



Land-Ocean  
Interactions in the  
Coastal Zone

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# INPRINT

Humans are in the centre of change and hazards affecting coastal zones. Whether “God-given” or “climate driven” the attractiveness of coasts, however, usually overrules the perceived risk – and, protected coasts attract even more people. Under these impressions of the multidisciplinary Storm Surge Congress 2010 this INPRINT features a variety of coastal change drivers including urbanisation, ship traffic, nutrient fluxes and their interference with fisheries.

We also explore recent efforts of society to adapt to change and to achieve sustainable coastal management on regional scale. We want to learn more from satellite images to better understand processes and dynamics of our “brown waters” and we look at a rather unique site in global context – the Wadden Sea – and future plans and research ambitions of the recently founded Wadden Academie.

LOICZ is very glad to say that much of these forward looking research efforts are accommodated in the increasing number of “Affiliated Projects”

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### LOICZ in brief

LOICZ aims to provide science that contributes towards understanding the Earth system in order to inform, educate and contribute to the sustainability of the world's coastal zone. LOICZ is a Core Project of the International Geosphere-Biosphere Programme (IGBP) and the International Human Dimensions Programme on Global Environmental Change (IHDP). The LOICZ IPO is hosted by the Institute for Coastal Research at the Helmholtz-Zentrum Geesthacht Centre for Materials and Coastal Research, which is part of the Helmholtz Association of National Research Centres.

LOICZ research as outlined in the Science Plan and Implementation Strategy, SPIS, is organised around five themes:

- Vulnerability of coastal systems and hazards to society
- Implications of global change for coastal eco-systems and sustainable development
- Human influences on river-basin-coastal zone interaction
- Biogeochemical cycles of coastal and shelf waters
- Towards coastal system sustainability by managing land-ocean interactions

The Science Plan and Implementation Strategy is available electronically on the LOICZ website and in hard copy at the LOICZ IPO.

This newsletter is also available online at [www.loicz.org](http://www.loicz.org)



## Scientific Highlights

### Sediment dynamics and the near-field wake of ships moving through narrow channels

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Large ships moving through narrow channels produce a Bernoulli wake, which can resuspend sediments on the adjacent shoals. Ship wake-sediment interaction in the Venice Lagoon was investigated during March and July 2009. Acoustic, pressure, electromagnetic and optical sensors were utilised to measure the water velocity, direction and height of the wake as well as the suspended sediment concentration. During the two sampling campaigns more than 100 ships passed the study site and the characteristics of each associated Bernoulli wake were recorded. Due to the long drawdown of the water along the shoals during the Bernoulli wake passage, high water velocities can be reached and maintained for tens to hundreds of seconds. These high current velocities allow for substantial resuspension of fine-grained sediments back into the water column. If a background current is sustained or multiple ships pass through the narrow channel sediment transport may occur. This process apparently has led to the erosion of shoals and nearby marshes, increased dredging costs in channels, and led to contaminant remobilisation from polluted sediments. The effect of this process would be amplified if these channels are located within estuarine chemical reaction zones, where a variety of redox-sensitive species are accumulated in superficial sediments.

#### Introduction

Large ships passing through narrow channels in coastal waters can resuspend sediments on the channel banks and on the shoals surrounding the channels. This process can lead to the erosion of marshes (Houser 2010) beaches (Soomere et al. 2009) or shoals (Rapaglia et al. in review). As the shipping industry continues to expand, ships increase in size, channels are dredged to greater depths and harbours grow, there is an urgent need to better understand the effects of navigation on the coastal environment. Much of the research concerned with vessel wake-sediment interaction and morphodynamics involves the far field wake of vessels (e.g., Parnell et al. 2008). In this case, a low-amplitude (Airy) wave can be a

good representation of the vessel's wake and the bed shear stress can be calculated from the orbital velocity.

Navigation of large ships in coastal waters produces a high-amplitude, non-linear wake. As a ship moves through a channel it displaces water around the hull, new water then must increase in velocity around the ship to replace the displaced water. According to the Bernoulli Effect, if the velocity of water increases then there must be a corresponding decrease in pressure, that is, a lowering of the water level along the side of the ship. This depression then propagates away from the boat onto the shoals. The wake takes the same shape of the leading wave of a tsunami (an N-wave; Tadepalli & Synolakis (1996) Madsen (2010), with a leading depression (trough) followed by a crest. The trough leads to extended duration of high current velocities, although the theoretical calculation of bottom water velocities, which lead to bed shear stress, is more difficult.

While relatively little literature exists on the interaction between the near-field wake and sediment resuspension data recently presented at the 2010 CIESM conference in Venice, Italy show that the high current velocities extending for tens of seconds are produced by a ship's Bernoulli depression wake. These waves may be the major factor in sediment resuspension along a large area of shoals in the Venice Lagoon, Italy.

The narrow dimensions (overall width: 200 m) of the Malamocco-Marghera industrial channel in the Venice Lagoon (Figure 1) allow for the propagation of large ships' (length >150 m) Bernoulli wakes onto the nearby shoals. The size of the wake and associated current speed has been shown to be proportional to both ship size and ship velocity. Rapaglia et al. (in review) utilised a relationship based on the product of the depth-based Froude number of the ship (which is a function of the ships velocity over the channel depth) and the blocking coefficient of a ship to determine a threshold beyond which the ships' Bernoulli wakes will propagate onto the shoals lea-

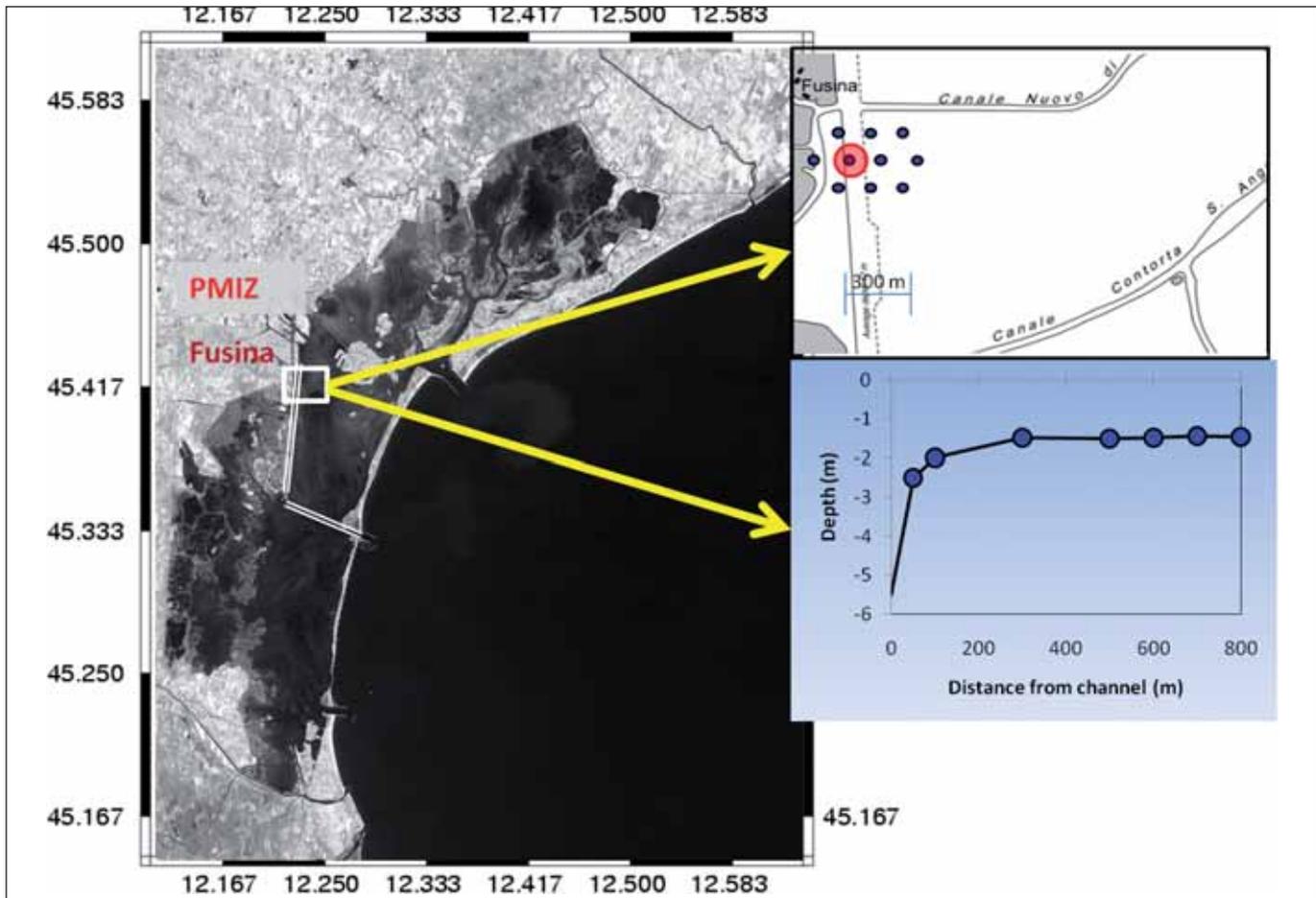


Figure 1. The study site within the Venice Lagoon. The Malamocco-Marghera Canal is marked with the double white line. The upper inset shows the relative location of the instruments on the shoals. The blue circles show the location of the pressure sensors. The red circle shows the location of the OBS sensor and the S4 electromagnetic current meter. The lower inset shows the depth at mean tide at various distances from the channel edge as recorded by the pressure sensors.

