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The geology of European coldwater coral carbonate mounds

the CARBONATE project

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Total lunar Eclipse, March 2007, Image Credit: Bruno Thien , CEA , Bagnols-sur-Cèze - France. Distributed by EGU via www.imaggeo.net

EGU General Assembly 2010

Highlights and tips

A full week of sessions and other events is waiting this year`s participants of the Wien General Assembly of the EGU 2010 between the 2nd and the 7th of May. The full programme can be accessed at http://meetingorganizer.copernicus.org/EGU2010/sessionprogramme . You can create, store, modify and print your own personal programme at http://meetingorganizer.copernicus.org/EGU2010/personal_programme .

Below we list some events that might be worth attending.

The Medal lectures, even if the lecturer is outside one`s narrow field, can be extremely rewarding to attend. There are 33 of them, listed under http://meetingorganizer.copernicus.org/EGU2010/sessionprogramme/ML .

Keynote lectures are usually also very interesting. For this year, the following four Keynote lectures are foreseen:

--Gauss Lecture of the Deutsche Geophysikalische Gesellschaft (DGG), by Joachim Saur: Water, Ice and Fire: Exploring the moons of our solar system with magnetic fields, Room 12 / Wednesday, 05 May, 19:00–20:00.

Since 2006, the German Geopyhsical Society (DGG) promotes the C.F. Gauss Lecture within the frame of the General Assembly of the European Geosciences Union (EGU). Selected authors give an in-depth overview on a specific field of geophysics. The C.F. Gauss Lecture will be accompanied by a reception for members and friends of the DGG before it starts. All delegates of the EGU 2010 are invited to participate.

--Bullerwell Lecture from the British Geophysical Association presented to David Dobson (UCL), Tectonics of the lower mantle II: mineral physics constraints, Room 12 / Thursday, 17:30–18:30.

--GEOTECHNOLOGIEN Keynote Lecture on Earth observation from space by Robert Meisner (ESA), ESA's Earth Observation missions, Room 12 / Tue, 04 May, 17:30–19:00.

--Penck Lecture by Dimitri Lague, Room 21 / Thu, 06 May, 19:00–20:00 (no info available on the topic of this lecture).

You can also consider the opportunity to meet EGU while attending the Assembly. You can meet the President and various EGU officers including Division Presidents at the times and Rooms listed under http://meetingorganizer.copernicus.org/EGU2010/sessionprogramme/EGU .

Five short courses will be offered during this Assembly (see more info at http://meetingorganizer.copernicus.org/EGU2010/sessionprogramme/SC).

Two Great Debates in Geosciences, open to everybody interested in exchanging views and arguments, are organised for this year:

--Getting real about energy, Room D / Thu, 06 May, 15:30–17:15: In the context of climate change the discussion of energy provision is focused increasingly on renewables, but how realistic a proposition is it for renewables to provide the energy we need? Nuclear is touted by many as an alternative, yet the problem of waste is far from being solved. So when and how are we to come up with a rational energy policy for the next fifty years? What are the real issues and how do we overcome the barriers we face today?

Dr Caspar Hewett will moderate the discussion.

The structure of the debate will be as follows. First the chair will give a brief outline of the issues and central questions for the debate and introduce the panel of three or four speakers (5 minutes). The panel will then each be invited to give a short introductory presentation (6-8 minutes depending on number of speakers) setting out their position on the topic. They will each then be given 2 minutes to respond to points made by the other speakers. The second part of the debate will focus on questions and points from the floor addressed to the panel through the chair. The chair will take 4 or 5 questions/points at a time, then bring the panel in for brief responses before going back out to the floor. At the end of the session the panel speakers will be given 2 minutes to sum up.

Caspar Hewett is director and chair of The Great Debate (http://www.thegreatdebate.org.uk/). He has over ten years of experience of organising and chairing public debates and facilitating workshops for a variety of audiences. He is currently working as an environmental consultant, is a Visiting Fellow of Swan Institute for Energy Research at Newcastle University and is a founder and steering committee member of RCE North East (North East of England's /United Nations Regional Centre of Expertise in Education for Sustainable Development/).

--To what extent do humans impact the Earth's climate? Room D / Tuesday, 04 May, 12:15–13:15.

Last but not least, do not forget to attend the Division Bussiness meeting of your Division. Times and Rooms for these meetings can be found at http://meetingorganizer.copernicus.org/EGU2010/sessionprogramme/DBM .

The opening reception of the Assembly will take place at the 1st Floor on Sunday, 02 May, 18:30–21:00.

-Ed.

The Cryosphere included in Thomson's ISI Science Citation Index Expanded

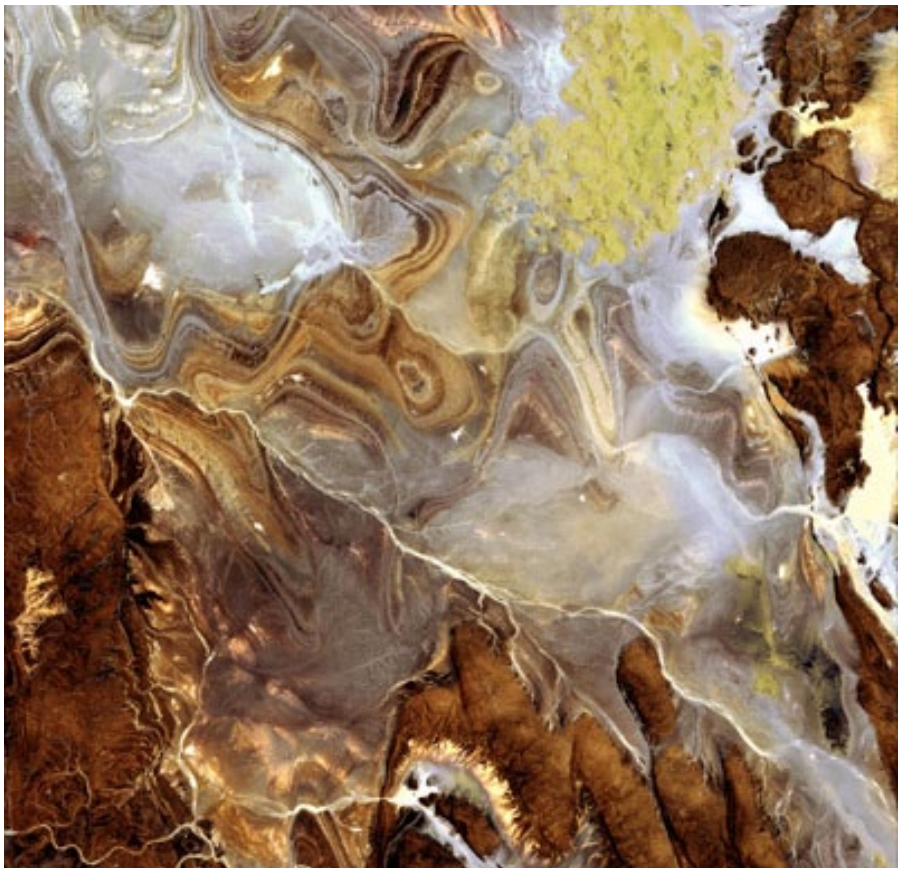
reflecting the efforts of the editorial board and the quality of papers submitted to it

After assessing the quality, number and characteristics of papers published in The Cryosphere since its launch in mid 2007, Thomson Reuters have announced that they will be including the journal in their ISI listings. This is excellent news for the journal and reflects the tremendous efforts of the editorial board, the quality of papers submitted to it, and its unique position in the scientific publications market. We are delighted that they will be backdating the listing to the first issue of the journal and look forward to further strengthening the journal's profile in the future.

TC Editors in Chief Jonathan L. Bamber - Stephan Gruber - Jon Ove Hagen - Peter Lemke - Michiel van den Broeke

EARTH FROM SPACE

Tanezrouft Basin in the Sahara desert



The landscape of the Tanezrouft Basin, credits: JAXA, ESA

23 October 2009.- The image shows the extraordinary landscape of the Tanezrouft Basin, one of the most desolate parts of the Sahara desert, in south-central Algeria. The region is known as 'land of terror' because of its lack of water and vegetation.

Most of the face of the Sahara stretching across Northern Africa is bare stone and pebbles rather than sand. With little vegetation present, the landscape is modified by strong, nearly constant wind erosion.

As visible, this region is characterised by dark sandstone hills, steep canyon walls, salt flats (white), stone plateaus, sandstone outcrop patterns of concentric loops and sprawling seas of multi-storey sand dunes known as 'ergs'. Erg Mehedjibat, which appears as a yellow bouquet of flowers (upper right), is made up of a cluster of small star dunes that grow upward rather than laterally.

Occupying approximately 10% of the African Continent, the Sahara is the largest desert in the world. It covers an area of about 9 million sq km over parts of Algeria, Chad, Egypt, Libya, Mali, Mauritania, Morocco, Niger, Tunisia and the Sudan.

The Algerian Sahara makes up more than 90 percent of the country's total area. Major oil and natural gas deposits lie beneath the Sahara's surface, contributing to Algeria's position as one of the wealthiest African nations. As large as the whole of Western Europe, Algeria is the second-largest country in Africa, after the Sudan.

Japan's ALOS (Advanced Land Observing Satellite) captured this image on 24 June 2009 with its Advanced Visible and Near Infrared Radiometer type-2 (AVNIR-2) instrument, which is designed to chart land cover and vegetation in visible and near infrared spectral bands with a resolution of 10 m.

ESA is supporting ALOS as a Third Party Mission, which means ESA utilises its multi-mission European ground infrastructure and expertise to acquire, process and distribute data from the satellite to its wide user community. To date, ESA has delivered ALOS data to more than 270 research and application projects, serving some 500 users.

ESA

Asteroid killed off the dinosaurs, says international panel

the Cretaceous–Tertiary mass extinction, which wiped out more than half of species on Earth, was caused by an asteroid colliding with Earth and not massive volcanic activity, according to a review, published today in Science.

Today's review of the evidence shows that the extinction was caused by a massive asteroid slamming into Earth at Chicxulub in Mexico.

It was previously argued about whether the extinction was caused by the asteroid or by volcanic activity in the Deccan Traps in India, where there were a series of super volcanic eruptions that lasted approximately 1.5 million years. These eruptions spewed 1.100.000 km3 of basalt lava across the Deccan Traps and were thought to have caused a cooling of the atmosphere and acid rain on a global scale.

In the new study, scientists analysed work done over the last 20 years. Geological records show that the event that triggered the extinction destroyed marine and land ecosystems rapidly, according to the study, concluding that the Chicxulub asteroid impact is the only plausible explanation for this.

Despite evidence for relatively active volcanism in Deccan Traps at the time, marine and land ecosystems showed only minor changes within the 500.000 years before the time of the KT extinction. Furthermore, computer models and observational data suggest that the release of gases such as sulphur into the atmosphere after each volcanic eruption in the Deccan Traps would have had a short lived effect on the planet. These would not cause enough damage to create a rapid mass extinction of land and marine species.

Reference: "The Chicxulub Impact and Mass Extinction at the Cretaceous-Paleogene Boundary", Science, Joanna Morgan, (for a full listing of authors please see paper), Schulte et al., The Chicxulub Asteroid Impact and Mass Extinction at the Cretaceous-Paleogene Boundary, Science, 5 March 2010, Vol. 327, no. 5970, pp. 1214 - 1218, DOI: 10.1126/science.1177265.

BOB (Bubbles OBservatory module)

seismicity and fluid expulsion along the North-Anatolian fault

03 November 2009.- The scientific cruise MARMESONET took place in the Marmara sea from 4th November to 14th December on the French oceanographic vessel Le Suroît. The cruise had two objectives: to determine a possible link between seismicity and fluid expulsion along the North-Anatolian fault and to conduct, with the network of excellence ESONET , preliminary studies for the introduction of permanent underwater observatories intended to watch the seismic activity threatening the region of Istanbul and its 12 million inhabitants. Within this context, «BOB» (Bubbles OBservatory module), a system of surveillance of gas bubble expulsion at the seabed, will be deployed.

Studying the links between fluid seepage and seismicity in the Marmara sea

Along active faults, gas, mainly methane, seeps from the sediment. The North-Anatolian fault has already produced devastating earthquakes along its 1600 km. The most dangerous segment of the fault today, the only one not to have ruptured since 1766, is located south of Istanbul, less than 20 km from the shoreline. This segment is the only one not presenting gas seepage. During the next earthquake, the gas trapped in the sediment will be expulsed. The question is to discover if gas release priming will occur just before rupture...

Further to the earthquakes in Izmit and Düzce in 1999, a Franco-Turkish cooperation, managed by INSU, resulted in six cruises on French ships (Ifremer and IPEV), aiming at better characterizing the seismic risk in the Marmara sea. The MARMESONET cruise is based on the results of these cruises. The project involved Ifremer, CEREGE (CNRS/INSU, University of Aix-Marseille III, Collège de France), INGV (Rome), ISMAR (CNR, Bologne), the Istanbul Technical University and the Institute of Marine Science and Technology (Dokuz Eyul University, Izmir).

Several actions will be led within the MARMESONET cruise: detection of fluid seepages and micro-bathymetry of the different study sites aided by an Ifremer AUV (Autonomous Underwater Vehicle) equipped with a CNRS-INSU sounder; fine imagery of the fluid routes up to the surface of the sediment; for each site, recording, coupled with microseismicity, of interstitial pressure and water/sediment flows over a one-year period. The underwater bubble observatory BOB, will also be installed in the Cinarcik basin for acoustic surveillance of gas bubbles.

In what conditions, and according to which processes, could fluid or gas seepage occur before an earthquake? The permanent multi-disciplinary underwater observatories will provide answers to this question.

Underwater observatories to further our knowledge of the oceans

Underwater observatories are comparable to laboratories placed on the ocean floor. Equipped with a set of measuring tools, they are capable of recording different types of data to help understand oceanic phenomena. Located at sensitive sites around the planet, such as formation zones in deepwater, seismic and hydrothermal zones, these pluridisciplinary instruments will provide real time ocean surveillance, to evaluate and warn against natural risks (linked to earthquakes, slope instability and tsunamis), ensure long-term monitoring of climatic evolution and the impact of global change on the oceans and in particular on ecosystems and biodiversity.

