blog – Dave Petley

Dave Petley is the Wilson Professor of Hazard and Risk in the Department of Geography at Durham University and [The Landside Blog](#) provides readers with regular updates on hazardous landslide events around the world.

Dave's blog is visually stunning, using photographs of landslides and their effects on infrastructure to raise public awareness of landslide dynamics and the hazards associated with them. These images are coupled with informative diagrams and striking footage that enhances public understanding.

The Landside Blog brings together current landslide events (particularly those that have been picked up in the media) and the science behind them. What reduces the stability of the area? How has this affected the land and why? These are some of the questions Dave tries to answer in his posts.



Screenshot of [The Contemplative Mammoth](#) frontpage.



Screenshot of [The Landside Blog](#).

Interested in communicating your research to a wider audience? Dave will be talking about how he uses The Landside Blog to share current research at the EGU General Assembly in the session [Blogs and Social Media in Scientific Research](#). Don't miss it!

Sara Mynott
EGU Communications Officer





EGU General Assembly 2013

07–12 April 2013, Vienna, Austria

The 2013 General Assembly of the European Geosciences Union (EGU) will bring together geoscientists from all over the world into one meeting covering all disciplines of the Earth, planetary, and space sciences. Especially for young scientists, it is the aim of the EGU to provide a forum where they can present their work and discuss their ideas with experts in all fields of geosciences. The EGU is looking forward to cordially welcoming you in Vienna.

Website: <http://egu2013.eu>

8th Annual International Symposium on Environment

13–16 May 2013, Athens, Greece

The aim of the conference is to bring together scholars and students of environment from all disciplines such as engineering, biology, chemistry, geology, economics, geography, history, political science, communications, environmental health, environmental law & justice, government policy, among others.

Website: <http://www.atiner.gr/environment.htm>

International Workshop on Seasonal to Decadal Prediction

13–16 May 2013, Toulouse, France

The goal of the workshop is to review our current abilities to make skillful predictions on seasonal to decadal timescales. The availability of results from the Climate-system Historical Forecasting Project and the Coupled Model Intercomparison Project, together with active investigations in operational and research communities, support the timeliness of the workshop.

Website: <http://www.meteo.fr/cic/meetings/2013/s2d/>

Japan Geoscience Union Meeting 2013

19–24 May 2013, Chiba-city, Japan

The annual meeting of the Japan Geoscience Union covers areas such as space and planetary sciences, atmospheric, ocean, and environmental sciences, human geosciences, solid Earth and biogeosciences. All presentation of international sessions are in English.

Website: http://www.jpгу.org/meeting_e/

Summer School on Climate Change Impacts and Policy in the Mediterranean Basin

20–24 May 2013, Venice, Italy

The main purpose of this school is to deeply investigate the key issues of the Climate Change Impacts and Policy in the Mediterranean Basin with the objective of enhancing awareness among students, policy makers, governments and representatives of the local communities involved in the field. The school is targeted to doctoral and post-doctoral students in environmental and resource economics, law, political science and engineering from all over the world.

Website: <http://bit.ly/ccimpactsschool>

GAS–MAC Joint Annual Meeting

22–24 May 2013, Winnipeg, Manitoba, Canada

The Joint Annual Meeting of the Geological Association of Canada and the Mineralogical Association of Canada is being held at the Convention Centre in downtown Winnipeg. On-line conference registration, including field trips and short courses, opened on 1 March.

Website: <http://gacmacwinnipeg2013.ca/>

10th HSTAM International Congress on Mechanics

25–27 May 2013, Chania, Crete, Greece

The congress is organised by the Hellenic Society for Theoretical and Applied Mechanics in cooperation with the Technical University of Crete. Scientific areas covered include fluid mechanics, dynamics and wave propagation, micromechanics and nanotechnology, and geomechanics and biomechanics

Website: <http://www.10hstam.tuc.gr>

75th EAGE Conference & Exhibition incorporating SPE EUROPEC 2013

10–13 June 2013, London, United Kingdom

The upcoming event of the European Association of Geoscientists and Engineers and the Society of Petroleum Engineers features a six-day programme consisting of a large conference and a technical exhibition presenting the latest developments in geophysics, geology and reservoir/petroleum engineering.

Website: <http://bit.ly/EAGEmeeting>

Space Climate 5 Symposium

15–19 June 2013, Oulu, Finland

Space Climate is an interdisciplinary science that deals with the long-term change in the Sun, and its effects in the heliosphere and in the near-Earth environment, including the atmosphere and climate. A special focus will be on studies of the causes, consequences and implications of the present, unusually low solar activity since solar cycle 23 that, most likely, indicates the imminent end of the Modern Grand Maximum of solar activity. Other topics include solar dynamo, solar irradiance variations, solar wind, geomagnetic field and activity, cosmic rays and cosmogenic isotopes, and solar effects on different layers of the atmosphere and on local and global climate, as well as possible solar effects on human health and on the development of human cultures.

Website: <http://www.spaceclimate.fi/>

AOGS 10th Annual Meeting

24–28 June 2013, Brisbane, Australia

The annual conventions of the Asia Oceania Geosciences Society provide a unique opportunity of exchanging scientific knowledge and discussion to address important geo-scientific issues among academia, research institution and public.

Website: <http://bit.ly/AOGSmeeting>

International Symposium on Planetary Sciences (IAPS2013)

01–04 July 2013, Shanghai, China

The IAPS2013 will bring together international scientists to present the latest results of research and development in planetary exploration and science. Topics include planetary geodesy, navigation, remote sensing, atmosphere, ionosphere/plasma physics, magnetic and gravity field, geomorphology, geophysics, geology, petrology, geochemistry, interior physics, life & astrobiology, giant & extrasolar Planets, etc. The deadline for abstract submission is 15 May.

Website: <http://202.127.29.4/meetings/iaps2013/>

FESP IV. Fire effects on soil properties

02–05 July 2013, Vilnius, Lithuania

The Mykolas Romeris University (Faculty of Politics, Department of Environmental Policy) has the pleasure to announce the 4th International Meeting of Fire Effects on Soil Properties, which aims to bring together worldwide fire and soil researchers and contribute to the scientific communication in the environment, towards sustainable development.

Website: <https://sites.google.com/site/fespivvilnius/>

17th International Symposium on Ostracoda: 'Back to the Future'

23–26 July 2013, Rome, Italy

The Italian Ostracodologists' Group and the International Research Group on Ostracoda are pleased to invite you to attend the 17th International Symposium on Ostracoda that will be held at the University of Roma Tre. The 17th ISO will occur 50 years after the First International Symposium organised by H.S. Puri in Naples (Italy) in 1963, and the Italian Ostracodologists are particularly glad to celebrate this anniversary back in Italy.

Website: <http://www.iso17.unipr.it/>

13th International Workshop on Modelling of Mantle and Lithosphere Dynamics

31 August–05 September 2013, Hønefoss, Norway

The numerical Earth sciences community meets every two years at an international workshop to discuss numerical techniques, investigate exciting new avenues, foster collaboration, and introduce students to the interesting challenges of mantle and lithosphere modelling. The 2013 workshop will include: numerical techniques, subduction dynamics, linking surface and deep processes, geophysics, chemistry and dynamics of planetary interiors, multi-scale physics of the crust and lithosphere. The deadline for abstract submission is 31 July.

Website: <http://www.earthdynamics.org/lucky13/>



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