ding to sediment resuspension events (Schoellhamer 1996). The current velocities generated by the Bernoulli wake lead to high bed shear stress causing resuspension events. These resuspension events could be a major source of the erosion, which has been recorded in this area of the Venice Lagoon since 1970 (Molinari et al. 2009) and could be an important factor in remobilisation and bioavailability of contaminants in the Venice Lagoon.

## Investigation Details

Venice Lagoon was considered an ideal location for the study of near-field ship wake effects on sediment morphodynamics. This is due to the presence of a narrow and deep navigation channel (12 m) next to shallow (1-3 m) shoals. The Venice Lagoon presents a large extension of shallow water areas with low background currents drained by an intricate network of tidal channels. In addition, due to the centuries-past diversion of rivers, there are no major terrestrial sediment sources to the lagoon. A suite of instruments including an S4 electromagnetic current meter, optical backscatter sensors (OBS) and 10 pressure sensors were emplaced on the shoals alongside the channel. An AIS receiver was utilised to record the ship information (length, width, draft, velocity, and heading).

More than 100 ships created waves during two sampling campaigns (March 9-13 and July 6-18 2009). Each of the waves led to a sediment resuspension event measured by the OBS sensor located 0.5 m above the sediment surface (Figure 2). Suspended sediment concentration (SSC) was found to vary by more than an order of magnitude pending the size of the Bernoulli wake. Larger wakes were strongly correlated with the magnitude of the sediment resuspension event. High current velocities ( $>1 \text{ m s}^{-1}$ ) persisted for tens of seconds as water is drawn off the shoals towards the ships. This leads to extended exposure of the sediments to high shear stress, greatly affecting the resuspension event. The long exposure to high velocities separates the effect of the Bernoulli wake from the more commonly investigated two amplitude wakes which may have high orbital velocities but for a much shorter period of time.

There is a threshold for extreme resuspension events based on a combination of ship size and velocity (Rapaglia et al. in review, Schoellhamer 1996). Taken as a parameter for sediment resuspension, it is possible to determine the maximum, safe navigation velocity on a ship-by-ship basis. This reduction in velocity is required to reduce the effects of sediment resuspension from the Bernoulli wake. A neural network model has been developed to forecast SSC. It has been used also to explore which of the physical parameters of the ship and the lagoon are most important for sediment resuspension events. This model could then be utilised to help determine safe navigation velocity and could be developed for use in other ports as well.

## Environmental Stress and Port Management

Industrial and ship effluents can lead to highly contaminated sediments in the vicinity of ports and harbours. In the case of the Venice Lagoon, the sediments are known to have elevated concentrations of a suite of metals and other pollutants (Critto et al. 2003, Secco et al. 2005). If these contaminants remain buried in the sediments, they may stay isolated from the system; the sediment being essentially a sink for these contaminants. A resuspension event, however, may remobilize these contaminants and increase their bioavailability (Kalnejais et al. 2007). Input of contaminated effluent into the Venice Lagoon from Porto Marghera, was largely stopped by legislation in the 1970's. Therefore the bulk of the contaminants were likely buried with time and therefore isolated from the system. However, up to 0.5 m of erosion has taken place

in this area since the 1970's possibly allowing contaminants to be re-released into the environment. We believe now that this remobilisation of contaminants was due to ship's wakes.

The Port of Venice spends millions of Euros annually on maintaining the shipping channel through dredging activities, yet there is very little input of sediment into this area. We believe that multiple ship wakes serve to draw sediment off the shoals and into the channel. Sediment often remains in resuspension for tens of minutes after the passage of a wake. If a second ship follows shortly after the first ship then the drawdown of water associated with the depression of the Bernoulli wake will transport sediment into the canal (Figure 3). This may be the

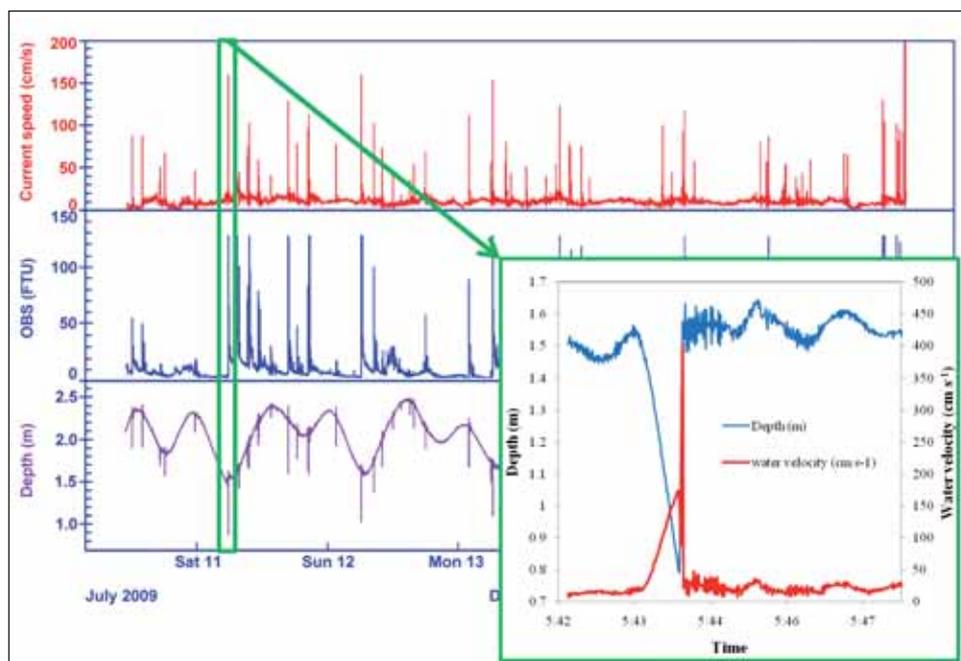


Figure 2. Shows a representative time series of water velocity (red graph), turbidity (blue graph), and water depth (purple graph) collected from July 10-16, 2009. The inset shows the depth and water velocity as one wave passes the sensor.

primary reason for the large volume of material which must be dredged every year. It therefore makes fiscal sense to attempt to reduce the amount and magnitude of these sediment resuspension events by forcing a reduction in the velocity of large ships.

### Other sites of particular interest

The Bernoulli wake may lead to sediment resuspension and erosion anywhere a narrow channel is adjacent to shoals. This phenomenon is not likely to be unique to the Venice Lagoon. Dredged channels and fairways are found at the entrance to many commercial harbours around the world. These channels may be very long as in the Elbe River entrance to Hamburg Harbour in Germany or run along large industrial areas, like Galveston, Texas and the Port of New York and New Jersey (USA). Since sediment resuspension and contaminant release is of particular interest in estuaries, it remains of vital importance to better ascertain the role of a ship's Bernoulli wake within the process of sediment morphodynamics.