The network of excellence ESONET, coordinated by Ifremer, aims to prepare the implementation of pluridisciplinary underwater observatories on 12 sites in Europe, including one in the Marmara sea. A new mark has been passed with

the MARMESONET cruise as it will contribute to the implementation of the permanent underwater observatories enabling to collect long-term data, and in particular on the interactions of fluid-seismic activity. The reduced dimensions of the Marmara sea, the proximity of the coast and the societal challenges (in addition to the seismic risk and the problems of pollution in the Istanbul region which require continuous surveillance of the water quality) are such that installing cabled multi-parameter observatories will be a reality in the coming years.

Of the 12 ESONET sites, French participation is concentrated mainly on 3 sites with specific perspectives centered on the seismic risk in Marmara, hydrothermal flows and volcanism for in the Azores (MoMAR) and slope instability and sedimentary and biogeochemical flows for the Ligurian sea.

Significant methane emissions in the Arctic from thawing seabed north of Siberia

methane in seawater is supersaturated in 80% of sea bottom samples

04 March 2010.- Methane is being released into the atmosphere from an area of the East Siberian Sea equivalent to four times the area of Sweden.

In a study in this week's issue of Science, conducted by researchers at the Russian Academy of Sciences, the University of Alaska, USA, and of Stockholm University, it is shown that the area is currently leaking annually 8 million tonnes of methane into the atmosphere. The current flow is equivalent to what was previously understood to apply for the entire world ocean, although it is not at present contributing to an acute change in the atmospheric methane balance.

The International Siberian Shelf Study (ISSS), which was completed over a year ago, is the most comprehensive so far in the inaccessible and poorly explored waters off north-eastern Siberia.

During the ISSS expedition measurements of methane were made in the seabed, at different depths in the water and in the overlying air at over one hundred locations. Combined with measurements from previous expeditions led by the Russian leaders of the study, Shakhova Natalya and Igor Semiletov, it can be seen that methane in seawater is supersaturated in 80% of sea bottom samples and in more than half of the surface water samples and air samples. In areas with concentrations up to 100 times above the natural background levels, the ISSS expedition documented, with the help of seismic instruments and echo sounding, the presence of methane chimneys on the ocean floor and fields of methane bubbles that rose to the surface of the sea so fast that the methane did not have time to dissolve in the seawater.

"The East Siberian coastal seas are an extension of the Siberian tundra, which was flooded when glaciers melted and sea levels rose at the end of the Ice Age. The thawing of the permafrost in the soil may largely be a result of natural causes, such as geothermal heat from below (through cracks in the earth's crust) and from the seawater above, during the 5000-8000 years since the permafrost was flooded," says Örjan Gustafsson, professor of biogeochemistry at the Stockholm University, leader for the Swedish ISSS team onboard and one of the authors of the article.

Reference: Extensive Methane Venting to the Atmosphere from Sediments of the East Siberian Arctic Shelf, Natalia Shakhova, Igor Semiletov, Anatoly Salyuk, Vladimir Yusupov, Denis Kosmach, Örjan Gustafsson.

MYRES 2010

Meeting of Young Researchers in Earth Science

From 20/09/2010 to 24/09/2010 the Brandenburg University of Technology (BTU) Cottbus, Germany, will host the 4th Meeting of Young Researchers in Earth Science (MYRES 2010). We invite early career scientist interested in feedbacks between physical and biological processes on the Earth's surface to participate.

MYRES biannual workshops bring together early career Earth system scientists from a broad spectrum of disciplines. MYRES IV: "Structures and Processes of the Initial Ecosystem Development" wants to address knowledge gaps in how abiotic and biotic processes interact to control the early stage evolution and function of ecosystems. Conference delegates should present a poster on their research, participate in discussions and give short statements to topics of the sessions. We are applying for funding so that MYRES will be able to pay airfare and lodging for all delegates.

Please find further information on www.myres.org .

Giant Impact Near India

could be the largest, multi-ringed impact crater

5 October 2009.- A mysterious basin off the coast of India could be the largest, multi-ringed impact crater the world has ever seen. And if a new study is right, it may have been responsible for killing the dinosaurs off 65 million years ago.

Sankar Chatterjee of Texas Tech University and a team of researchers took a close look at the massive Shiva basin, a submerged depression west of India that is intensely mined for its oil and gas resources. Some complex craters are among the most productive hydrocarbon sites on the planet. Chatterjee presented his research at the October's Annual Meeting of the Geological Society of America in Portland, Oregon, USA.

"If we are right, this is the largest crater known on our planet," Chatterjee said. "A bolide of this size, perhaps 40 kilometers in diameter creates its own tectonics."

Shiva's outer rim forms a rough, faulted ring some 500 kilometers in diameter, encircling the central peak, known as the Bombay High, which would be 3 miles tall from the ocean floor (about the height of Mount McKinley). Most of the crater lies submerged on India's continental shelf, but where it does come ashore it is marked by tall cliffs, active faults and hot springs. The impact appears to have sheared or destroyed much of the 30-mile-thick granite layer in the western coast of India.

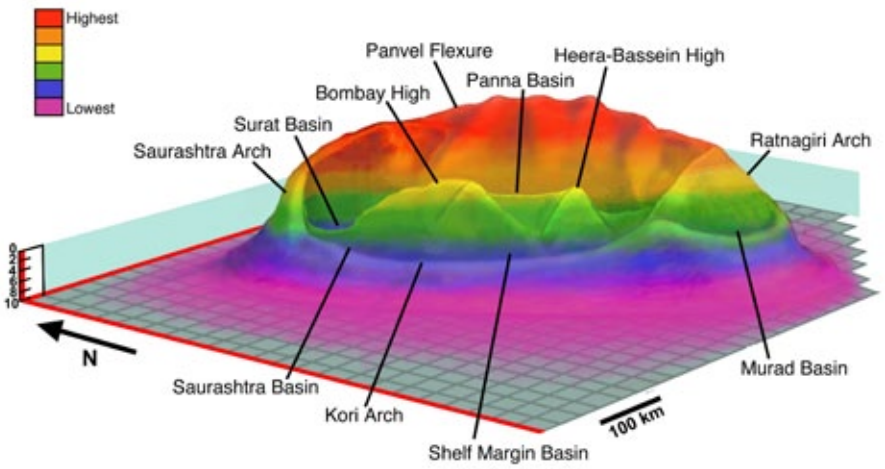


Diagram shows a three-dimensional reconstruction of the submerged Shiva crater (~500 km diameter) at the Mumbai Offshore Basin, western shelf of India from different cross-sectional and geophysical data. The overlying 4.3-mile-thick Cenozoic strata and water column were removed to show the morphology of the crater.

The Geological Society of America

Permian mass extinction helped ancient fungi thrive

The mass devastation of Earth's forests 250 million years ago was the catalyst for a fungal explosion, according to new study in Geology.

The mass devastation of Earth's forests 250 million years ago was the catalyst for a fungal explosion, according to a new international study published in Geology. The researchers said Reduviasporonites fungi emerged and proliferated across the globe following the wipeout.

Led by Imperial College London, UK, the authors evaluated the carbon and nitrogen content of the fossilised remains of the Reduviasporonites, and classified them as a type of wood-rotting fungus that made their home inside dead trees.

Permian mass extinction helped ancient fungi thrive

An enlarged image of Reduviasporonites, credit: Prof. Sephton, Imperial College London.

The British, Dutch and American researchers had a look at the geochemical signature of Reduviasporonites. They compared their results with those from modern fungi and found that Reduviasporonites and modern fungi have similar chemical characteristics.

The finding lays to rest the theory that an asteroid impact was probably responsible for the massive destruction across Pangaea, the supercontinent consisting of all Earth's land masses that existed during the Palaeozoic and Mesozoic eras.

According to the researchers, fossil records of Reduviasporonites show chains of microscopic cells and are a sign that these organisms thrived during the Permian-Triassic period, considered

An enlarged image of Reduviasporonites, credit: Prof. Sephton, Imperial College London

the severest global catastrophe ever experienced on Earth. Up to 96% of all marine species and 70% of land species were wiped out during this period. Data show that the continent was hit by basalt lava flows from Siberia in Russia.

The study's results suggest that extensive vegetation on Pangaea was lost following the mass extinction. Geological records also indicate that the population of Reduviasporonites grew across Pangaea as the Permian period entered its last stages.

Reference: M.A. Sephton, H. Visscher, C.V. Looy, A.B. Verchovsky, and J.S. Watson, Chemical constitution of a Permian-Triassic disaster species, Geology, October 2009, 37, 875-878, doi:10.1130/G30096A.1.

Transport, storage, and surface fluxes of heat in the Barents Sea

The heat loss in the Barents Sea depends on the effective area for cooling, and an increased heat transport leads to a spreading of warm water further north

19 February 2010.- The Barents Sea is a robust and effective ocean cooler. Despite its shallow depth of 230 m, it releases more energy to the atmosphere than any other sea around the Arctic.

A paper, published in Ocean Science, describes a new approach for understanding the Barents Sea. Results show that the northwards migration of the sea ice, and the larger open ocean areas in the south, can compensate for much of the increase in ocean heat transport since the mid 1990's.

The heat is lost by the ocean in the southern Barents Sea through evaporation and sensible fluxes, as there is an approximate balance between the incoming solar, and the outgoing long wave, radiation. The northern Barents Sea receives little ocean heat transport, leading to early sea ice formation during winter.

The ~70 TW of heat transported to the Barents Sea by ocean currents is lost in the southern Barents Sea as latent, sensible, and long wave radiation, each contributing 23–39 TW to the total heat loss. Solar radiation adds 26 TW in the south, as there is no significant ice production.

The northern Barents Sea receives little ocean heat transport. This leads to significant ice production during winter. Heat loss through long wave radiation all year is removing most of the summer solar heating.

During the last decade the Barents Sea has experienced an atmospheric warming and an increased ocean heat transport. The heat loss in the Barents Sea depends on the effective area for cooling, and an increased heat transport leads to a spreading of warm water further north.

The Barents Sea has now less sea-ice-cover than before. Hence, it looses most of the extra heat from stronger ocean currents. Bear Island, between Norway and Svalbard (photo Lars H. Smedsrud).

Reference: Smedsrud, L. H., Ingvaldsen, R., Nilsen, J. E. Ø., and Skagseth, Ø.: Heat in the Barents Sea: transport, storage, and surface fluxes, Ocean Sci., 6, 219-234, 2010.

Bjerknes Center for Climate Research, University of Bergen

Quantifying the positive feedback between CO2 and temperature

For each degree Celsius of global warming, CO2 levels in the atmosphere increased by roughly three percent, according to study in Nature

27 January 2010.- Anthropogenic climate change promotes increased release of the greenhouse gas CO2 from the terrestrial biosphere and the oceans - this, in turn, increases global warming. For each degree Celsius of global warming, CO2 levels in the atmosphere increased by roughly three percent. This conclusion is the outcome of a study conducted by climatologists of the Swiss Federal Research Institute for Forest, Snow and Landscape (WSL) in collaboration with Bern and Mainz Universities. Their paper was published in the journal Nature on 28 January 2010.

The Swiss Federal Research Institute WSL, the University of Bern and Johannes Gutenberg University Mainz have analyzed climate fluctuations of the last 1,000 years. The article published in Nature describes the investigations conducted by David Frank and his research team, working under the umbrella of the Oeschger Center for Climate Change Research in Bern. As a result of these investigations, they are now in the position to estimate with greater accuracy to what extent the atmospheric CO2 concentrations were influenced by climate change in the preindustrial past.

Global warming results in increased release of greenhouse gas

The burning of fossil fuels is responsible for the current rise in CO2 levels. However, climatic change itself interferes with the natural equilibrium between the massive depots of carbon in the atmosphere, the oceans, and the biosphere: This results in additional release of CO2 from these long-term reservoirs. The additional release of CO2, by adding to the warming, acts as a feedback mechanism that amplifies climate change. However, the actual strength of feedback between carbon cycle and warming is currently debated. Nine different reconstructions of temperature fluctuations and three CO2 histories were tested for their reliability and used to constrain the carbon cycles response to climate change. The authors calculated the links between temperature and CO2 levels for more than 200,000 possible data combinations. They produced a mean value and a corresponding confidence interval for the extent of feedback between temperature and CO2.

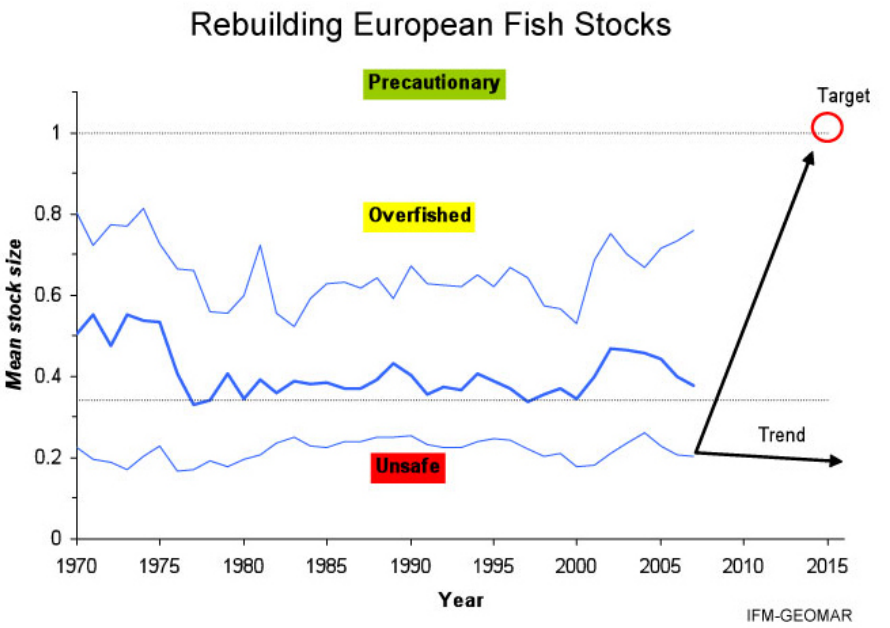
Natural climate variation over the last 1,000 years already exceeded

The new analysis also makes it possible to compare current rates of global warming with the rate of natural temperature variation. Global temperatures are currently more than 0.3 degrees Celsius higher than the warmest period of the last 1,000 years. This suggests that human activities have widened the range of natural temperature fluctuation in this millennium by 75 percent.

Reference: Frank, D. C.; Esper, J.; Raible, C. C.; Büntgen, U.; Trouet, V.; Stocker, B. & Joos, F. (2010): Ensemble reconstruction constraints on the global carbon cycle sensitivity to climate. Nature, 463, 7280: 527-530.

Europe misses by more than 30 years the goal of rebuilding Its fish stocks

in European waters stocks are intentionally managed such that they stay close to the brink of collapse



Average fishing pressure on 54 European fish stocks. The lower arrow indicates the path if 75% of the stocks were to be fished at the maximum sustainable rate in 2015. However, with the current trend that target will be missed by more than 30 years. Source: IFM-GEOMAR.

21 January 2010.- At the Development Summit in Johannesburg in 2002, the European countries agreed to rebuild their fish stocks to levels that can produce the maximum sustainable yield, no later than 2015. According to scientists of the Excellence Cluster "Future Ocean", that goal is already out of reach: Of 54 analysed stocks, only saithe, western horse mackerel and Baltic sprat have a sufficiently large stock size and are fished at a sustainable rate. The state of twelve stocks, including North Sea cod, plaice and halibut, is so bad that they can not recover sufficiently until 2015, even if all fishing was halted. Other stocks could reach the target if fishing pressure was reduced substantially, but that has not happened so far.

These results were published by Dr. Rainer Froese, Leibniz Institute of Marine Sciences (IFM-GEOMAR) und Prof. Dr. Alexander Proelß, Walter-Schücking-Institute of International Law of the University of Kiel, in the journal "Fish and Fisheries". The German scientists, both members of the interdisciplinary Exzellence Cluster "Future Ocean", point out that the continuous overfishing of European stocks constitutes a breach of the precautionary principle, which is a binding principle of Community law.

"The precautionary principle is a binding legal principle for the organs of the European Commission and for the Council of Ministers. The current practice of continuous overfishing violates international law as well as Community law", says Prof. Dr. Alexander Proelß, expert of international law at the Walter-Schücking-Institute. The obligation to manage fish stocks such that they can produce the maximum sustainable yield is part of the Law of the Sea (UNCLOS) of 1982, which entered into force in 1994. In the "Johannesburg Plan of Implementation" (2002) the European Union as well as Norway, Russia and Iceland, agreed to rebuild their fish stocks to the level that can produce the maximum sustainable yield, no later than 2015. "Until now, the provisions of the Law of the Sea have not been introduced into national law, and the plan of implementation had no visible impact on European fisheries management," says Proelß.

On the contrary: the fishing quotas for 2010 decreed by the Council of Ministers again exceed by far the catches that would allow the rebuilding of the

stocks. “If this practice continues, Europe will miss by more than 30 years the goal that it has propagated” says Dr. Rainer Froese, fisheries biologist at the Kiel Leibniz Institute of Marine Sciences (IFM-GEOMAR). Yet, catches from sustainably managed stocks could be substantially higher. “Our analysis suggests that landings could be 79% higher if stocks had been managed according to the international agreements,” says Froese. “However, in European waters stocks are intentionally managed such that they stay close to the brink of collapse. This policy makes no sense from an ecological or economic point of view”.

Europe misses by more than 30 years the goal of rebuilding Its fish stocks

Average fishing pressure on 54 European fish stocks. The lower arrow indicates the path if 75% of the stocks were to be fished at the maximum sustainable rate in 2015. However, with the current trend that target will be missed by more than 30 years. Source: IFM-GEOMAR.

Reference: Froese, R., and A. Proelß, 2010: Rebuilding fish stocks no later than 2015: will Europe meet the deadline? Fish and Fisheries, doi: 10.1111/j.1467-2979.2009.00349.x

Leibniz Institute of Marine Sciences (IFM-GEOMAR)

Big freeze plunged Europe into ice age in months

switching off the North Atlantic circulation can force the Northern hemisphere into a mini ice age in a matter of months

30 November 2009.- William Patterson, from the University of Saskatchewan in Canada, and his colleagues have shown that switching off the North Atlantic circulation can force the Northern hemisphere into a mini ice age in a matter of months. Previous work has indicated that this process would take tens of years.

Around 12,800 years ago the northern hemisphere was hit by a mini ice-age, the Younger Dryas, nicknamed the ‘Big Freeze’, which lasted around 1300 years. Geological evidence shows that the Big Freeze was brought about by a sudden influx of freshwater, when the glacial Lake Agassiz in North America burst its banks and poured into the North Atlantic and Arctic Oceans. This vast pulse diluted the North Atlantic conveyor belt and brought it to a halt.

Without the warming influence of this ocean circulation temperatures across the Northern hemisphere plummeted, ice sheets grew and human civilisation fell apart.

Previous evidence from Greenland ice cores has indicated that this sudden change in climate occurred over the space of a decade or so. Now new data shows that the change was amazingly abrupt, taking place over the course of a few months, or a year or two at most.

Patterson and his colleagues have created the highest resolution record of the ‘Big Freeze’ event to date, from a mud core taken from an ancient lake, Lough Monreach, in Ireland. Using a scalpel layers were sliced from the core, 0.5mm thick, representing a time period of one to three months.

Carbon isotopes in each slice reveal how productive the lake was, while oxygen isotopes give a picture of temperature and rainfall. At the start of the ‘Big Freeze’ their new record shows that temperatures plummeted and lake productivity stopped over the course of just a few years. “It would be like taking Ireland today and moving it up to Svalbard, creating icy conditions in a very short period of time,” says Patterson, who presented the findings at the European Science Foundation BOREAS conference on humans in the Arctic, in Rovaniemi, Finland, November 2009.

Meanwhile, their isotope record from the end of the Big Freeze shows that it took around two centuries for the lake and climate to recover, rather than the abrupt decade or so that ice cores indicate. “This makes sense because it would take time for the ocean and atmospheric circulation to turn on again,” says Patterson.

This study was part of a broad network of 38 individual research teams from Europe, Russia, Canada and the USA forming the European Science Foundation EUROCORES programme ‘Histories from the North - environments, movements, narratives’ (BOREAS). This interdisciplinary initiative brought together a wide range of disciplines including humanities, social, medical, environmental and climate sciences.

European Science Foundation

Online textbook in climatology available

for students at the master level

Dear Colleagues, Dear friends,

I am pleased to announce that the first version of the online textbook entitled Introduction to climate dynamics and climate modelling is now available. This online textbook (www.climate.be/textbook) is originally intended to students at the master level. An additional goal is to allow a free online access to this new resource in order to give to people having a basic scientific background the information required to understand the mechanisms involved in climate dynamics and climate change.

The site has been optimised for Mozilla-Firefox but could also be viewed using Internet Explorer. You may have to install a package to see well the equations. The link to the package is provided on the left column in all the pages.

I hope that you will find it useful.

Hugues Goosse

Near surface geophysics for the study and the management of historical resources

past, present and future in ADGEO Special Issue

This special volume of ADGEO hosts papers that were presented at the session entitled "Near surface geophysics for the study and the management of historical resources: past, present and future", organized within the framework of the General Assembly of the European Geosciences Union (EGU), held in Vienna, Austria, 19–24 April 2009. The conveners invited the contributors to this session to prepare papers reflecting their presentations and submit them for publication in this special volume. Two independent anonymous experts reviewed all the papers involved to this process.

The papers presented in this volume are concerned with the state of art and novel instrumentation, sensing techniques, as well as data processing approaches to support the archaeological research and Cultural Heritage conservation strategies.

In this field, in the recent years is observed an increasing of interest to non-destructive and non-invasive geophysical test methods. This allows overcoming the subjectivity and ambiguity arising in the choice of the number and the areas locations where to perform the destructive examination. In addition, non invasive techniques such as aerial and satellite remote sensing are able to give a global vision of the heritage from the identification of unknown archaeological features to the monitoring of cultural resources.

Very recently, large attention is posed to the integration of the classical geophysical techniques with new emerging surface and subsurface sensing techniques (optical sensors, thermography, acoustics) for a multi depth, multi-resolution, and multi-scale monitoring of buildings and artifacts.

The conveners hope that the presented research papers will be interesting for readers in the different branches of the Environmental and Cultural Heritage Sciences and will attract new potential contributors to the important topic of the Cultural Heritage monitoring and diagnostics.

They wish to thank all the authors for their presentations and fruitful discussions at the session and preparing the publications. To all reviewers, without significant work of which, the publication of this volume would not have been possible. They also thank the staff of Copernicus Publications (first of all – Nadine Deisel and Svenja Lange) for their professional and friendly collaboration.

The articles of this special issue are available free of charge at http://www.adv-geosci.net/24/1/2010/adgeo-24-1-2010.pdf

L. V. Eppelbaum, N. Masini, and F. Soldovieri: Near surface geophysics for the study and the management of historical resources: past, present and future (EGU GI9 Session 2009), Adv. Geosci., 24, 1, 2010

Medal Lecture paper in HESS Opinions

a random walk on water

According to the traditional notion of randomness and uncertainty, natural phenomena are separated into two mutually exclusive components, random (or stochastic) and deterministic. Within this dichotomous logic, the deterministic part supposedly represents cause-effect relationships and, thus, is physics and science (the "good"), whereas randomness has little relationship with science and no relationship with understanding (the "evil"). Here the author argues that such views should be reconsidered by admitting that uncertainty is an intrinsic property of nature, that causality implies dependence of natural processes in time, thus suggesting predictability, but even the tiniest uncertainty (e.g. in initial conditions) may result in unpredictability after a certain time horizon. On these premises it is possible to shape a consistent stochastic representation of natural processes, in which predictability (suggested by deterministic laws) and unpredictability (randomness) coexist and are not separable or additive components. Deciding which of the two dominates is simply a matter of specifying the time horizon and scale of the prediction. Long horizons of prediction are inevitably associated with high uncertainty, whose quantification relies on the long-term stochastic properties of the processes.

The full paper, presented as a Medal lecture in the 2009 GA, is available free of charge at http://www.hydrol-earth-syst-sci.net/14/585/2010/hess-14-585-2010.html

Koutsoyiannis, D.: HESS Opinions "A random walk on water", Hydrol. Earth Syst. Sci., 14, 585-601, 2010.

First climatology of polar mesospheric clouds

from the GOMOS/ENVISAT stellar occultation instrument

GOMOS (Global Ozone Monitoring by Occultation of Stars), on board the European platform ENVISAT launched in 2002, is a stellar occultation instrument combining four spectrometers and two fast photometers which measure light at 1 kHz sampling rate in the two visible channels 470–520 nm and 650–700 nm. On the day side, GOMOS does not measure only the light from the star, but also the solar light scattered by the atmospheric molecules. In the summer polar days, Polar Mesospheric Clouds (PMC) are clearly detected using the photometers signals, as the solar light scattered by the cloud particles in the instrument field of view. The sun-synchronous orbit of ENVISAT allows observing PMC in both hemispheres and the stellar occultation technique ensures a very good geometrical registration. Four years of data, from 2002 to 2006, are analyzed up to now. GOMOS data set consists of approximately 10.000 cloud observations all over the eight PMC seasons studied. The first climatology obtained by the analysis of this data set is presented, focusing on the seasonal and latitudinal coverage, represented by global maps. GOMOS photometers allow a very sensitive PMC detection, showing a frequency of occurrence of 100% in polar regions during the middle of the PMC season. According to this work mesospheric clouds seem to be more frequent in the Northern Hemisphere than in the Southern Hemisphere. The PMC altitude distribution was also calculated. The obtained median values are 82.7 km in the North and 83.2 km in the South.

The full paper is available free of charge at http://www.atmos-chem-phys.net/10/2723/2010/acp-10-2723-2010.html

Pérot, K., et al: First climatology of polar mesospheric clouds from GOMOS/ENVISAT stellar occultation instrument, Atmos. Chem. Phys., 10, 2723-2735, 2010.

The radiative forcing potential of different climate geoengineering options

approach provides a common framework for the evaluation

Climate geoengineering proposals seek to rectify the Earth's current and potential future radiative imbalance, either by reducing the absorption of incoming solar (shortwave) radiation, or by removing CO2 from the atmosphere and transferring it to long-lived reservoirs, thus increasing outgoing longwave radiation. A fundamental criterion for evaluating geoengineering options is their climate cooling effectiveness, which the authors quantify here in terms of radiative forcing potential. The authors use a simple analytical approach, based on energy balance considerations and pulse response functions for the decay of CO2 perturbations. This aids transparency compared to calculations with complex numerical models, but is not intended to be definitive. It allows them to compare the relative effectiveness of a range of proposals. They consider geoengineering options as additional to large reductions in CO2 emissions. By 2050, some land carbon cycle geoengineering options could be of comparable magnitude to mitigation "wedges", but only stratospheric aerosol injections, albedo enhancement of marine stratocumulus clouds, or sunshades in space have the potential to cool the climate back toward its pre-industrial state. Strong mitigation, combined with global-scale air capture and storage, afforestation, and bio-char production, i.e. enhanced CO2 sinks, might be able to bring CO2 back to its pre-industrial level by 2100, thus removing the need for other geoengineering. Alternatively, strong mitigation stabilising CO2 at 500 ppm, combined with geoengineered increases in the albedo of marine stratiform clouds, grasslands, croplands and human settlements might achieve a patchy cancellation of radiative forcing. Ocean fertilisation options are only worthwhile if sustained on a millennial timescale and phosphorus addition may have greater long-term potential than iron or nitrogen fertilisation. Enhancing ocean upwelling or downwelling have trivial effects on any meaningful timescale. The approach provides a common framework for the evaluation of climate geoengineering proposals, and these results should help inform the prioritisation of further research into them.

The article is available free of charge at http://www.atmos-chem-phys.net/9/5539/2009/acp-9-5539-2009.html

Lenton, T. M. and Vaughan, N. E.: The radiative forcing potential of different climate geoengineering options, Atmos. Chem. Phys., 9, 5539-5561, 2009.

Iodine-mediated coastal particle formation

an overview of the Reactive Halogens in the Marine Boundary Layer (RHaMBLe) Roscoff coastal study

This paper presents a summary of the measurements made during the heavily-instrumented Reactive Halogens in the Marine Boundary Layer (RHaMBLe) coastal study in Roscoff on the North West coast of France throughout September 2006. It was clearly demonstrated that iodine-mediated coastal particle formation occurs, driven by daytime low tide emission of molecular iodine, I2, by macroalgal species fully or partially exposed by the receding waterline. Ultrafine particle concentrations strongly correlate with the rapidly recycled reactive iodine species, IO, produced at high concentrations following photolysis of I2. The heterogeneous macroalgal I2 sources lead to variable relative concentrations of iodine species observed by path-integrated and in situ measurement techniques.