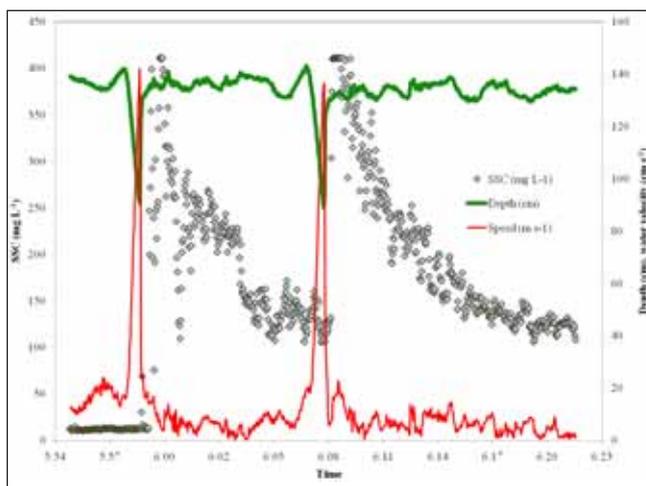


Figure 3. Water depth, SSC, and water velocity recorded on the instruments as two ships pass the study site on July 10th. Water velocity from the successive wave increases, while SSC remains elevated from the passage of the first wave.

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## Towards a trilateral research agenda of the Wadden Sea Region

In the 2010/1 issue of INPRINT the Wadden Academy was initially introduced. In brief, the Wadden Academy is a Dutch organisation that is an entity of the Royal Netherlands Academy of Arts and Sciences (KNAW) with three main tasks:

1. identifying gaps in our knowledge of the Wadden Sea Region
2. promoting coherent national and international research programmes in this region and
3. promoting information supply and exchange between research institutes, government, stakeholders and the general public

In this article, an overview will be given of initiatives that are taken jointly with Dutch, German and Danish scientists to reinforce trilateral research cooperation in the Wadden Sea Region based on an integrated approach.

### Political setting

In March 2010 on the German Wadden island Sylt representatives of the Danish, Dutch and German government responsible for the governance of the Wadden Sea Region adopted the renewed Joint Declaration on the Protection of the Wadden Sea. This declaration raises awareness of the many present and future challenges to the protection, restoration and sustainable use of the Wadden Sea. Ambitious goals were set, including

- the preservation of the natural ecosystem
- the adaptation of the Wadden Sea Area to climate change
- sustainable economic use of the area and
- the maintenance of its unique landscape and cultural heritage

In addition, the Ministerial Council Declaration adopted the specific challenges formulated in the inscription of the Dutch and German Wadden Sea to the UNESCO World heritage. All these management goals require a solid scientific backing.



Figure 1: At the opening of the Trilateral conference at Sylt Klaas Deen (Secretary to the board of the Wadden Academy) offered the brochure 'Towards a trilateral research agenda' to Gerda Verburg, Minister of Agriculture, Nature and Food Quality (Netherlands), Karen Elle Mann, Minister of Environment (Denmark) and State Secretary Ursula Heinen-Esser of the Federal Ministry of Environment (Germany).

### Integrated research

There is a substantial disciplinary knowledge base on the Wadden Sea Region, but major gaps in this knowledge also remain. It is further noted that the existing knowledge and expertise is fragmented and compartmentalised. An interdisciplinary, integrated approach is needed to improve the understanding of the Wadden Sea Region as a coherent and open system.



Figure 2: The Wadden Sea Region, a coastal strip from the Netherlands through Denmark of about 400 km. It consists of an extensive system of barrier islands, sea, tidal flats and salt marshes and a mainland with a unique open landscape.

In the Knowledge agenda of the Wadden Academy (Kabat et al. 2009) the following four criteria are listed to characterize 'integrated' research:

- to show a combination of two or more disciplines with the emphasis on crossing the boundaries between natural science, social science and humanities
- to take into account the interplay between processes at different temporal and spatial scales
- to take into account the accumulation of processes, interventions and impacts
- to be based on the co-production of knowledge, where the formulation of knowledge demand, the production of knowledge and the use in management result from close interaction between scientists, government experts and policymakers

Obviously, an integrated approach does not preclude disciplinary, in-depth and curiosity-driven scientific research in the Wadden Sea Region.

## Trilateral coordination of research

The lack of an integrated interdisciplinary approach calls for a major improvement in coordinating research on the international Wadden Sea Region across national boundaries.

The keywords here are change and scale. Major changes are occurring in the global environment, human activities, the legal regime and the socio-political situation. All of these changes have an impact on the Wadden Sea system and none is restricted to one country only. These changes require new international research which focuses not only on ecology and the consequences of human activities but also on the socio-economic, legal and cultural-historical dimensions of the Wadden Sea Region. The scale of the system that undergoes these changes and reacts to it is the whole Wadden Sea Region in its relations with the rest of the world.

Reasons for organising research at the trilateral level are manifold. To name a few: the common responsibility for the Wadden Sea as a key element in the world ecosystem; the important exchanges within the (international) Wadden Sea and between the Wadden Sea as a whole and the surrounding area; the existence of substantial and interesting gradients within the Wadden Sea; the diversity of management issues and instruments in the region; the need to continuously update policy instruments to take account of new needs and common legislation.

## Towards a trilateral research agenda

On 8-10 December, 2010, international scientists of all disciplines will come together in Leeuwarden, The Netherlands, to exchange knowledge and ideas on the future of trilateral research. The symposium 'Towards a trilateral research agenda' will therefore cross the borders between countries and the borders between disciplines. The major aims of this symposium are to

- Give an overview of our current state of knowledge on the trilateral Wadden Sea Region
- Define important interdisciplinary gaps in our knowledge that need to be addressed in a trilateral research agenda; and
- Explore funding options for a trilateral cooperation in Wadden research based on an integrated system approach

## Global comparison

The Wadden Academy and partners also want to improve the worldwide cooperation between countries with extensive wadden areas. A comparative analysis of the Wadden Sea Region and coastal areas elsewhere may lead to new insights into how the Wadden Sea Region can be best monitored/governed/etc. LOICZ has stressed the importance of so-called global reference sites which, in an Earth system science context, aim to inform best practises on how to increase a region's potential to cope with global and climate change influences and to deal with issues of governance and adaptive land and sea use. By becoming a global reference site, (research) approaches that are taken in the Wadden Sea Region may serve as an example to other regions.

## References

This article was based on the following documents:

Towards a trilateral research agenda of the Wadden Sea Area. ISBN/EAN 978-94-90289-16-4. Serial number: 2010-02.

Kabat, P., Bazelmans, J., van Dijk, J., Herman, P.M.J., Speelman, H., Deen, N.R.J. & R.W.A. Hutjes (2009): Knowledge for a sustainable future of the Wadden: integrated research agenda of the Wadden Academy of the Royal Dutch Academy of Sciences.

For more information on the upcoming symposium and for PDFs of publications of the Wadden Academy, please visit [www.waddenacademie.knaw.nl](http://www.waddenacademie.knaw.nl) or contact Dr. Tim van Oijen ([tim.van.oijen@waddenacademie.knaw.nl](mailto:tim.van.oijen@waddenacademie.knaw.nl)).

The trilateral policy documents that are referred to in the text are the 2010 Joint Declaration on the Protection of the Wadden Sea and the 2010 Ministerial Council Declaration. These documents are available for download on the website of the Common Wadden Sea Secretariat (CWSS): [www.waddensea-secretariat.org](http://www.waddensea-secretariat.org)

Scientific symposium on the Wadden Sea Region: towards a trilateral research agenda. 8-10 December 2010, Leeuwarden, The Netherlands

For more information, see [www.waddenacademie.knaw.nl](http://www.waddenacademie.knaw.nl)

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## The backbone of LOICZ: Affiliated Activities

One aim of LOICZ is to provide a framework to encourage the fullest participation of multi-national, regional, and national research activities in its global research. These activities shall contribute to achieving the goals, aims and objectives outlined in the LOICZ Science Plan and Implementation Strategy (SPIS). A way we accomplish this is to actively engage with the international research community concerned with natural and social sciences on Global Environmental Change in the coastal zone. LOICZ is a forum to assimilate, synthesize and integrate the outputs of the research community. It provides an opportunity to communicate, discuss and disseminate these outputs making them available to the global audience of scientific peers, the general public, and decision-makers in policy and practice. Information on Affiliated Activities is held in a central database that is accessible online through the LOICZ website. It makes basic information and regular updates available to the wider global community as well as to LOICZ for its assessment and synthesis task and its reporting requirements.

We encourage coastal scientists to seek affiliation of their research project/s, PhD thesis or capacity-building activities to LOICZ and become a member of the global science community and network of researchers and practitioners. Since 1993, more than 400 individual activities from all over the world have already been involved in this LOICZ research portfolio.