Apparent particle emission fluxes were associated with an enhanced apparent depositional flux of ozone, consistent with both a direct O3 deposition to macroalgae and involvement of O3 in iodine photochemistry and subsequent particle formation below the measurement height. The magnitude of the particle formation events was observed to be greatest at the lowest tides with the highest concentrations of ultrafine particles growing to the largest sizes, probably by the condensation of anthropogenically-formed condensable material. At such sizes the particles should be able to act as cloud condensation nuclei at reasonable atmospheric supersaturations.

The full paper is available free of charge at http://www.atmos-chem-phys.net/10/2975/2010/acp-10-2975-2010.html

McFiggans, G. et al: Iodine-mediated coastal particle formation: an overview of the Reactive Halogens in the Marine Boundary Layer (RHaMBLe) Roscoff coastal study, Atmos. Chem. Phys., 10, 2975-2999, 2010.

Predictability of the monthly North Atlantic Oscillation index

based on fractal analyses and dynamic system theory

The predictability of the monthly North Atlantic Oscillation, NAO, index is analysed from the point of view of different fractal concepts and dynamic system theory such as lacunarity, rescaled analysis (Hurst exponent) and reconstruction theorem (embedding and correlation dimensions, Kolmogorov entropy and Lyapunov exponents). The main results point out evident signs of randomness and the necessity of stochastic models to represent time evolution of the NAO index. The results also show that the monthly NAO index behaves as a white-noise Gaussian process. The high minimum number of nonlinear equations needed to describe the physical process governing the NAO index fluctuations is evidence of its complexity. A notable predictive instability is indicated by the positive Lyapunov exponents. Besides corroborating the complex time behaviour of the NAO index, present results suggest that random Cantor sets would be an interesting tool to model lacunarity and time evolution of the NAO index.

The full paper is available free of charge at http://www.nonlin-processes-geophys.net/17/93/2010/npg-17-93-2010.html

Martínez, M. D., Lana, X., Burgueño, A., and Serra, C.: Predictability of the monthly North Atlantic Oscillation index based on fractal analyses and dynamic system theory, Nonlin. Processes Geophys., 17, 93-101, 2010.

Reconstruction of the most intense avalanches of the last 40 years

in the Catalonian Pyrenees using dendrochronology

Avalancha en Benasque, Pirineo aragonés, el 7 de diciembre de 2008

The authors have studied the dynamics of avalanches in the Catalonian Pyrenees using dendrochronology (exact dating from tree-ring growth). The results show that the periods 1971-72, 1995-96 and 2002-03 have been the most intense of the last 40 years. Avalanches in the 90s affected the entire Pyrenees and since then there have been none more intense.

Dendrochronology applied to the study of landslides has allowed thw authors from the University of Barcelona (UB), and from the Geological Institute of Catalonia to date and map landslides that occurred over the 20th century, up to the present day.

The study, which has recently been published in the Natural Hazards and Earth System Sciences journal, reveals, with dendrochronological analysis and meteorological records, nine winters with avalanches during the second half of the 20th century. More severe landslides occurred in the periods 1971-72, 1995-96, and 2002-03. The study is currently ongoing in

the Aragonese Pyrenees in collaboration with the University of Zaragoza.

The authors took samples of wood from living and dead trees from the landslide area to ascertain, by looking at their rings, the time at which disturbances in their growth occurred. "Snowfall causes inclination of tree trunks, damage and breakage of branches or the crown, uprooting, clearance of old or dead trees of the specimen", Muntán states.

These effects are represented by identifiable ring marks, as happens with mountain pine (Pinus uncinata) in the high mountains of the Pyrenees, the inclination of which changes the anatomy of subsequent rings and gives them a more intense colouration on one of the sides.

The authors predict that it will be possible to reconstruct the last 150 years of landslide events from this mountain range using dendrochronology.

The full article can be accessed free of charge at http://www.nat-hazards-earth-syst-sci.net/9/1599/2009/nhess-9-1599-2009.html

Muntán, E.; García, C.; Oller, P.; Marti, G.; García, A.; Gutierrez, E. "Reconstructing snow avalanches in the Southeastern Pyrenees" Natural Hazards and Earth System Sciences 9(5): 1599-1612, 2009.

Model of optical response of marine aerosols to Forbush decreases

study shows that the optical properties of aerosols show a distinct response to Forbush Decreases, assuming that the nucleation of fresh aerosols is driven by ions

In order to elucidate the effect of galactic cosmic rays on cloud formation, the authors investigate the optical response of marine aerosols to Forbush decreases – abrupt decreases in galactic cosmic rays – by means of modeling. They vary the nucleation rate of new aerosols, in a sectional coagulation and condensation model, according to changes in ionization by the Forbush decrease. From the resulting size distribution they then calculate the aerosol optical thickness and Angstrom exponent, for the wavelength pairs 350, 450 nm and 550, 900 nm. In the cases where the output parameters from the model seem to compare best with atmospheric observations they observe, for the shorter wavelength pair, a change in Angstrom exponent, following the Forbush Decrease, of −6 to +3%. In some cases they also observe a delay in the change of Angstrom exponent, compared to the maximum of the Forbush decrease, which is caused by different sensitivities of the probing wavelengths to changes in aerosol number concentration and size. For the long wavelengths these changes are generally smaller. The types and magnitude of change is investigated for a suite of nucleation rates, condensable gas production rates, and aerosol loss rates. Furthermore they compare the model output with observations of 5 of the largest Forbush decreases after year 2000. For the 350, 450 nm pair the authors use AERONET data and find a comparable change in signal while the Angstrom Exponent is lower in the model than in the data, due to AERONET being mainly sampled over land. For 550, 900 nm they compare with both AERONET and MODIS and find little to no response in both model and observations. In summary their study shows that the optical properties of aerosols show a distinct response to Forbush Decreases, assuming that the nucleation of fresh aerosols is driven by ions. Shorter wavelengths seem more favorable for observing these effects and great care should be taken when analyzing observations, in order to avoid the signal being drowned out by noise.

The full paper is available free of charge at http://www.atmos-chem-phys.net/10/2765/2010/acp-10-2765-2010.html

Bondo, T., Enghoff, M. B., and Svensmark, H.: Model of optical response of marine aerosols to Forbush decreases, Atmos. Chem. Phys., 10, 2765-2776, 2010.

Earth's surface heat flux

estimated at around 47 TW, greater than previous estimates

The authors present a revised estimate of Earth's surface heat flux that is based upon a heat flow data-set with 38.347 measurements, which is 55% more than used in previous estimates. Their methodology, like others, accounts for hydrothermal circulation in young oceanic crust by utilising a half-space cooling approximation. For the rest of Earth's surface, they estimate the average heat flow for different geologic domains as defined by global digital geology maps; and then produce the global estimate by multiplying it by the total global area of that geologic domain. The averaging is done on a polygon set which results from an intersection of a 1 degree equal area grid with the original geology polygons; this minimises the adverse influence of clustering. These operations and estimates are derived accurately using methodologies from Geographical Information Science. The authors consider the virtually un-sampled Antarctica separately and also make a small correction for hot-spots in young oceanic lithosphere. A range of analyses is presented. These, combined with statistical estimates of the error, provide a measure of robustness. Their final preferred estimate is 47±2 TW, which is greater than previous estimates.

The article is available free of charge at http://www.solid-earth.net/1/5/2010/se-1-5-2010.html

Davies, J. H. and Davies, D. R.: Earth's surface heat flux, Solid Earth, 1, 5-24, 2010.

The global SF6 source inferred from long-term high precision atmospheric measurements

and its comparison with emission inventories

Emissions of sulphur hexafluoride (SF6), one of the strongest greenhouse gases on a per molecule basis, are targeted to be collectively reduced under the Kyoto Protocol. Because of its long atmospheric lifetime (estimated as 800 to 3200 years), the accumulation of SF6 in the atmosphere is a direct measure of its global emissions. Examination of the authors extended data set of globally distributed high-precision SF6 observations shows an increase in SF6 abundance from near zero in the 1970s to a global mean of 6.7 ppt by the end of 2008. In-depth evaluation of their long-term data records shows that the global source of SF6 decreased after 1995, most likely due to SF6 emission reductions in industrialised countries, but increased again after 1998. By subtracting those emissions reported by Annex I countries to the United Nations Framework Convention of Climatic Change (UNFCCC) from our observation-inferred SF6 source leaves a surprisingly large gap of more than 70–80% of non-reported SF6 emissions in the last decade. This suggests a strong under-estimation of emissions in Annex I countries and underlines the urgent need for independent atmospheric verification of greenhouse gases emissions accounting.

The full paper is available free of charge at http://www.atmos-chem-phys.net/10/2655/2010/acp-10-2655-2010.html

Levin, I., et al: The global SF6 source inferred from long-term high precision atmospheric measurements and its comparison with emission inventories, Atmos. Chem. Phys., 10, 2655-2662, 2010

What can we learn from European continuous atmospheric CO2 measurements

to quantify regional fluxes

An inverse model using atmospheric CO2 observations from a European network of stations to reconstruct daily CO2 fluxes and their uncertainties over Europe at 40 km resolution has been developed within a Bayesian framework. In this first part, a pseudo-data experiment is performed to assess the potential of continuous measurements over Europe using a network of 10 stations of the AEROCARB project such as in 2001 (http://www.aerocarb.cnrs-gif.fr/). Under the assumptions of a small observation noise and a perfect atmospheric transport model, the reconstruction of daily CO2 fluxes and in particular of their synoptic variability is best over Western Europe where the network is the densest. At least a 10 days temporal and a 1000 km spatial averaging of the inverted daily/40 km fluxes is required in order to obtain a good agreement between the estimated and the `true` fluxes in terms of correlation and variability. The performance of the inversion system rapidly degrades when fluxes are sought for a smaller temporal or spatial averaging.

The full paper is available free of charge at http://www.atmos-chem-phys.net/10/3107/2010/acp-10-3107-2010.html

Carouge, C., Bousquet, P., Peylin, P., Rayner, P. J., and Ciais, P.: What can we learn from European continuous atmospheric CO2 measurements to quantify regional fluxes – Part 1: Potential of the 2001 network, Atmos. Chem. Phys., 10, 3107-3117, 2010.

The geology of European cold-water coral carbonate mounds

the CARBONATE project

CARBONATE (Mid latitude carbonate systems: complete sequences from cold-water coral carbonate mounds in the northeast Atlantic) is funded through the ESF EUROCORES: EuroMARC programme focusing on coral carbonate mound/reef core material obtained from sites along the European - north African margin from northern Norway, to Ireland, to the Gulf of Cádiz to Mauritania. Cold-water corals are common along the European continental margin where they form high biodiversity reefs. Reef growth is climatically steered and over a couple of million years, successive reef growth can form coral carbonate mounds. These structures can reach several hundred metres tall and contain unique sedimentological and palaeontological records. CARBONATE has demonstrated that the development of cold-water coral carbonate mounds and reefs is driven by hydrodynamic and oceanographic processes which supplies sediment forming a major component of the mounds. Furthermore these processes also supply and resuspend POM from which the cold-water corals fed. In this way, both the lithic and the carbonate components of the mound record are in tune with climatically-steered oceanographic changes. CARBONATE has studied, in high resolution, a complete sequence through a cold-water coral reef/mound from northern Norway telling us important information about mound initiation and development. CARBONATE has also generated a number of key palaeoenvironmental records at intermediate water depths. Perhaps more importantly, for the first time, these coral carbonate mound palaeo-archives are placed along a latitudinal gradient from northern Norway (70oN) to Mauritania (16oN) helping to define cold-water coral palaeobiogeographical provinces.

Cold-water corals differ from shallow-water tropical corals in many respects. They are azooxanthellate and therefore aphotic flourishing at several hundred to thousands of metres water depth (Roberts et al., 2009). They mainly feed on particulate organic matter (POM) and prefer depth ranges in the oceans where the flux of POM is high. Such areas often coincide with water mass boundaries where contour currents and internal tides create dynamic current flows, and on topographic rises where flows are also intensified (Mienis et al., 2007). Cold-water coral reefs often occur in areas of active bedload transport (Wheeler et al., 2008) which is baffled by the coral frameworks to form a major component of the coral reef deposit (Roberts et al., 2009).

By drilling the 155 m high Challenger Mound, SW of Ireland, IODP Exp. 307 (Ferdelman et al., 2006) revealed that coral carbonate mounds contain a unique sedimentary record, spanning time intervals where, in some cases, erosion may dominate the rest of the margin. Despite some hiatuses in deposition, coral carbonate mounds have high accumulation rates (up to 5 mm a-1, Fugløy Reef, Norway: Lindberg et al., 2007) offering the potential as high resolution sedimentary archives.

CARBONATE (Mid latitude carbonate systems: complete sequences from cold-water coral carbonate mounds in the northeast Atlantic) is a 3 year project ending this year, funded through the ESF EUROCORES: EuroMARC programme (European Collaboration for Implementation of Marine Research on Cores). CARBONATE focuses on coral carbonate mound/reef core material obtained from sites along the European - north African margin from northern Norway, to Ireland, to the Gulf of Cádiz to Mauritania (Figure 1). CARBONATE draws on expertise in the areas of sedimentology, palaeontology, carbonate diagenesis and palaeoceanography/palaeoclimatology.

As well as analysing the palaeoenvironmental mound record, CARBONATE is also concerned with understanding the fundamental drivers of mound/reef development. We know that mound development is strongly influenced by biological, hydrological, oceanographical and sedimentological factors (Roberts et al., 2009). To better understand the influ-

ence of different environmental controls on the development of the mound/reef system, CARBONATE looks at a number of mounds/reefs in different environmental settings. By looking at a suite of sites situated along a latitudinal gradient from northern Norway to Mauritania, a better understanding of regional responses to oceanographic/climate change is also being determined. Analysis of core material is supplemented by lander, CTD and ROV assessments of the contemporary environment on, or near, mounds.

One of CARBONATE's goals has been to quantify the amount and flux of carbonate stored by these mounds and reefs. CARBONATE budgets from different latitudes vary greatly e.g. 54 to 188 g m-2 a-1, northern Norway (Lindberg & Mienert, 2005) and 0.277 to 5.160 g m-2 a-1, west of Ireland (Dorschel et al., 2007). By understanding how biogeochemical processes control the development of these carbonate mounds and their response to climate change, we will make an important step in quantifying their role as mid-latitude carbonate sinks.

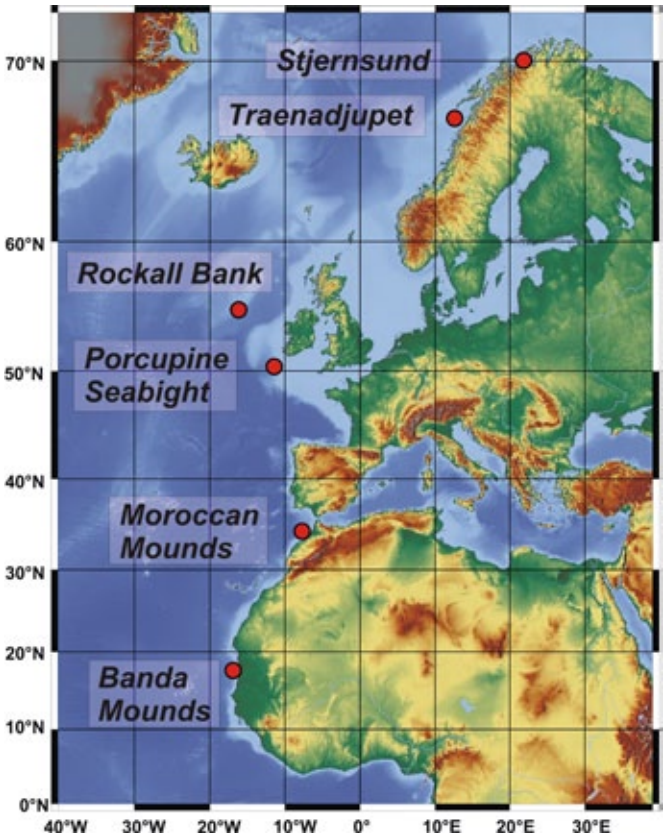


Figure 1: The location of borehole sites studied in the CARBONATE project.

Cold-water corals in Northern Norway (64-70°N)

The Norwegian Sea constitutes the northernmost working area within the CARBONATE project and contains numerous recent cold-water coral sites (e.g. Freiwald et al., 1997), many of which have also been a focus of earlier European studies. The Norwegian margin comprises a glacially over-deepened shelf between 250 and 350 m, which was entirely covered by the outlet-glaciers of the Fennoscandian ice-sheet during the last glacial period. This relatively deep position allows for a widespread distribution of cold-water corals bathed in Atlantic Water. The coral community is almost exclusively dominated by Lophelia pertusa (Figure 2), which tends to form muddy carbonate banks and in several areas like Sula Ridge almost reef-like bioconstructions rising several meters in height above the surrounding seabed. These fragile coral sites are of paramount importance as nursing ground for fishes. They are being exploited by demersal fisheries, which poses a severe threat to the reefs and consequently Norwegian Lophelia habitats were among the first in Europe to be protected by a bottom-trawling ban.

The coral distribution spans off-shore shelf settings as well as in-shore fjord settings such as the Oslofjord, the Trondheimsfjord (Tautraryggen) and in Stjernsund. Many of these localities are situated inside the Polar circle and provide an important biogeographical endmember among the North Atlantic coral sites, with relatively low temperatures of 5°C to 7°C, a pronounced seasonality with a strongly eutro phic regime and vigorous bottom currents (Freiwald et al., 1997; Rüggeberg et al., in press).

Figure 2: A typical view of a Norwegian cold-water coral mound, dominated by Lophelia pertusa, with glass sponges and red Paragorgia arborea colonies. Image source Jago-Dive during POS-325 cruise (© IFM-GEOMAR).

The Norwegian sites provide an ideal setting to accomplish one of the key goals of the CARBONATE project: to study coral mound growth from the initial settling stages to a mature mound edifice. Contrasting with the giant Irish cold-water coral carbonate mounds, which have evolved in repeated growth phases across multiple interglacial periods (e.g. Frank et al., 2009), the Norwegian mounds are all post-glacial rooted on either glacially exposed bedrock surfaces or glaciomarine deposits making the Pleistocene/Holocene boundary clearly visible in gravity cores. Ongoing research has been devoted to the unravelling of the sedimentological and geochronological history of these Holocene mounds (López Correa, in prep.). For this purpose cores from the shelf-locality Trænadjupet (64°N) and the in-shore site Stjernsund (70°N) are being examined in detail.

Our multi-proxy approach invokes the measurement of physical core properties like magnetic-susceptibility, gamma-ray and XRF-scans, alongside classical parameters like grain-size analyses. The geochronological framework for the deposits has been established with a dense coverage of U-series ages of cold-water coral skeletons and with AMS14C-ages of benthic foraminifera (López Correa, in prep.). Oxygen isotope (Î´18O) and stable carbon isotopes (Î´13C) of benthic foramin-

ifera like Cibicides spp. and Cassidulina neoteretis are used to reconstruct palaeoceanographic changes in on-mound and offmound settings. A further focal point is the analyses of the foraminiferal assemblages (Joseph et al., 2009) in coral banks and adjacent fjord basin settings in Stjernsund from cores that span the past ~10 ka. The carbonate content of the Holocene coral bank deposits is assessed by the measurement of bulk inorganic carbonate and via the quantification of the coral content from computed-tomography scans of the cores (Titschack et al., 2009).

The ongoing palaeoceanographic analyses and the interpretation of fossil facies development in the cores benefits from extensive documentation of the recent Norwegian coral banks, comprising JAGO-submersible video-footage (Freiwald et al., 1997) and hydrographic datasets (Rüggeberg et al. in press). These banks show various facies zones, such as eroded coral rubble, winnowed coral or boulder pavements (glacial lag deposits), and thriving Lophelia colonies, which can be recognized in cores. The grain-size spectra indicate relatively strong currents and a constant high background sedimentation, which facilitated the mound growth. The tight geochronological framework reveals frequent hiatuses, even during the relatively stable Holocene climatic conditions.

Analysis of the benthic foraminiferal assemblages down core will be used to reconstruct the ecological evolution of the coral reef settings and help to understand the factors that trigger the start of mound growth in this region. Surface samples from different mound facies revealed a connection between coral growth and the abundance of foraminifer species like Discanomalia coronata (Margreth et al., 2009). Changes in the faunal assemblages will further trace variations in current velocity, climate, nutrient flux and bottom water oxygenation. Stable isotopes from benthic foraminifera are expected to yield information about past temperature and seawater density.

Cold-water corals along the Rockall Trough margins (53-57°N)

In contrast to the Norwegian Shelf, the Irish continental margin reveals several cold-water coral carbonate mound provinces (east and west Rockall Bank, west and northwest Porcupine Bank, Porcupine Seabight), which occur in water depths ranging from 500 to 1200 m (Figure 3) (Akhmetzhanov et al., 2003; Henriet et al., 2003; Kenyon et al., 2003; van Weering et al., 2003a; van Weering et al, 2003b; Mienis et al., 2006; Wheeler et al., 2007; de Haas et al., 2009; Dorschel et al., 2009; van Rooij et al., 2009). The mounds that are exposed above the seabed are partly buried by the surrounding sediments, whilst others are completely buried, making the total height of these structures from the buried base to their summits up to 500 m. Seismic studies indicate that the majority of the Rockall Trough mounds started to develop on a late Early Pliocene reflector (Figure 4) (Mienis et al., 2006; de Haas et al., 2009) which formed due to changes in the large scale current pattern in the NE Atlantic Ocean, which in turn may have resulted from local (Rockall Trough) changes in the shape of the basin or even ocean-wide changes in hydrography due to larger scale plate tectonics.

The mounds along the southwest Rockall Trough margin belong to the most extensively studied mound provinces. The mounds protrude several tens to 380 m above the surrounding seabed and have a diameter of several hundreds of metres to 5 km. Often the mounds are aligned in ridges that can be in the order of 15 km long and are oriented perpendicular to the slope of the Rockall Trough (Mienis et al., 2006; de Haas et al., 2009). Most of the mounds in this area are characterised by the presence of an abundant living coral cover at the summit. The most abundant scleractinian coral species in this province are Lophelia pertusa and Madrepora oculata. Other species are present in lower numbers, of which hydrozoan coral Stylaster sp. is the most abundant. Cold-water coral reefs and mounds are observed mainly on slopes and topographic highs, where high current speeds exist. The coral covered mounds are embedded mainly in the Eastern North Atlantic Water (ENAW) in a confined bathymetric zone between 600 and 1000 m water depth. Cold-water corals seem to be restricted in their growth by temperature and food availability. Environmental parameters play a very important role in the growth of the cold-water corals and thus affect carbonate mound formation (Mienis et al., 2007) This has been demonstrated by repeated measurements of water temperature, salinity and suspended matter by CTD Rosette samplers and short and long term lander deployments. These hydrographical observations show the presence of a highly energetic environment in and around the cold-water carbonate-mounds on the southwest Rockal

Trough margin. The presence of living corals on top of the carbonate mounds appears linked to the presence of internal waves and tidal currents in the water column, and consequently carbonate mound structures are shaped by the local hydrodynamic regime. Internal waves force the formation of intermediate and bottom nepheloid layers and bring fresh food particles to the mounds. The distribution of corals is considered to be directly related to the presence of enhanced turbidity. An increase in temperature can be directly related to an increase in the amount of (fresh) particles in the water column. Current speed increases when a transition occurs from cold to warm waters. High current speeds prevent local sedimentation but provide sufficient food particles to the corals, so that the corals thrive at the mound summits (Mienis et al., 2007).

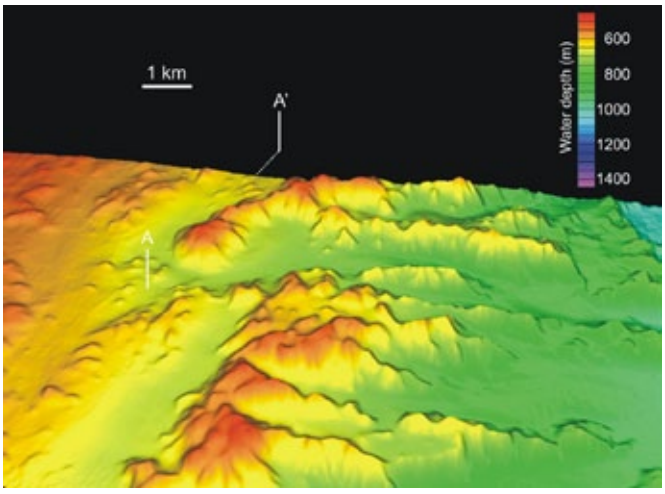


Figure 3: Multibeam image of some of the mounds at the southwest Rockall Trough margin. The location of section A-A' seismic line shown in Figure 4 is also indicated.

Bottom landers deployed on a mound with a dense coral cover and one without show a similar seasonal variation in internal-wave activity with high activity during winter and summer months and less dynamic conditions in spring and autumn. Increased intensity of internal-wave activity, reflected in higher than average near-bottom current speed and amplitude of daily temperature fluctuations, results in higher mass fluxes as

recorded in the sediment traps. On the site without coral cover, mass fluxes are up to two times higher, compared to the site with dense coral cover. During periods of high mass fluxes a predominance of resuspended material was observed at both sites, as indicated by reduced 210Pb activity and low organic matter concentrations. The flux of resuspended material largely masked the primary pelagic signal. However, low Î´15N values and high fluorescence values in early spring and summer marked the arrival of fresh particles on both sites (Duineveld et al., 2008). A dense coral framework, baffling a large amount of particles settling between the coral branches, results in differences in particle flux, chemical composition and freshness of the trapped material. In the long term, the presence of a coral framework plays a crucial role in the build-up of cold-water coral mounds (Mienis et al, 2009a). 210Pb measurements have shown that sedimentation rates on the mounds are higher than on the surrounding seabed.

vals, formed by early diagenetic processes are essential in mound evolution, as they stabilise the steeply inclined mound flanks and provide a colonisation substratum. In these intervals aragonitic coral material is virtually absent and coccoliths display widespread overgrowth. Downcore XRF scans, CT-scan images and petrographic observations indicate different degrees of diagenetic alteration. The upper boundary of the most recent lithified interval shows some erosional features, but petrographic observations indicate that initial lithification of the sediments is not related to this erosive event or long term nonsedimentation, but to earlier subsurface diagenesis. 14C and U/Th dating and stable isotope analysis of planktonic and benthic foraminifera indicate a continuous sedimentation pattern since the end of the Younger Dryas (e.g. Frank et al., 2009). The deeper, and thus older, part of the mounds, showing mainly intermediate isotope values, is dominated by the presence of large hiatuses, spanning periods of up to 200 ka.

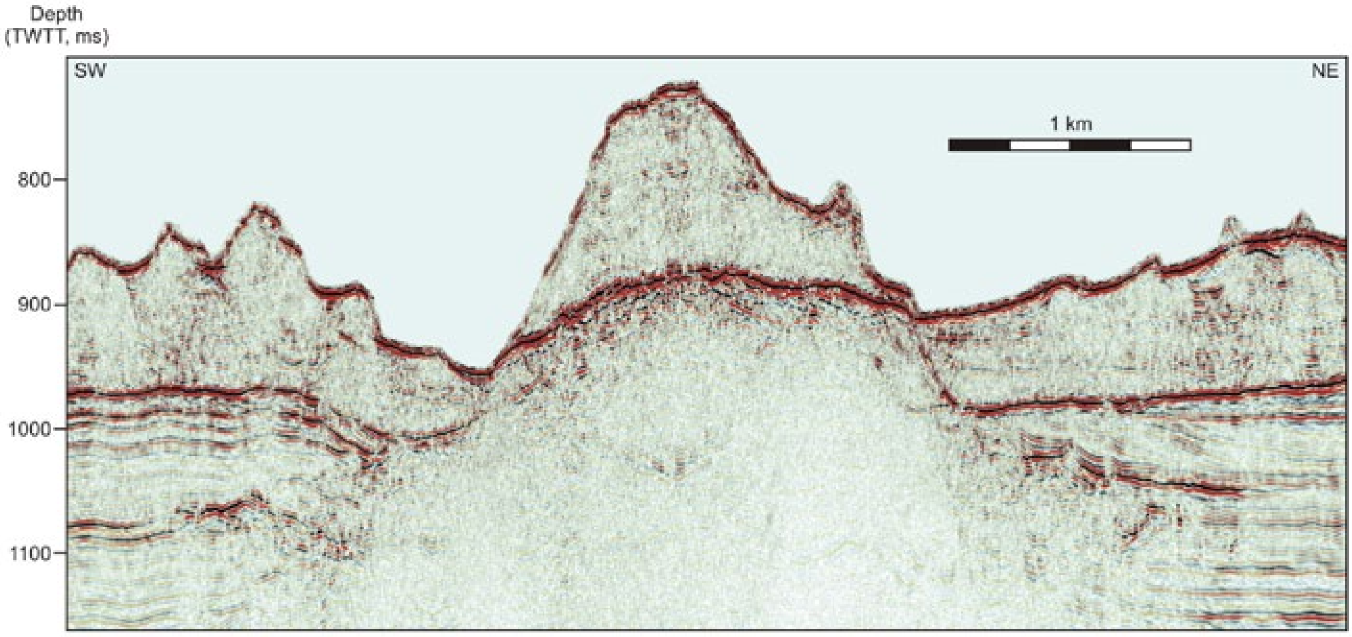


Figure 4: Seismic line across some carbonate mounds at the southwest Rockall Trough margin as indicated in Figure 3 (A-A'). The late Early Pliocene unconformity forming the base of the mounds is clearly visible as a strong reflector.