### Early stage research

We particularly encourage early stage researchers from PhD student to Post-Doc level to seek affiliation of their projects. LOICZ acknowledges that much of the work contributing to coastal Earth System science is being carried out by young scientists. Therefore LOICZ wants to support these efforts by enhancing their visibility and introduction to scientific peers in the global research community. Affiliated early stage research will thus contribute to the global research portfolio and its products and information will also feed into the global LOICZ synthesis likewise with the larger affiliated projects.

Affiliation will give early stage scientists comprehensive information about the variety of scientific activities in their field and allow them to foster their network with senior scientists and the global research community. They may also have easier access to participation in workshops, conferences and meetings organized by LOICZ that relate to their own work. By promoting their individual research on a global platform, early stage researchers will be given the opportunity to contribute to LOICZ aims and objectives directly.

Application for affiliation of scientific work at PhD and Post Doc level needs the same set of principle information and delivery of appropriate documents (e. g. thesis outline instead of a project proposal if applicable). In addition and to guarantee a good conduct in quality control LOICZ kindly asks for a co-signature and professional affiliation details of the supervising scientist. The review conducted by the LOICZ scientific peers will apply the same standards as for senior projects. Detailed information on the affiliation procedure is available on the LOICZ website in the 'Projects' section <http://www.loicz.org/projects/index.html>

## Synthesis of Affiliated Activities

LOICZ is preparing for an interim scientific synthesis in 2010, and as part of the synthesis the Affiliated Activities will be evaluated in the context of the LOICZ scientific framework. The synthesis is an opportunity to share your research findings with the global LOICZ community and value your contribution to coastal and global change research. We therefore encourage you to regularly check and update the project information on the

LOICZ database <http://kopc01.hzg.de:7777/loiczdatabases/app/Welcome.jsp>, including relevant publications and reports on your research findings. In order to edit your project information on-line, you need to log in with your user name and password. If you require any assistance, please contact the IPO.

## Call for affiliation of research activities

LOICZ seeks to expand its network of scientists by endorsing research activities concerned with any of its priority topics on a global, regional or national level.

Within these topics LOICZ strives to develop:

- methodologies or models that allow data assimilation, processing and synthesis, including up and/or down scaling;
- scenarios of change and/or response to change in socio-ecological systems;
- scientific context for the evaluation of existing policies and structures;
- globally applicable tools for scientific synthesis, decision support and structure development; and
- dissemination interfaces to provide information and assist sustainable coastal development on appropriate scales.

To achieve this, LOICZ is calling for proposals to bring high quality research activities into the LOICZ cluster of Affiliated Activities. As well as fundamental science projects, LOICZ also looks for projects that have a multidisciplinary perspective, especially combining natural and social sciences. Projects can focus on global, regional or local scales and address coastal sciences and/or coastal management questions. Projects that collaborate with other Earth System Science Partnership (ESSP) elements, especially with other Core Projects of IHDP and IGBP, are sought in particular. Also projects that synthesize and analyze research outcomes already available or involve dissemination and outreach that will lead to better public knowledge are most welcome. LOICZ particularly encourages affiliation of early stage research at PhD and Post-doc level. Details about projects already affiliated to LOICZ can be found in the LOICZ Project database accessible through the LOICZ website.

Although LOICZ cannot offer funding to Affiliated Activities, its endorsement provides the following benefits:

1. support in the state of proposal for funding;
2. promotion of the project and associated activities, its contributing team, outputs and outcomes through the LOICZ website and/or newsletter;
3. contribution to workshops, conferences and meetings organized by LOICZ and hence establish linkages to other projects operating in similar fields and/or addressing similar issues;
4. access to a wide circle of information related to funding and the science community that is available through the LOICZ database; and
5. Principle Investigators of Affiliated Activities are offered a Corresponding Membership to the LOICZ Scientific Steering Committee (does not apply to PhD level). This appointment is subject to annual review.
6. Affiliated Activities will generally feed into the global LOICZ synthesis (Interim Synthesis planned for 2010).

Researchers whose work fits into the LOICZ portfolio are encouraged to submit proposals to the LOICZ IPO as soon as possible. The required form is accessible after registration to the LOICZ project database and additional information can be obtained from the LOICZ website or via contacting the LOICZ IPO.

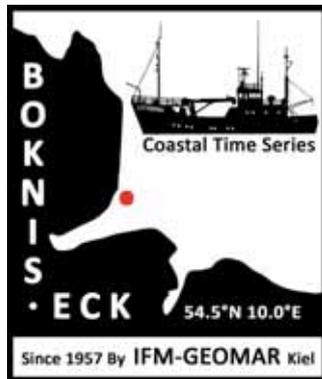
## LOICZ-Affiliated Activities

### Boknis Eck Time Series Station

#### Overview

The Time Series Station Boknis Eck (BE) is located at the entrance of the Eckernförde Bay ( $54^{\circ}31'N$ ,  $10^{\circ}02'E$ ; water depth 28m, Fig. 1) in the south-western Baltic Sea. Sampling takes place monthly during a half-day trip to BE with R/V Littorina (Fig. 2-4). Samples are taken from six standard depths (1, 5, 10, 15, 20 and 25 m). The Boknis Eck Time Series Station was initiated by J. Krey of the former Institut für Meereskunde (IfM) in Kiel, Germany. The first measurements were performed on 30 April 1957. Salinity, temperature, and O<sub>2</sub> data from BE have been recorded on a monthly basis since April 1957 with only two major breaks (1976-78 and 1983-1985). Chlorophyll a measurements started in 1960 and nutrient data (NO<sub>2</sub>-, NO<sub>3</sub>-, NH<sub>4</sub><sup>+</sup>, PO<sub>4</sub><sup>3-</sup>, SiO<sub>4</sub><sup>2-</sup>) are available since March 1979. Routine trace gas measurements in the water column started in July 2005 (N<sub>2</sub>O), June 2006 (CH<sub>4</sub>) and February 2009 (DMS). Moreover the BE site is frequently used for non-routine project work (e.g. molecular biology, carbonate system, sediments, surface microlayer sampling). Additionally BE serves as an instrument test site.

The work at Boknis Eck Time Series Station is currently run by the Chemical Oceanography Research Unit of IFM-GEOMAR (see contact information below). During the last decades the work at BE was supported by various agencies such as DWK Meeresforschung (1957-1975), HELCOM (ECD and BMP from 1979 to 1995), BMBF (KBP, 1996-1999) and IfM (1999-2003). Past and ongoing individual projects using BE as sampling site were funded by 'Future Ocean' Kiel Cluster of Excellence, DFG, BMBF, EU, and others.



#### Hydrographic and biogeochemical settings

Riverine inputs are negligible in the Eckernförde Bay and thus the overall hydrographic setting at BE is representative for the southwestern Baltic Sea which is dominated by the regular inflow of North Sea water through the Kattegat and the Great Belt. Because the inflowing North Sea water has a higher salinity compared to Baltic Sea water, a pronounced summer stratification occurs which leads to the development of a pycnocline at about 15 m water depth. The seasonal stratification occurs from mid-March until mid-September. During this period, vertical mixing is restricted and bacterial decomposition of organic material in the deep layer causes pronounced hypoxia and sporadically occurring anoxia during late summer. Pronounced phytoplankton blooms occur regularly in autumn (September-November) and spring (February/March) and to a lesser extent during summer (July/August). The autumn and spring blooms are followed by

pronounced sedimentation of organic material. The summer blooms can be associated with a short period of pronounced sedimentation as well, however, sedimentation during the summer months is generally lower. In general, the duration and actual O<sub>2</sub> concentrations of hypoxia/anoxia have profound influences on both the ecosystem and biogeochemical cycles at BE. This is especially important in view of the fact that the microbial processes leading to the formation of climate-relevant trace gas such as nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>) and dimethyl sulfide (DMS) are strongly influenced



Fig. 4: Surface microlayer sampling at Boknis Eck, June 2010. (Photo M. Krumbholz, IFM-GEOMAR)





Fig. 2: R/V Littorina on her way to the Boknis Eck Time Series Station.

(Photo A. Villwock, IFM-GEOMAR)

by the prevailing O<sub>2</sub> concentrations in the water column as well as in the sediments. Thus BE seems to be an ideal place to study the effect of hypoxia/anoxia on trace gas formation and emission. Moreover, BE as part of the Eckernförde Bay is well known for its 'gassy' sediments which are sites of enormous accumulation of sedimentary CH<sub>4</sub>.

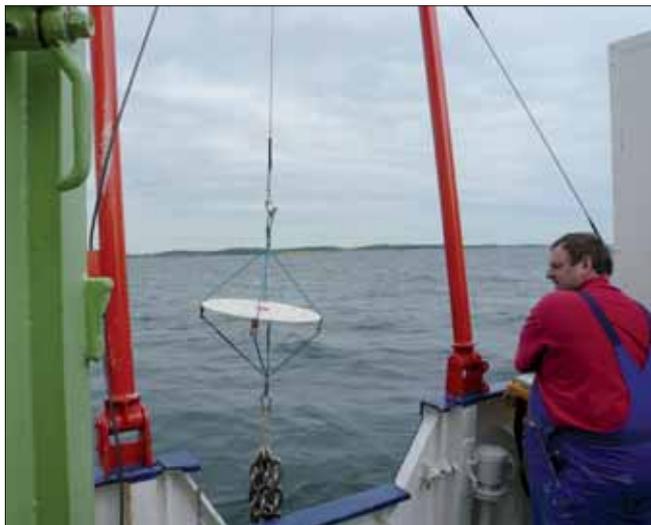


Fig. 3: Deployment of Secchi disk at Boknis Eck, June 2010.  
(Photo M. Krumbholz, IFM-GEOMAR)

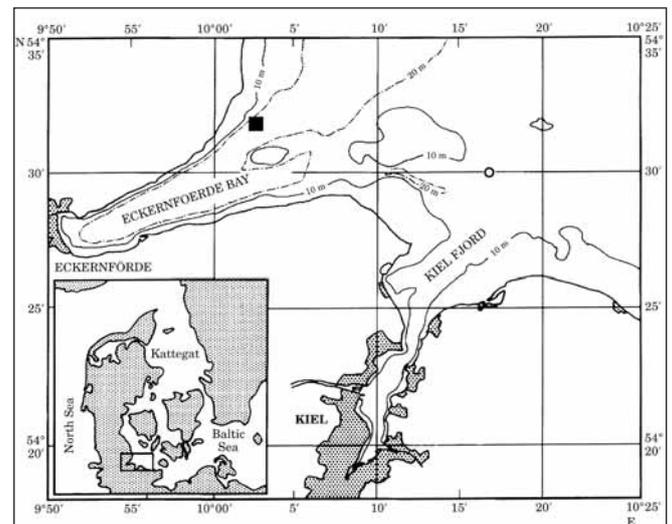


Fig. 1: Location (black square) of the Time Series Station Boknis Eck.  
(Map H.P. Hansen, IFM-GEOMAR)

## Selected publications with results from Boknis Eck.

### **Bange, H.W.** et al. (2010):

Dissolved methane during hypoxic events at the Boknis Eck Time Series Station (Eckernförde Bay, SW Baltic Sea). *Biogeochemistry* 7: 1279-1284.

### **Hansen, H.P.** et al. (1999):

Seasonal and long-term control of bottom water oxygen deficiency in a stratified shallow-coastal system. *ICES J. Mar. Sci. Suppl.* 56: 65-71.

### **Kremling, K.** et al. (1997):

Variability of dissolved and particulate trace metals in the Kiel and Mecklenburg Bights of the Baltic Sea 1990-1992. *Marine Pollution Bulletin* 34: 112-122.

### **Richardson, M.D. & Davis, A.M.** (1998):

Modeling methane-rich sediments of Eckernförde Bay. *Continental Shelf Research* 18: 1671-1688.

### **Schweiger, B.** et al. (2007):

A time series of hydroxylamine (NH<sub>2</sub>OH) in the southwestern Baltic Sea. *Geophysical Research Letters* 34, L24608, doi:10.1029/2007GL031086.

### **Smetacek, V.** (1985):

The annual cycle of Kiel Bight plankton: A long-term analysis. *Estuaries* 8: 145-157.

### **Treude, T.** et al. (2005):

Environmental control on anaerobic oxidation of methane in gassy sediments of Eckernförde Bay (German Baltic). *Limnology and Oceanography* 50: 1771-1786.

### **Wasmund, N.** et al. (2008):

100-years changes in the phytoplankton community of Kiel Bight (Baltic Sea). *Journal of Marine Systems* 73: 300-322.

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Further information on Boknis Eck Time Series Station is available on the project's website (in German, English version will follow soon):

<http://www.ifm-geomar.de/index.php?id=bokniseck>

Please read more detailed information about the Boknis Eck Time Series Station in the upcoming volume of LOICZ inprint.



Read more about:

“Boknis Eck Time Series Station” in LOICZ INPRINT 2011/1



## RADOST (Regional Adaptation Strategies for the German Baltic Sea Coast)



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A general presentation of the RADOST project, whose affiliation with LOICZ was established in November 2010, has been provided in INPRINT 2010/2. The purpose of this article is to describe certain aspects of RADOST in more detail, focusing on geographical coverage, scientific modelling and regional stakeholders' perceptions on modelling, climate change and adaptation.

### RADOST focus areas

While RADOST's project area is formed by the entire Baltic coastline of Germany, and parts of modelling and research extend to the entire Western Baltic Sea as well as the river

basins of tributaries, the project team chose several focus areas in which certain activities are concentrated (see map). Six focus areas have been identified as "hot spots" where climate-related challenges and intensive use of natural resources culminate. Simulations and applied research, regional dialogue activities ("regional round tables") as well as implementation projects in RADOST concentrate on these areas. For instance, the Baltic Sea area stretching eastwards from the island of Rügen to Adlergrund and inland towards the industrial and energy site of Lubmin (designated as "Adlergrund/Lubmin" focus area) is of great importance both for nature conservation and economic development. Planned investments of several billion Euros in this region make this area a hot spot for industrial development. At the same time, Adlergrund is an important site for the re-colonisation of deeper sea regions by benthic animals after episodic population fluctuation. In addition, this region is one the most frequented roosting areas for water fowl in Europe. Within the focus topic „Conservation and Land use“, RADOST aims to develop solutions for pressing resource conflicts by fostering dialogue in a unique network configuration involving representatives from politics, government, business, science and civil society.



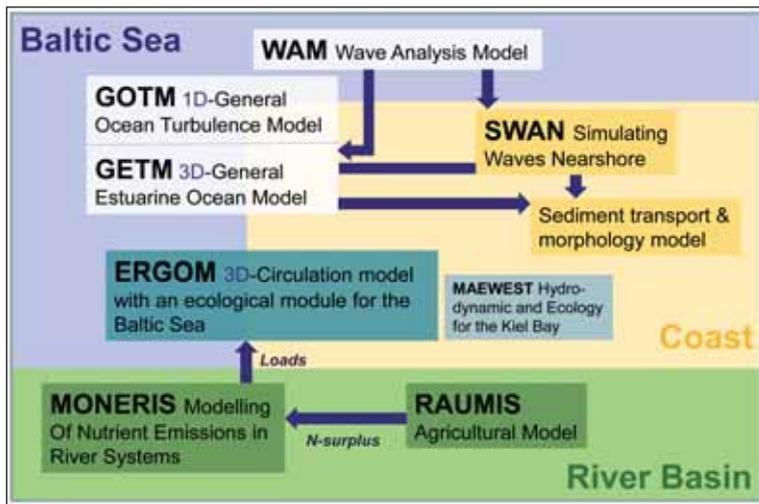
*RADOST focus areas and their relation to focus topics*

## RADOST research in natural and engineering sciences

RADOST's work programme in natural and engineering sciences encompasses three broad areas:

- Hydrodynamics (water levels, sea state, currents) and sediment transport
- Water quality
- Ecology and biological diversity.

The applied simulations cover a broad spectrum of aspects and spatial scales. The basis is formed by the climate scenarios for the catchment areas, the coast and the Baltic Sea (for example, changes in temperature, rainfall and wind) as well as the socio-economic scenarios of regional (land use) change. Based on this, simulation models for sea, coastal and river catchment areas are coupled in RADOST for the first time, allowing new possibilities for simulating climate change impacts (see graphic). The models are able to incorporate both large-scale areas, such as the entire Baltic Sea, and areas on the local scale, such as the individual coastal sections. This is important for addressing specific coastal engineering and ecological questions in the focus research areas.



Integration of simulation models in RADOST. Source: Leibniz Institute for Baltic Sea Research (IOW)

## Regionalised climate scenarios

As the basis for RADOST modelling, the IPCC scenarios A1B and B1 were chosen, i.e. one medium emissions scenario and one scenario with relatively low greenhouse gas emissions. For regionalization, the regional model COSMO-CLM is used. This model was originally developed by the German Weather Service (DWD) and has been further developed by more than 30 international research institutes. It has been chosen because it covers both the whole Baltic Sea area and the time period from 1961 to 2100. This combination was required for the envisaged scope of modelling in RADOST and was not offered by any other regional climate model.