Baffling of biogenic carbonate debris, pelagic material and siliciclastic particles by the coral framework covering the mounds, results in a much higher vertical sediment accumulation on the mounds than on the surrounding seabed Whereas high current velocities in the intramound areas result in local non-sedimentation and erosion, as is shown by the presence of IRD lag deposits on the seabed and moats around some of the mounds, the presence of extensive hardgrounds and firmgrounds and the 3-dimensional coral framework are considered to be responsible for the stability of the, sometimes extremely steep, slopes of the mounds.

Component analysis of box and piston cores from the southwest Rockall Trough margin shows that the mounds are constructed of a small percentage of siliciclastic material. The majority of the mound sediments consist of the calcium carbonate remains of the multitude of different species living at the mounds (e.g. corals, bivalves and gastropods) as well as pelagic compounds (e.g. foraminifera and coccoliths). An alternation of skeletal and cement dominated intervals is distinguished down core in sediment cores. The lithified inter-

Down core hiatuses may reflect periods of non-deposition or erosion, which are linked to glacial– interglacial variability. Environmental conditions probably change at glacial–interglacial timescales, influencing the local hydrodynamic regime, food supply and thus coral growth and sedimentation rate at the carbonate mounds. This in its turn influences the carbonate mound development in the Rockall Trough area. (de Haas et al., 2009; Mienis et al., 2009b; van der Land et al., in press).

Cold-water coral graveyards in the Gulf of Cádiz (35-36oN)

The Gulf of Cádiz was recently identified as an additional cold-water coral site along the European/African margin and characterised by so-called "coral graveyards" with fossil corals, comprising isolated coral patches and coral rubble (Figure 5) (Foubert et al., 2008; Wienberg et al., 2009). The fossil cold-water corals are widely distributed along the Spanish and Moroccan margins mainly occurring on elevated structures such as mud volcanoes, diapiric ridges, along steep fault escarpments and on coral mounds (Wienberg et al., 2009). The latter

are of particular interest as they provide the possibility to study the development of coral ecosystems with respect to climate-induced changes of the environmental and hydrographic conditions (in particular for the past glacial-interglacial cycle), and moreover, to estimate their likely importance in global carbonate budgets.

The coral mounds occur solely along the Moroccan margin of the Gulf of Cádiz, where they are arranged as cluster or provinces. Coral mounds are developed on top of topographic highs, such as the Renard Ridge (with Pen Duick Escarpment) and Vernadsky Ridge, where to date over 200 coral mounds have been found in a water depth between 500 and 700 m (Foubert et al., 2008). Other coral mound provinces have been discovered in the vicinity of mud volcanoes in water depths of 400-960 m (Akhmetzhanov et al., 2007; Hebbeln et al., 2008). Two of these provinces (SE of Yuma and N of Meknes) are being studied within the scope of CARBONATE (Figure 5). Compared to their Irish counterparts, the coral mounds in the Gulf of Cádiz are rather small-sized as they are only 20-30 m in height, and 50-200 m in length (Wienberg et al., 2009). First analyses of sediment cores, surface samples and ROV video footage revealed that these are mainly made up of the coral species Lophelia pertusa, Madrepora oculata and dendrophylliid species (Figure 5) (Foubert et al., 2008; Wienberg et al., 2009), embedded in a hemipelagic sediment matrix. However, up to now, not much is known about the origin, structure, composition, and temporal development of these mounds.

The current absence of living scleractinian cold-water corals points to unfavourable environmental conditions at present and might be explained by the current warm and oligotrophic conditions in the Gulf of Cádiz causing reduced food availability (Wienberg et al., 2009). Sedimentological studies revealed that after deglaciation bottom current strength in the Gulf of Cádiz markedly decreased and remained rather low during the entire Holocene (e.g., Rogerson et al., 2005). In addition, local hydrodynamic processes such as tidal currents and internal waves supplying food particles to and through the coral thickets are diminished at present (Wienberg et al., 2009).

The widespread occurrence of fossil corals indicates that they were more abundant during the recent geological past, implying environmental and oceanographic conditions must have been more suitable during previous climatic periods (Foubert et al., 2008). Indeed, an initial dating effort revealed that cold-water corals were common in the Gulf of Cádiz at least during the last glacial (Wienberg et al., 2009). A series of AMS radiocarbon dates showed that the reef-forming coral species Lophelia pertusa and Madrepora oculata have been restricted to a period between 12 and 50 ka BP (Wienberg et al., 2009). Recently obtained U/Th dates even confirmed that major phases of coral growth in the Gulf of Cádiz are not solely restricted to the last glacial but also to prior glacial periods, whereas during interglacials coral growth seems to be reduced or even absent (Wienberg et al., in prep.). Most conspicuous is the widespread decline of the coral ecosystems in the Gulf of Cádiz during the Younger Dryas cold reversal (12.9–11.5 ka BP) which coincides with renewed coral growth on the Rockall Bank and the re-establishment of coral mound growth along the slopes of the Porcupine Seabight at around 11 ka BP (Frank et al., 2009). This pattern, suggests that at the transition of the last glacial-interglacial, cold-water corals started to migrate from the southern NE Atlantic towards the north where they found more suitable conditions. Thus, it appears that the biogeographical limits for sustained cold-water coral growth along the NE Atlantic margin are strongly related to climate change. Moreover, it becomes more and more evident that enhanced bottom current strength and enhanced food availability (productivity) have been the main forcing factors for the development of healthy cold-water coral ecosystems or even coral mounds in the Gulf of Cádiz (Wienberg et al., in prep), and that the reduction of these two parameters at the end of the last glacial caused their widespread decline in this area.

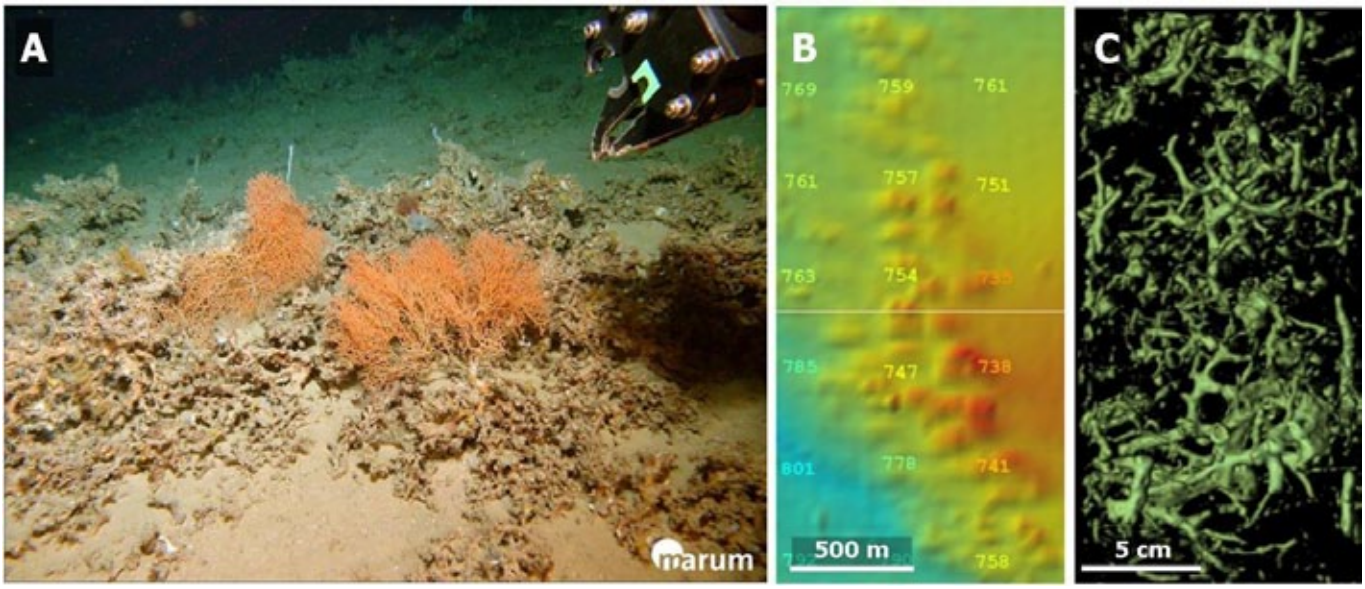


Figure 5: Cold-water corals in the Gulf of Cádiz. A: ROV image showing fossil scleractinian cold-water corals colonised by reddish gorgonians. B: Map of the coral mound province SE of the Yuma mud volcano. C: Computer-tomograph scan of a sediment core collected in the coral mound province north of the Meknes mud volcano showing abundant cold-water coral fragments in the downcore record.

Coral mounds off Mauritania (16-19°N)

Recently, coral mounds have been discovered along the Mauritanian margin (Colman et al., 2005) and like elsewhere are grouped into distinct provinces. One of these provinces is

the Banda Mound province and constitutes the southernmost study area within CARBONATE. The Banda Mounds occur in water depths between 450 and 550 m with

seismic data revealing additional buried mounds (Colman et al., 2005). The mounds have heights of up to ~100 m and are conical with moats developed around their base. Sediment cores and surface samples revealed that Lophelia pertusa is the main coldwater coral species in this area, whereas Madrepora oculata and dendrophylliid corals are minor components of the coral assemblage. Like the Gulf of Cádiz, only fossil corals cover mounds off Mauritania at present. Initial U/Th dates on Lophelia fragments revealed a pattern that coral growth or even mound growth was restricted to the last glacial (back to 65 ka BP) and ended with the onset of the Holocene (Eisele et al., in prep). Again, enhanced bottom current strength and productivity-related food-supply are potential suspects to be the main forcing factors for sustained coral growth off Mauritania during the last glacial.

Conclusions

Using instrumented deep-sea lander deployments, CARBONATE has demonstrated that the development of cold-water coral carbonate mounds and reefs is driven by hydrodynamic and oceanographic processes. Not only do these processes supply sediment which forms a major component of the mounds, but they also supply and resuspend POM which the cold-water corals fed. In this way, both the lithic and the carbonate components of the mound record are in tune with climatically-steered oceanographic changes.

CARBONATE has studied, in high resolution, a complete sequence through a cold-water coral reef/mound from northern Norway. This is only the second time that such a study has been performed telling us important information about mound genesis and development in contrasting settings to the previous study on the Irish margin (IODP Exp. 307).

CARBONATE has generated a number of key palaeoenvironmental records at intermediate water depths. Perhaps more importantly, for the first time, these coral carbonate mound palaeo-archives are placed along a latitudinal gradient from northern Norway (70oN) to Mauritania (16oN). In doing so, CARBONATE has defined cold-water coral palaeobiogeographical provinces suggesting that southern Europe and north Africa represent potential refugia for cold-water corals during glacial periods. However, we should be wary about making basin-wide conclusions from a limited number of sites. The real challenge is to look at the wider basin and understand the connectivity between the north African margin, the Mediterranean, the Caribbean, the eastern American seaboard and the NE Atlantic where all the major cold-water coral sites exist. Very little is known about the geological history of cold-water coral reef development from

the eastern Atlantic. Are cold-water corals able to spread across the Atlantic during periods of climatic change or are they restricted to north-south movements up the European margin? What do the American records tell us about the functioning of the Gulf Stream and how is the timing of these changes reflected across the Atlantic on the European margin? Such questions are posed to be answered with the opportunity of continued funding through a new EUROCORES initiative, EuroTRACES: European Trans- Atlantic Ecosystem Study.

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Andy Wheeler, Dept. of Geology & ERI, University College Cork, Ireland. a.wheeler@ucc.ie
Henk de Haas, Royal Netherlands Institute for Sea Research (NIOZ), Den Burg, The Netherlands
Matthias López Correa, GeoZentrum Nordbayern, Universität Erlangen-Nürnberg, Erlangen, Germany
Claudia Wienberg, MARUM, Center for Marine Environmental Change, University of Bremen, Germany
CARBONATE partners (including Dept. of Earth & Environmental Sciences, Catholic University of Leuven, Belgium)

InterRidge Student and Postdoctoral Fellowships

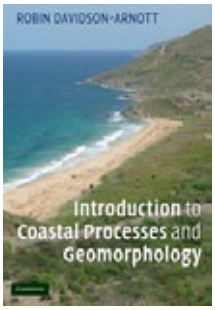
These Fellowships are designed to encourage international collaboration on any aspect of ridge-crest science. They can be used for any field of ridge-crest science.

Up to four fellowships, each worth $5000 USD are available through InterRidge's Student and Postdoctoral Fellowship programme. One is open to a graduate student or postdoc from any nation, the other three to graduate students or postdocs from either a developing country or to people assisting in training those of a developing country. Full details can be found at: http://www.interridge.org/en/fellowship/2010.

Deadline: 31st March 2010

Debbie Milton
National Oceanography Centre
European Way
Southampton
UK
SO14 3ZH

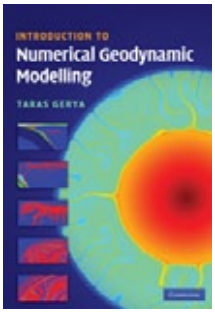
Introduction to Coastal Processes and Geomorphology



Authors: Robin Davidson-Arnott
Publisher: Cambridge University Press
ISBN: 9780521696715
YEAR : 2010
EDITION : 1st
PAGES : 442
PRICE : 34.50 €
Paperback

Written for undergraduate students studying coastal geomorphology, this is the complete guide to the processes at work on our coastlines and the features we see in coastal systems across the world. Accessible to students from a range of disciplines, the quantitative approach of this book helps to build a solid understanding of wave and current processes that shape coastlines. The resulting processes of erosion, transport and deposition and the features they create are clearly explained, with over 400 illustrations and photographs. From sandy beaches to coral reefs, the major coastal features are related to contemporary processes and to sea-level changes over the past 25,000 years. Key equations describing or predicting measurements from instruments used to map these processes are all presented in this wide-ranging overview. Davidson-Arnott completes this teaching package with online material that brings the subject to life, including videos of coastal processes and virtual field trips.