## Physical modelling

The general estuarine ocean model GETM delivers the large-scale boundary conditions for coastal waters along the entire German Baltic coast. In addition, more detailed local models will be used for the RADOST focus areas, prompted by simulation results of the modular ocean model MOM and the wave analysis model WAM. The outcomes will provide the basis for the interactive coupling of GETM with the wave model SWAN (simulating waves nearshore) and thus providing reliable information on possible changes in coastal erosion patterns. Thus, the physical modelling in RADOST comprises the following main elements:

- Large scale changes in sea state statistics (WAM model, Helmholtz-Zentrum Geesthacht – HZG)
- Large-Scale Modified Currents (GETM model, Leibniz Institute for Baltic Sea Research – IOW)
- Currents and sea state in small-scale coastal areas (model coupling GETM / SWAN, University of Rostock, Department of Coastal Engineering – URCE)
- Simulations of changes in sediment transport and morphology for the entire German Baltic coast as well as more detailed simulations for the focus areas (URCE).

## Ecological modelling to investigate changes in water quality

As a starting point for the modelling of alterations in water quality, the RADOST partner vTI (Johann Heinrich von Thünen Institute – Federal Research Institute for Rural Areas, Forestry and Fisheries) provides data on nutrient surpluses from agricultural land obtained from the regional agricultural and environmental information system RAUMIS, which at the same time provides a link from socio-economic to natural scientific research in RADOST. These data are fed into the mass balance model MONERIS (modelling nutrient loads on river systems) run by the Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB), which will in turn enable the quantification of climate change impacts on the nutrient loads on the catchment areas of the German coastal waters. To investigate potential changes in water quality in the outer coastal waters and the

Baltic Sea, IOW uses the three-dimensional ecosystem model ERGOM. In addition, the Schleswig-Holstein State Office of Agriculture, Environment and Rural Areas (LLUR) will apply the hydrodynamic and ecological MAEWEST for the Kiel Fjord. The integration of agricultural, catchment area, coastal water and Baltic Sea models will create a highly capable modelling system that will enable the assessment of impacts of climate change as well as the quantification of the impacts of land use changes and of other measures in the catchment areas.

## Analysis of ecosystems and biodiversity

The ecological modelling with a focus on water quality will be complemented by investigations into possible alterations in species composition (including invasive species), biodiversity and ecosystem function on the German Baltic coast. The RADOST partner Institute of Applied Ecology (IfAÖ) will draw on time series data from over 4,500 plots including almost 11,500 replicated samples of the environment of Baltic Sea floor to analyse changes in species composition and regional plant and animal community structures under different environmental conditions over the past 15 years. The aim is to understand typical reactions of the marine biota to climate-induced environmental changes. The results from the RADOST simulations of hydrodynamics and sediment transport will then be used to assess possible future developments.

## Integrating stakeholder perspectives in research activities

Political and economic stakeholders were involved from the beginning of the modelling process to ensure that model outputs will meet their information needs. A major part of the project will be dedicated to utilizing modelling results in practical research activities structured along the main sectors and adaptation challenges of the region. This will include the implementation of pilot adaptation solutions with local partners. An emphasis is put on highlighting innovative concepts that simultaneously address different sectoral objectives.

From the regional stakeholders' perspective, a strong impetus for the project came from the coastal protection authorities, who communicated the need for reliable long-term assessments of coastal conditions (sea level rise, hydrodynamics, coastal erosion and sediment transport). Awareness is also growing among port managers. From discussions with port stakeholders it emerged that there is a wish to obtain clear "predictions" on future extreme events (e.g. maximal water levels in the next decades), since potential extreme events are a key determinant for infrastructure planning. However, climate science cannot deliver predictions, even less so on extreme events. It can only offer ranges of model values from different scenarios. On this basis, it is possible to conduct cost-benefit estimations for certain measures (e.g. raising infrastructure facilities to a certain level) under different scenarios within the socio-economic research module in RADOST led by the Institute for Ecological Economy Research (IÖW).

Overall, a key objective will be to make constructions and society more resilient to an uncertain climate future rather than adapting them to a particular anticipated set of future climatic conditions.

## Investigating stakeholders' perceptions of climate change and adaptation

In addition to direct thematic discussions with regional stakeholders, RADOST also provides an in-depth analysis of the perceptions, interests and interaction of the different actors involved in adaptation to climate change. While a stakeholder and institutional analysis, including in-depth interviews of representatives of different stakeholder groups, formed part of RADOST's work programme from the beginning, this module will be extended by a new cooperation between HZG and the Ecologic Institute. A survey of decision-makers in the regional administration will explore:

- perceptions of the level of satisfaction with the interaction between science and policy related to adaptation to climate change
- the perceptions of environmental threats associated with climate change
- the perceptions of adaptation measures

The survey will be conducted in the beginning of 2011. It is hoped that the results will contribute to bridge existing gaps of communication between science and stakeholders as well as between administration and the public, inter alia by

- identifying the differences between the knowledge needs of policy makers and the knowledge provided by science
- suggesting new patterns of communication between science and policy
- identifying knowledge gaps that hinder political decisions

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## CoastColour

The importance of the coastal zone for economic activities, and its reflection of anthropogenic stresses on the ecosystem, have been described and discussed widely throughout the past 20 years. Responding to this, the European Space Agency, ESA, designed the MERIS instrument specifically to provide measurements most suitable for coastal zone management and research. MERIS data make an important contribution to further understanding of the coastal zone in climate change, its importance in the global carbon cycle, the generation of biogenically-active gases and its sensitivity and response to changes in temperature, sea level and water mass distribution.

CoastColour will work towards these objectives by developing, demonstrating, validating and intercomparing different Case 2 algorithms over a global range of coastal water types, identifying best practices, and promoting discussion of the results in an open, public form.

More generally, ocean-colour remote sensing proves to be an ideal vehicle for retrieving a broad range of objective indices of ecosystem status and ecosystem health. These are difficult to quantify, but could be characterized using a series of metrics measurable by remote sensing. These so-called ecological indicators provide a compact description of the pelagic ecosystem at a given time and place. Because of the high dynamics in ocean processes (especially the coastal

zone, the so called “brown waters”), the information needs to be updated frequently. We cannot rely on ships as an observing platform here but need to employ the opportunities provided by remote sensing. Thorough consideration of the complexity of coastal ocean dynamics will however be critical in this respect. For ecosystem state observation analysis and continued assessment, coastal ocean-colour remote sensing is a priority avenue.

### Data and Test Sites

MERIS is the imaging spectrometer on the European ENVISAT satellite. MERIS measures the backscattered solar irradiance in 15 spectral bands, from 412.5 nm up to 900 nm. The bands have been chosen to support measurements of ocean colour in the coastal zone optimally.

The CoastColour dataset comprises all MERIS Full Resolution (300 m spatial resolution) data acquired between 2002 and 2010. It is planned to continue data processing in 2011. A consolidated set of 27 globally distributed sites were selected, where the CoastColour products are generated. Processing is restricted currently to those sites where in-situ data necessary for algorithm tuning and validation are available. These sites represent a large variety of coastal water types and atmospheres. Figure 1 represents the global distribution of the CoastColour sites.