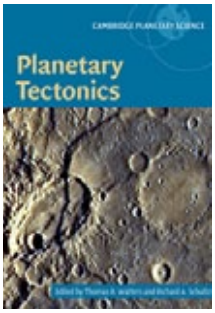
Introduction to Numerical Geodynamic Modelling



Authors: Taras Gerya
Publisher: Cambridge University Press
ISBN: 9780521887540
YEAR : 2010
EDITION : 1st
PAGES : 345
PRICE : 45.00 €
Hardback

Numerical modelling of geodynamic processes was predominantly the domain of high-level mathematicians experienced in numerical and computational techniques. Now, for the first time, students and new researchers in the Earth Sciences can learn the basic theory and applications from a single, accessible reference text. Assuming only minimal prerequisite mathematical training (simple linear algebra and derivatives) the author provides a solid grounding in basic mathematical theory and techniques, including continuum mechanics and partial differential equations, before introducing key numerical and modelling methods. 8 well-documented, state-of–the-art visco-elasto-plastic, 2-D models are then presented, which allow robust modelling of key dynamic processes such as subduction, lithospheric extension, collision, slab break-off, intrusion emplacement, mantle convection and planetary core formation. Incorporating 47 practical exercises and 67 MATLAB examples, this textbook provides a user-friendly introduction for graduate courses or self-study, encouraging readers to experiment with geodynamic models.

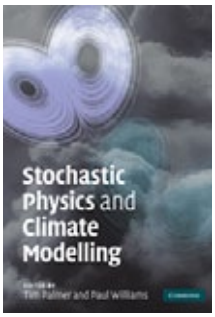
Planetary Tectonics



Authors: Thomas R. Watters, Richard A. Schultz
Publisher: Cambridge University Press
ISBN: 9780521765732
YEAR : 2010
EDITION : 1st
PAGES : 518
PRICE : 90.00 €
Hardback

This book describes the tectonic landforms resulting from major internal and external forces acting on the outer layers of solid bodies throughout the Solar System. It presents a detailed survey of tectonic structures at a range of length scales found on Mercury, Venus, the Moon, Mars, the outer planet satellites, and asteroids. A diverse range of models for the sources of tectonic stresses acting on silicate and icy crusts is outlined, comparing processes acting throughout the Solar System. Rheological and mechanical properties of planetary crusts and lithospheres are discussed to understand how and why tectonic stresses manifest themselves differently on various bodies. Results from fault population data are assessed in detail. The book provides methods for mapping and analysing planetary tectonic features, and is illustrated with diagrams and spectacular images returned by manned and robotic spacecraft. It forms an essential reference for researchers and students in planetary geology and tectonics.

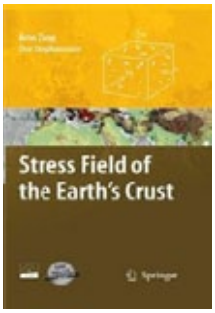
Stochastic Physics and Climate Modelling



Authors: Tim Palmer and Paul Williams
Publisher: Cambridge University Press
ISBN: 9780521761055
YEAR : 2010
EDITION : 1st
PAGES : 480
PRICE : 98.00 €
Hardback

This is the first book to promote the use of stochastic, or random, processes to understand, model and predict our climate system. One of the most important applications of this technique is in the representation of comprehensive climate models of processes which, although crucial, are too small or fast to be explicitly modelled. The book shows how stochastic methods can lead to improvements in climate simulation and prediction, compared with more conventional bulk-formula parameterization procedures. Beginning with expositions of the relevant mathematical theory, the book moves on to describe numerous practical applications. It covers the complete range of time scales of climate variability, from seasonal to decadal, centennial, and millennial. With contributions from leading experts in climate physics, this book is invaluable to anyone working on climate models, including graduate students and researchers in the atmospheric and oceanic sciences, numerical weather forecasting, climate prediction, climate modelling and climate change.

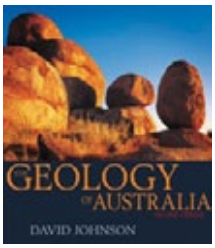
Stress Field of the Earth's Crust



Authors: Arno Zang, Ove Stephansson
Publisher: Springer
ISBN: 9781402084430
YEAR : 2010
EDITION : 1st
PAGES : 322
PRICE : 79.95 €
Hardback

This book about rock stress is suitable for students in geosciences and rock engineering, who need to broaden their horizons about the Stress Field of the Earth's Crust. The book covers the topic so that geosciences students will be able to grasp the Cauchy Stress Principle without fear of matrix transformations in an exercise. Students interested in mathematics, physics and engineering will learn how strain gauges are used to obtain in-situ stress by the overcoring method. Leading edge technology in determining rock stress like quadruple packer and the Kaiser effect are presented together with classical methods like hydraulic fracturing. Borehole techniques (breakouts) and core-based methods (anelastic strain recovery) are illustrated. With respect to stress data, we choose to present the scientific ultra-deep drilling project KTB (Germany), the excavation for nuclear waste disposal at Olkiluoto (Finland) and the drilling into a seismic active fault zone at SAFOD (USA). Stress compilations viewed by the World Stress Map project are presented and interpreted in terms of plate tectonics.

The Geology of Australia



Authors: David Johnson
Publisher: Cambridge University Press
ISBN: 9780521767415
YEAR : 2009
EDITION : 2nd
PAGES : 348
PRICE : 46.00 €
Paperback

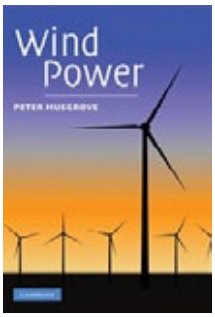
The Geology of Australia provides a vivid and informative account of the evolution of the Australian continent over the last 4400 million years. Starting with the Precambrian rocks that hold clues to the origins of life and the development of an oxygenated atmosphere, it goes on to cover the warm seas, volcanism and episodes of mountain building, which formed the eastern third of the Australian continent. This illuminating history details the breakup of the supercontinents Rodinia and Gondwana, the times of previous glaciations, the development of climates and landscapes in modern Australia, and the creation of the continental shelves and coastlines. Separate chapters cover the origin of the Great Barrier Reef, the basalts in Eastern Australia, and the geology of the Solar System. This second edition features two new chapters, covering the evolution of life on Earth while emphasising the fossil record in Australia, and providing a geological perspective on climate change. From Uluru to the Great Dividing Range, from earthquakes to dinosaurs, from sapphires to the stars The Geology of Australia is a comprehensive exploration of the timeless forces that have shaped this continent.

Understanding Fluid Flow

Authors: Grae Worster
Publisher: Cambridge University Press
ISBN: 9780521132893
YEAR : 2009
EDITION : 1st
PAGES : 104
PRICE : 16.80 €
Paperback

Understanding Fluid Flow takes a fresh approach to introducing fluid dynamics, with physical reasoning and mathematical developments inextricably intertwined. The 'dry' fluid dynamics described by potential theory is set within the context of real viscous flows to give fundamental insight into how fluids behave. The book gives a flavour of theoretical, experimental and numerical approaches to analysing fluid flow, and implicitly develops skills in applied mathematical modelling of physical systems.

Wind Power



Authors: Peter Musgrove
Publisher: Cambridge University Press
ISBN: 9780521747639
YEAR : 2010
EDITION : 1st
PAGES : 323
PRICE : 22.40 €
Paperback

Climate change caused by burning fossil fuels and escalating fossil fuel prices make the further rapid development of renewable energy sources a global imperative. Energy provided by wind power, though no panacea, has the potential to make a substantial contribution to meeting electricity needs in many countries. This concise and accessible account of the history and future development of wind power technology offers a complete overview of this vital field for engineers, scientists, students and all readers interested in wind power. Requiring no prior technical knowledge, this book provides a global historical assessment of wind power use, encapsulating sequential experimental changes, and concluding with narration of wind deployment, and an assessment of future options. Wind power is shown as compatible with large scale use: a clean, competitive and abundant energy source to help meet our future needs.

River Restoration: Fluvial-Geomorphic and Ecological Tools - (Course)

07/06/2010 - 11/06/2010 - Lyon and Provence, France

This workshop provides training in fluvial geomorphic tools to assess the status of rivers, to identify on-going trends and their causes and to develop programs of measures to reverse ecological decline and restore fluvial processes that can create habitats and improve water quality.

The 5-Day course emphasizes understanding geomorphic process as a sound basis for planning and designing river restoration projects and programs. It covers general principles and case studies from a wide range of environments, with specific applications and field visits to Mediterranean and mountain environments. The course and course materials are in English, but draw heavily on river restoration and management experiences in France and elsewhere in the EU, complemented by experiences in North America.

This professional training course is designed for managers, landscape architects, planners, ecologists, engineers, and members of other professions with interests in river restoration.

Instructors include Matt Kondolf (UC Berkeley), Hervé Piégay (CNRS Lyon), David Sear (University of Southampton), Frederic Liébault (CEMAGREF Grenoble), Simon Dufour (Université Aix-Marseille), Nicolas Lamouroux (Université Lyon 1), Laurent Schmitt (Université Lyon 2), Anne-Julia Rollet (Université du Caen Basse-Normandie), Mark Tompkins (Newfields River Basin Services), Walter Binder (Bavarian Interior Ministry, ret.), Alastair Driver (Environment Agency, UK).

Course materials include the reference text Tools in Fluvial Geomorphology (John Wiley & Sons 2003), >40 relevant papers and manuals on CD-rom, and printed lecture notes and field trip guides. Tuition includes course materials, field transportation, lunches, four Provençal dinners, and an introduction to the terroir, vineyards, and land-use history of the region. Inexpensive lodging is available within a few minutes' walk of the conference venue.

WWW.INSTITUTBEAUMONT.COM

Climatic Change and Impacts on Natural and Protected Areas - (Course)

30/08/2010 - 03/09/2010 - L'Aquila, ITALY

The purpose of the summer school is to revisit the concepts and ideas of a previous workshop held almost 11 years ago, about Global Change and Protected Areas (September 1999 in L'Aquila), to assess progress that has been made in our scientific ability to generate detailed climate projections at the regional scale that are of use to impact modelers, stakeholders and decision-makers working in the context of protected natural areas.

The main objective of the school are thus to provide the students with an insight into climate and impacts modeling techniques, as well as environmental monitoring and decision-making strategies for regions that are not always easily accessible and rich in data. There will be ample opportunity to sample interdisciplinary aproaches to complex environmental problems and to exchange ideas and questions between the lecturers and the students.

Registration Includes: attendance to lectures, notes, coffee breaks and an all-day excursion through the suggestive landscapes of the Gran Sasso-Monti della Laga National park The application form should be submitted online through the ISSAOS 2009 website: http://cetemps.aquila.infn.it/issaos

DIRECTOR OF THE SCHOOL ORGANIZER: Prof. Martin Beniston CETEMPS, University of Geneva University of L'Aquila Via www.unige.ch/climate Vetoio 1, Coppito 67010 L'Aquila ITALY

CETEMPS - Center of Excellence for the Forecast of Severe Weather and University of L'Aquila

http://cetemps.aquila.infn.it/issaos

INTERNATIONAL SUMMER SCHOOL ON ATMOSPHERIC AND OCEANIC SCIENCES
L'Aquila, ITALY
issaos@aquila.infn.it

First International School on the KTH Approach to Modeling the Geoid - (Course)

20/09/2010 - 24/09/2010 - Istanbul, Turkey

After the successful experiences in the determinations and evaluations of precise local geoid models in different countries, the Department of Geomatic Engineering, Yildiz Technical University plans to arrange the First International Geoid School based on the KTH approach (KTH is a Swedish abbreviation for Royal Institute of Technology, Stockholm, Sweden).

This training course provides a good opportunity for the student to familiarize himself with the latest developments in geoid determination, as well as to enhance the international collaboration in gravity field modeling by building contacts to the professionals dealing with geoid determination in various countries.

The school is offered only for university students and personnel from public organizations, and the software package is available only for training of students and scientific works.

The registration fee is 400 € before June 15, 2010 and 450 € after that date. The fee includes lecture notes, preliminary software manual, a CD with the LSMSA software package, opening reception, lunches, coffee/tea at breaks and a social dinner. Registration form is given at the official site. The software package and manual will be offered to participants after a) registration and b) signing a license agreement form. Please, contact Mr. M. Bagherbandi (mohbag@kth.se) for this form.

For more information about the contents of the school, please visit the KTH website: www.infra.kth.se/geo/, or contact Mr. Mohammad Bagherbandi (mohbag@kth.se) at KTH.

Department of Geomatic Engineering, Yildiz Technical University

http://www.infra.kth.se/geo/events/ISI-2010.pdf

8th Intern. Training Workshop Integrated Coastal Management in the Mediterranean and the Black Sea - (Course)

31/08/2010 - 16/09/2010 - Dalyan/Southern Aegean coast, Turkey

The 8th International Training Workshop on Integrated Coastal Management in the Mediterranean and the Black Sea (MEDCOAST Institute 2010) is scheduled to take place in Dalyan/Southern Aegean coast, Turkey during 31 August - 16 September 2010.

The deadline for application is 31 May 2010.

The MEDCOAST Institute has been organized since 1994 until the seventh Institute in 2004. This ICM capacity building effort is now continued after a long break (6 years). The organisers look forward to an exciting and valuable 17 days to work together (with hands on the job) in the idyllic setting of Dalyan, a small resort in the heart of a coastal protected area.

Similar to past programs, MEDCOAST Institute 2010 consists of three parts:

1) Four days long in-class training, including lectures by the international faculty on various topics related to ICM in the Mediterranean and the Black Sea, presentations by participants on their country experiences, and group exercises, to be held in a pleasant hotel in Dalyan (31 August - 3 September).

Emphasised topics are:

*ICM issues and problems in the Mediterranean and the Black Sea.

*Sustainable development and theoretical framework for ICM.

*Physical and ecological description of coastal systems. *Coastal and marine resources, uses, coastal development activities.

*Coastal and marine spatial planning.

*Coastal tourism.

*Beach management.

*Coastal erosion and the use of coastal engineering technology.

*Coastal water quality & litter.

*Coastal management techniques and tools.

*Specially protected coastal and marine areas.

*Coastal management implications of climate change. *Remote sensing and GIS.

*Environmental economics.

*Institutional and legal arrangements.

*EU policy and legislation for coastal and marine management.

*ICZM Protocol of the Barcelona Convention.

*Review of the regional efforts for ICM in the Mediterranean.

*Review of the regional efforts for ICM in the Black Sea.

2) A week long, hands-on study trip and field observations on traditional wooden boats sailing along the Aegean coast from Marmaris to Fethiye (Olu Deniz) and anchoring at locations of significant coastal conservation and/or development activities for observations, applied research and interviews with various actors and stakeholders of coastal management. A number of lectures will also be delivered on the boat during evenings (4-10 September).

3) Workshop with hands-on training, including lectures by the faculty on topics relevant to the field trip, presentations by the participants on their field work, group discussion sessions and exercises in the pleasant hotel in Dalyan (11-16 September).

http://www.medcoast.org.tr

MYRES 2010 - (Course)

20/09/2010 - 24/09/2010 - Cottbus, Germany

The Brandenburg University of Technology (BTU) will host the 4th Meeting of Young Researchers in Earth Science (MYRES 2010). We invite early career scientist interested in feedbacks between physical and biological processes on the Earth's surface to participate.

MYRES biannual workshops bring together early career Earth system scientists from a broad spectrum of disciplines. MYRES IV: "Structures and Processes of the Initial Ecosystem Development" wants to address knowledge gaps in how abiotic and biotic processes interact to control the early stage evolution and function of ecosystems. Conference delegates should present a poster on their research, participate in discussions and give short statements to topics of the sessions. We are applying for funding so that MYRES will be able to pay airfare and lodging for all delegates.

Please find further information on www.myres.org.

http://www.tu-cottbus.de/btu/en.html

Workshop on the auroral substorm & its importance on the development of solar-terrestrial research - (Meeting)

08/04/2010 - 10/04/2010 - Taiwan

COMMEMORATING THE BIRTH OF THE CONCEPT OF THE AURORAL SUBSTORM

An extensive array of all-sky cameras operated during the International Geophysical Year (IGY) made it possible to study simultaneous auroral activities over the entire arctic region for the first time in the history of auroral science. On the basis of this data set, Syun Akasofu recognized a global feature of the temporal evolution of auroral displays and developed a global phenomenological model and proposed the concept of the auroral substorm in 1964. Subsequently, in the search of the cause of the auroral substorm, researchers, both observational and theoretical, have worked on a complex plasma system in space around the Earth, a system consisting of the magnetosphere, ionosphere and the upper atmosphere. It has been found that this system responds dynamically to various solar wind disturbances on a global scale. Thus, the concept of the magnetospheric substorm has been developed.

WORKSHOP OBJECTIVES:

In this workshop, we shall examine how our perspective of space plasmas has evolved from a focus on discrete pro-

cesses to the study of complex global plasma systems. We do this recognizing the fact that Akasofu's pioneering work in 1964 has provided the impetus to look at space plasma from a global perspective. We shall also discuss the evolution of networks of ground-based and space-based instrumentation and the increased integration of ground and space-based observations. Finally, we shall discuss the evolution of coupled global physics-based models to explain the observations and predict the impact of solar wind disturbances on the near-Earth space environment.

ABSTRACT SUBMISSION:

Besides the invited talks, the Workshop Program Committee strongly encourages the submission of contributed talks and posters relevant to the themes of this workshop. If you are interested in submitting a paper, please contact the workshop website http://www.ss.ncu.edu.tw/~Aurora/.

Abstract submission deadline: March 5, 2010

PRACTICAL INFORMATION:

The workshop will be hosted by the Institute of Space Science, National Central University, Taiwan. Sessions will be held in the morning and afternoon. The workshop will be concluded with a reception and a banquet at the South Garden Hotels and Resorts: http://www.southgarden.com.tw/html/index.asp

This workshop may provide some financial supports to the needed participants. Please check the workshop website for more information.

Further information regarding abstract submission, registration, and travel will be forthcoming in the next announcement. Please address questions to Jesper W Gjerloev (jesper.gjerloev@jhuapl.edu) or Workshop website: http://www.ss.ncu.edu.tw/~Aurora/

Institute of Space Science, National Central University, Taiwan

ORGANIZING COMMITTEE:

Jerry Chao, Jesper W Gjerloev, Tony Lui and Kiyo Yumoto

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Raymond Greenwald, Lou-Chuang Lee, Yohsuke Kamide, Ching Meng and Hermann Opgenoorth

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http://www.ss.ncu.edu.tw/~Aurora/.

[writer info:]

Jesper W Gjerloev (jesper.gjerloev@jhuapl.edu)

Stress controls on faulting, fracturing and igneous intrusion in the Earth's crust - (Meeting)

06/09/2010 - 08/09/2010 - Scotland, United Kingdom

E.M Anderson (1877-1960) was one of the 20th centuries most influential structural geologists, for his 1905 paper and his 1942/51 book on "The Dynamics of Faulting and Dyke Formation with Application to Britain". This contains some simple but profound insights into stress and fault development in the brittle crust - namely that there are three basic stress regimes in the crust and that three fundamental classes of fault should therefore exist if these stress conditions are combined with the Coulomb criterion for brittle shear failure. He also argued convincingly for stress controls on the orientation of high-level igneous intrusions (dykes, cone sheets, etc.). It is notable that his 1905 paper predicted the existence of subvertical wrench (strike-slip) faults well before most geologists were prepared to accept that such faults existed or were important. One year later came the 1906 San Francisco strike-slip rupture on the San Andreas Fault.

Modern measurements of tectonic stress, stress inversions from fault slip data and focal mechanism analyses have largely verified his supposition that one of the principal stresses is usually vertical. Seismology also shows that his three fundamental fault classes account for a high proportion of observed focal mechanisms. The work continues to underpin much research on the borderline between structural geology and seismology.

Contributors to the meeting are invited to reappraise 'Andersonian' concepts (e.g. how often, and under what conditions, do stress trajectories deviate significantly from the vertical and the horizontal) in the light of our present understanding of stress, failure mechanics, and igneous intrusive processes in the crust.

Department of Geographical and Earth Sciences, University of Glasgow, Glasgow G12 8QQ, Scotland, UK

tel. +44 (0)141 330 4782

fax. +44 (0)141 330 4894

email: enquiries@ges.gla.ac.uk

Organisers: Zoe Shipton, Rick Sibson, Dave Healy, Rob Butler, Heather Moir

http://www.gla.ac.uk/events/andersonconference/

6th International Workshop on Grid Computing for Complex Problems - GCCP 2010 - (Meeting)

08/11/2010 - 10/11/2010 - Bratislava, Slovakia

GCCP 2010 invites researchers and practitioners to submit papers that contribute results of research in Grid Computing for Complex Problems as well as papers that report on industrial IT projects. Contributions are welcome in, but not limited to the following topics of interests:

- Bio-applications
- Computational Chemistry & Material Science
- Life Sciences
- Environmental applications and Distributed Computing
- Earth Science
- Astronomy & Astrophysics
- High energy Physics
- Business benefits and challenges of grid in Financial Markets
- Data Movement Mechanisms – Data Grid
- Grid and Service-oriented Computing
- Distributed Computing and Large Scale Applications

- High Performance Distributed Computing and Large Scale Simulation
- Use of Knowledge and Semantics in Distributed Computing
- Research Infrastructures
- National and International Grid Projects
- Grid Tutorials
- Grid Access
- Workflow and Parallelism
- Interoperability and Resource Utilization

Important dates

June 30, 2010 submission deadline for extended abstract (2 pages)
July 31, 2010 notification of acceptance
September 30, 2010 submission of camera-ready final papers and registration
November 8-10, 2010 the conference

Program Committee

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(to be completed and confirmed)

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Jolana Sebestyenova
Olga Schusterova

Contact & info: conference.ui@sav.sk
http://conference.ui.sav.sk/gccp2010/

Call for proposals for ESF Research Conferences in 2012 - (Meeting)

24/08/2010 - 30/08/2010 - France, Austria

The European Science Foundation invites scientists to submit proposals for high-level research conferences to take place in 2012 within the framework of its Research Conferences Scheme in the following scientific domains (only domains of interest to geoscientists are listed here):

* Interdisciplinary Environmental Sciences
* Physics/Biophysics and Environmental Sciences

Applicants should be scientists/researchers based at European universities/research institutes (in the broad sense) in ESF Member Organisation countries.

Submission deadline: 15 September 2010 (midnight CET)

http://www.esf.org/activities/esf-conferences/call-for-proposals

2nd International Sclerochronology Conference - (Meeting)

24/07/2010 - 28/07/2010 - University of Mainz, Germany

Call for papers

Registration and abstract submission for ISC2010 is now open, see http://www.scleroconferences.de.

Who should attend? Anyone working on or interested in the formation and interpretation of growth increments in accretionary hard parts of invertebrate and vertebrate organisms as well as corraline red algae, their geochemistry and crystal fabrics or the underlying processes of biomineralization, should attend this conference. Come to Mainz, share your thoughts and help to bring this fast-developing field forward.

Please note: The organisers also highly welcome contributions from people working with tree rings, speleothems and related bio- and geoarchives.

The conference organizers hope to welcome you at the University of Mainz for exciting presentations and discussions in this fast developing field. Please check the website for further information.

Program committee:

- Bernd R. Schöne (conference chair), Geosciences, University of Mainz, Germany
- Andrew L.A. Johnson, Geographical, Earth and Environmental Sciences, University of Derby, UK
- Claire E. Lazareth, LOCEAN, Institut Pierre Simon Laplace, France
- David P. Gillikin, Earth Science and Geography, Vassar College, USA
- Kazushige Tanabe, Earth and Planetary Science, University of Tokyo, Japan
- Meghan Burchell, Anthropology, McMaster University, Canada
- Thomas Tütken, Steinmann Institute, University of Bonn, Germany

Sclerochronology is the study of physical and chemi-

cal variations in the accretionary hard tissues of organisms, and the temporal context in which they formed. Sclerochronology focuses primarily upon growth patterns reflecting annual, monthly, fortnightly, tidal, daily, and sub-daily increments of time entrained by a host of environmental and astronomical pacemakers. Familiar examples include yearly banding in reef coral skeletons and otoliths or daily and annual growth patterns in mollusk shells. Sclerochronology is analogous to dendrochronology, the study of annual rings in trees, and equally seeks to deduce organismal life history traits as well as to reconstruct records of environmental and climatic change through time and space.

http://www.scleroconferences.de

Claire E. Lazareth
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5th International Workshop on 3D Geo-Information - (Meeting)

03/11/2010 - 04/11/2010 - Berlin, Germany

Participants and Focus

3D GeoInfo aims at bringing together international researchers from academia, industry and government in the field of 3D geo information. The workshop offers an interdisciplinary forum to researchers in the fields of:

- Data collection and modelling: advanced approaches for 3D data collection, reconstruction and methods for representation
- Data management: topological, geometrical, and network models for maintenance of 3D geo information
- Data analysis and visualisation: frameworks for representing 3D spatial relationships, 3D spatial analysis, algorithms for navigation, interpolation, and advanced virtual reality.

Workshop Topics

Amongst others, the following subjects will be addressed by the workshop:

- 3D geo information requirements (based on analysis of applications)
- 3D data acquisition, processing (LiDAR, photogrammetry) and ob-ject reconstruction
- 3D GIS and time / 4D models
- 3D in spatial databases
- 3D geometry and topology; levels of detail (scale, resolution)
- 3D visualisation, augmented and virtual reality
- 3D spatial analysis and simulation
- 3D indoor and outdoor navigation
- 3D city models and building (information) modeling (outdoor and indoor integration) and future aspects of city modelling
- 3D spatial data infrastructures and 3D data integration
- 3D and 4D earth system and geological modeling
- 3D applications (e.g., 3D cadastre, 3D utilities, 3D city and urban planning, disaster and risk management, environmental simulation, training simulation).

Publications

Researchers are invited to submit full papers (up to 6000 words) or extended abstracts (1000-1500 words) describing original and unpublished fundamental scientific research. All manuscripts will be subject to a double-blind review process. Accepted full papers will be published in a book by a renowned science publisher. Accepted extended abstracts will be published in the conference proceedings with ISBN/ISSN reference. A selection of high-quality papers will be accepted for (oral/poster) presentation at the workshop. Guidelines for all forms of submissions are according to templates which will be provided on the Workshop website. Please submit all abstracts and papers through the website according to the following deadlines:

Full paper submission: 30 April 2010
Extended abstract submission: 07 May 2010
Notification of full paper acceptance: 18 June 2010
Notification of extended abstract acceptance: 02 July 2010
Camera ready submission: 06 August2010

Organised by ISPRS WG IV/8, EuroSDR, DGPF,and Berlin University of Technology.

Program Chair: Thomas H. Kolbe, Berlin University of Technology, Germany

http://www.igg.tu-berlin.de

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Germany
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Seismology-Academic

Two PostDoc Positions within Microseismic Monitoring

Company: NORSAR
Location: Norway-Kjeller
Date Posted: 12/01/2010
[show details...]

Seismology-Academic

3 PhD positions in Seismology

Company: Insitute of Geophysics, University of Hamburg
Location: Germany-Hamburg
Date Posted: 26/02/2010
[show details...]

Climate-Academic

Assistant Professor in Urban Climatology

Company: School of Geographical Sciences and Urban Planning, Arizona State University
Location: USA-Arizona
Date Posted: 19/11/2009
[show details...]

Climate-Academic

PostDoc Position in Chile

Company: University of Santiago
Location: Chile-Santiago
Date Posted: 30/03/2010
[show details...]

Atmospheric Sciences-Academic

PhD position in meteorological dimension of the project 'ClearFLo' at King's College London

Company: King's College London
Location: England, United Kingdom-London
Date Posted: 24/11/2009
[show details...]

General-Academic

Full or Associate Professor of Physical Geography

Company: University of Zurich
Location: Switzerland-Zurich
Date Posted: 08/04/2010
[show details...]

More details on these jobs can be found online at www.the-eggs.org (click on the button "Job Positions" on the left). Job positions online are updated twice a week.