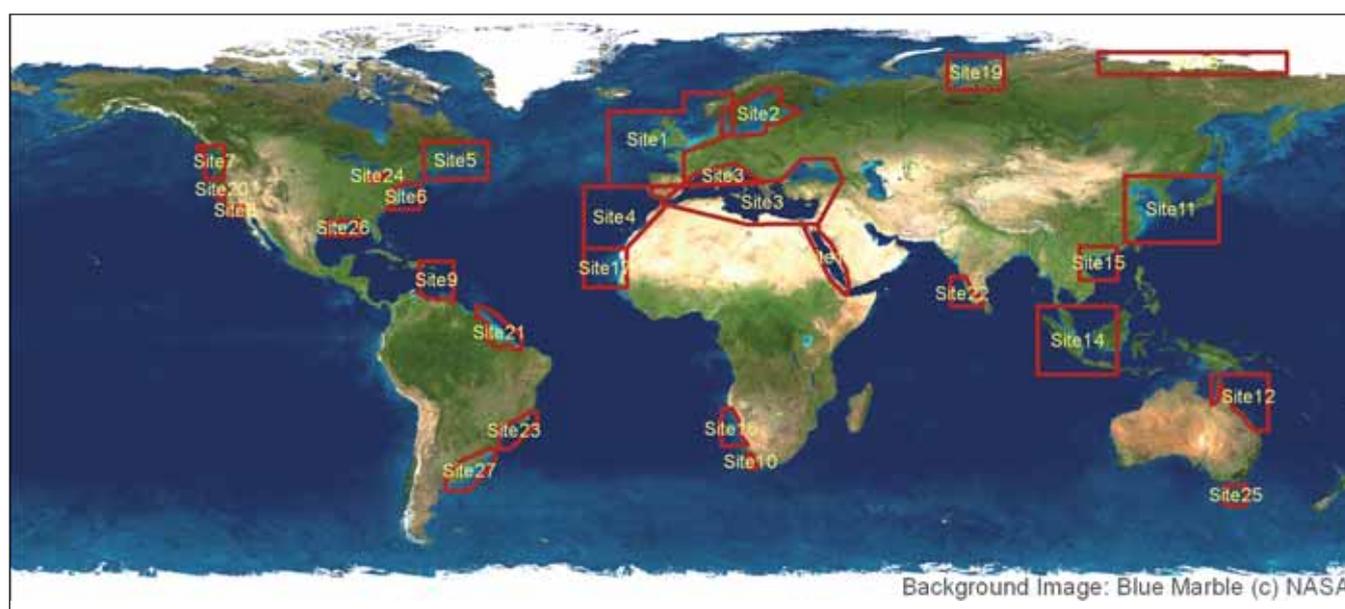


Figure 1: Global network of CoastColour sites



## CoastColour Processing

The task of retrieving water optical properties and concentrations from reflection spectra in coastal waters is a complex matter. In contrast to Case 1 water (usually deep waters), where by definition, only one independent component (chlorophyll-a concentration) determines the variability of the water-leaving radiance reflectance, in Case 2 waters (usually more onshore), a large number of factors determine the reflectance. These often exceed the number of independent pieces of information which can be retrieved from the spectra. These factors are: the various dissolved and suspended water constituents including a variety of phytoplankton species with varying cell size and compositions of absorbing pigments and bottom effects, stratification and floating material on or close to the surface, including red tides, floating carpets of cyanobacteria and foam produced by blooms of algae such as *Phaeocystis*. Furthermore, the coastal atmosphere is more complex in contrast to the deep ocean, with soot-containing particles from industry, heating and traffic, biomass burning, contrails from aircraft and desert dust.

Considering all of these factors, a system of procedures is necessary, which reduces the multitude of variables to a small number of components that can be retrieved from reflectance spectra. Depending on the type of water, the retrieval of water constituents and inherent optical properties will be performed using a set of branching algorithms. The information necessary to decide on the appropriate algorithm is from techniques like spectral unmixing and fuzzy logic. Two alternative retrieval techniques will be applied for the determination of the water optical properties and concentrations of water constituents. One is a semi-analytical procedure as developed by Lee et al. (2002), the other is based on a full radiance model and the parameterization of its inversion by an artificial neural network, which is used as a non-linear regression technique. Outputs of both types of algorithms are the inherent optical properties for each component, and these will be converted into concentrations of phytoplankton, suspended matter yellow substance using generic, water-class or site-dependent conversion factors. The algorithms will be implemented in the open source BEAM software.

## CoastColour products

CoastColour will process all available MERIS Full Resolution (300m) images over the test sites. The products will include a set of radiometric and geo-bio-physical quantities which will be generated over all sites:

- Top-of-atmosphere radiances
- Surface reflectances (directional water leaving radiance reflectance and fully normalised water leaving radiance reflectance)
- Inherent optical properties (absorption and scattering coefficients)
- Water constituent concentrations (chlorophyll-a and total suspended matter)
- Water transparency/turbidity information (attenuation coefficient, signal depth, depth of the euphotic layer, Secchi disk depth, turbidity in formazine units)
- Chlorophyll indices (FLH and MCI)
- Uncertainties per parameter and pixel

An attempt will be made to generate additional experimental, products for selected sites, including:

- Primary productivity
- Phytoplankton carbon biomass
- Concentrations of some taxonomic or functional groups such as coccolithophorides, Cyanobacteria etc.
- Effective Fluorescence

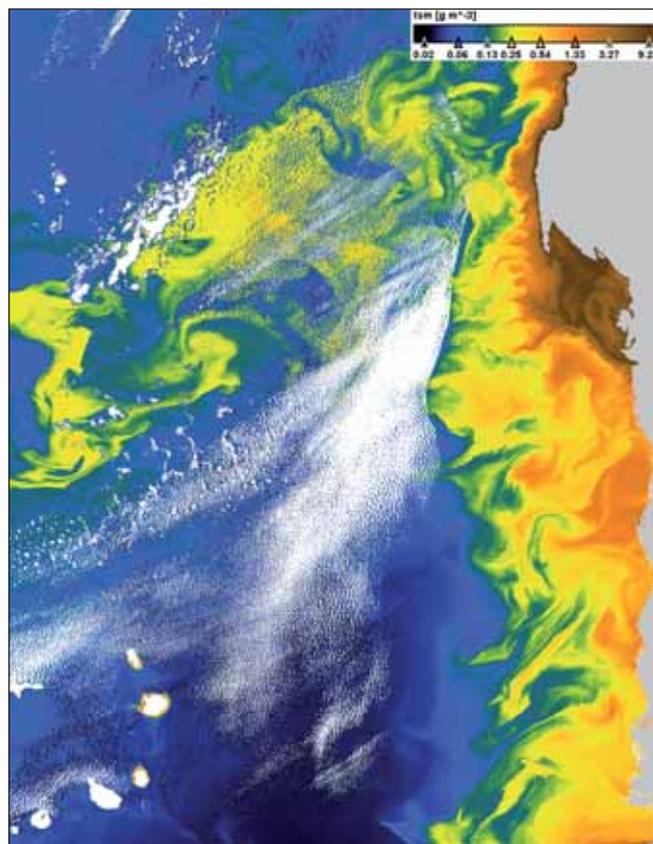


Figure 2: Concentration of total suspended matter (Cap Verde, MERIS image of 24.03.2005)

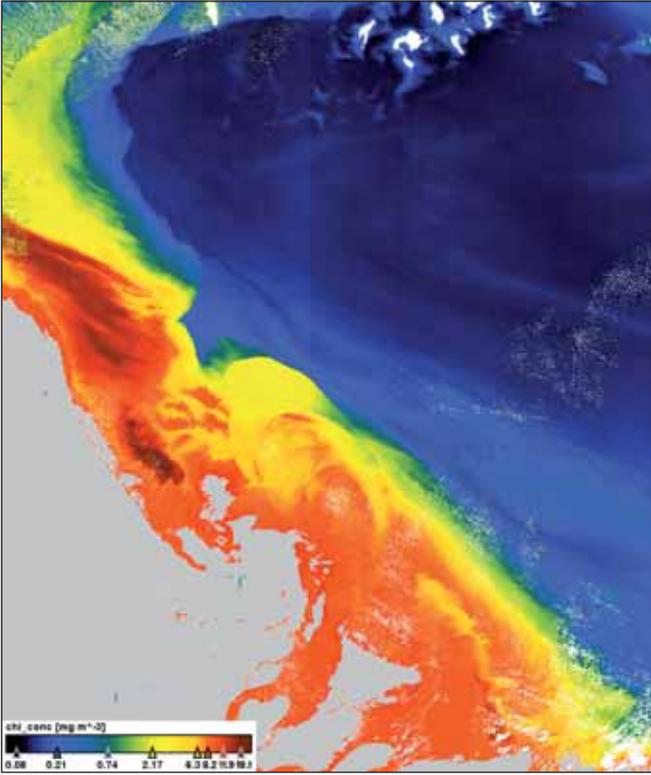


Figure 3: Chlorophyll concentration  
(French Guyana and Amazon Delta, MERIS \*image of 01.10.2005\*

## Validation

The control of the data products and the generation of uncertainty maps accompanying the products is a key issue for the acceptance of RS products for any scientific and operational application. Due to the complexity of coastal waters with respect to water constituents and optical components involved, this requirement is a high challenge and we are in some cases at the limit what presently can be done. The final products will be validated on several levels. Besides others this includes quality assurance of the in situ data used for the construction of bio-optical models as the basis of the algorithms for each of the test sites or water class and for the validation of the algorithms and products.

## International Algorithm Round Robin

Coastal zones differ in many respects, including the optical properties of the water and atmosphere. CoastColour is therefore relying on a regionalization of the algorithms; however, scientists working on their sites often have available locally optimized algorithms. An international algorithm inter-comparison is therefore part of the project with the aim to better understand the advantages of different methods and to conclude on best practice for regional algorithm development.

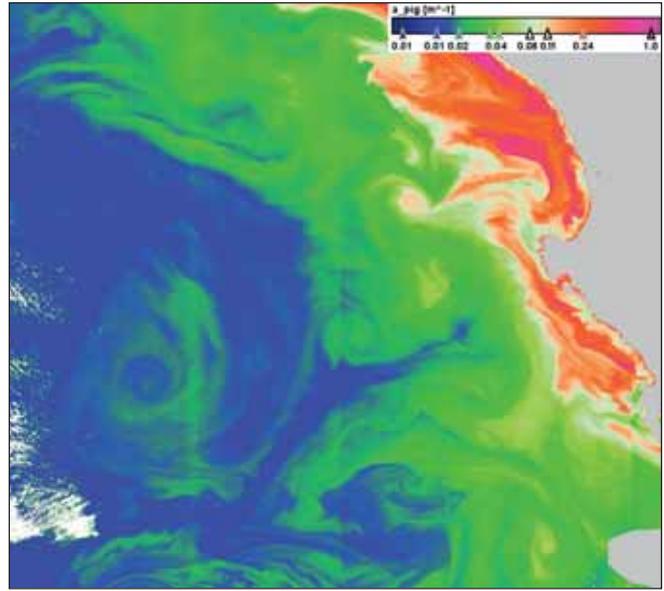


Figure 4: Pigment absorption coefficient  
(Benguela, MERIS image of 29.10.2005)

### Scientific/Industrial Team and Group of Consultants

The CoastColour objectives require the combination of various skills from leading scientists in and outside Europe, and to link CoastColour to a large number of international ocean colour and coastal zone projects. An international team has been constituted under the leadership of Carsten Brockmann from Brockmann Consult (Germany):

- Shubha Sathyendranath and Trevor Platt FRS from the Plymouth Marine Laboratory (PML, UK) embed the CoastColour project into key international working groups, such as the IOCCG, ChloroGIN, GEO
- CoastColour is also affiliated to the LOICZ project which provides the link into a world wide global change research context and expert network under the International Geosphere Biosphere Programme, IGBP, and the International Human Dimensions Programme on Global Environmental Change, IHDP
- Steve Groom and his team of the Remote Sensing Group at PML contribute to the algorithm development, in-situ data and validation
- Roland Doerffer and his colleagues from the Institute of Coastal Research, Helmholtz-Zentrum Geesthacht (Germany) lead the scientific work associated with the algorithm development and regional adaptation
- Kevin Ruddick, leader of the remote sensing group of the Management Unit of the North Sea Mathematical Models (MUMM, Belgium), is responsible for the Round Robin inter-comparison of Case2 algorithms and the validation
- Richard Santer from the University of the Littoral Opal Coast (LISE, France) is in charge of the atmospheric characterization and regionalisation
- Vanda Brotas from the Centre of Oceanography of the University Lisbon (CO, Portugal) is responsible for the in-situ data validation and management
- Norman Fomferra and Uwe Krämer together with their teams at Brockmann Consult take care of algorithm implementation, verification and data processing.

- This core team is supported by a group of consultants who provide specific expertise. This injection of know-how is one key to success for a project that shall provide, at a global scale, regional products with best adapted regional algorithms. The group of consultants comprises Yu-Hwan Ahn (KORI, East Asian Waters processing), Jim Gower (DFO, Fluorescence Line Height), Mark Dowell (JRC, classification of marine waters), Stewart Bernard (CSIR, Regional IOPs and HABs), Zhongping Lee (U. Mississippi, Analytical Case2 Algorithm), Bryan Franz (NASA, Ocean Colour Biology from SeaWiFS and MODIS) and Thomas Schroeder/Arnold Dekker (CSIRO, inversion algorithms and regional IOPs).

The work is further supervised and guided by a Science Team. This team will act as a critical supporter, not being funded and hence an independent constructive advocate of the science and user community, with a minority involvement by members of the consortium.

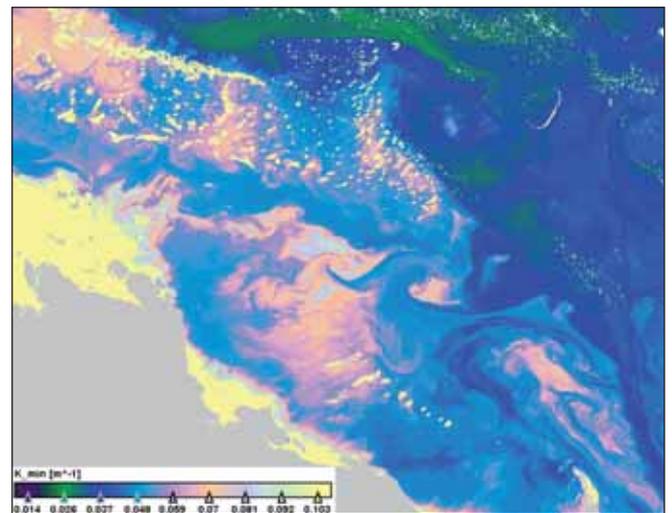


Figure 5: Minimum downwelling irradiance attenuation coefficient (Great Barrier Reef, MERIS image of 26.07.2005)

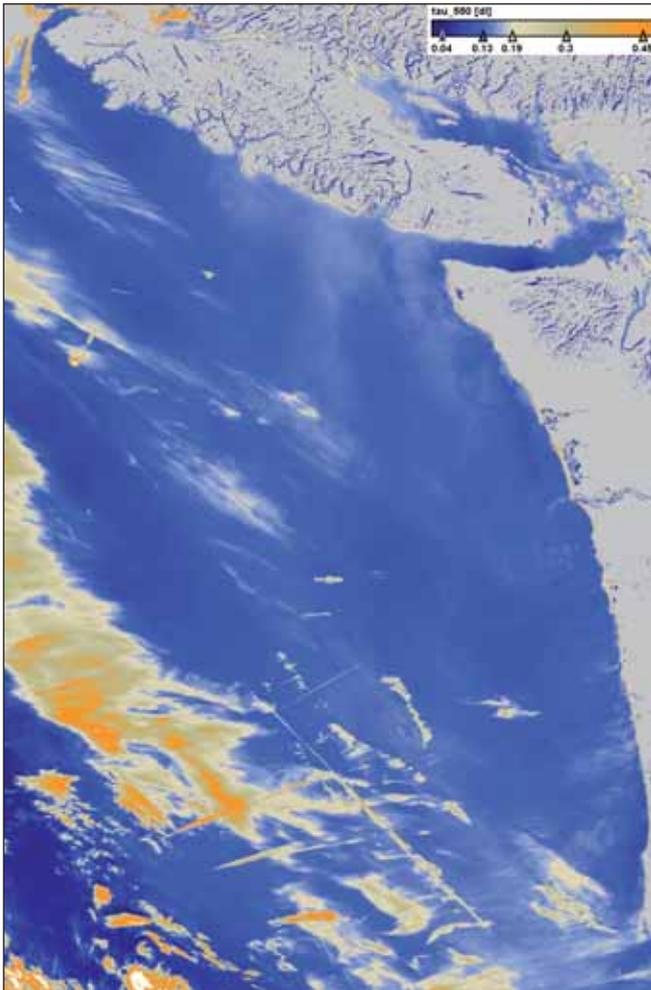


Figure 6: Aerosol optical thickness at 550nm  
(Washington and Oregon, MERIS image of 13.03.2005)

## International cooperation

A key objective of CoastColour is to perform the work in a transparent manner and in discussion with the international scientific and user communities by different measures. The aim is to ensure a continuous exchange of information in both directions: requirements and feedback from users to the project, and up-to-date information from the project to the users.

The project keeps close contact with the users and international bodies. Following a call for participation as a champion user, more than 40 users responded and agreed to provide user requirements as well as local in-situ data. These champion users are spread over the globe and were asked in direct consultations to characterize regional requirements, which gave pivotal input for the final definition of project objectives. Through discussion with the users, within the team and with the science team, all user requirements and algorithm requirements were reviewed with the goal to identify in detail how the final CoastColour (CC) algorithms will look like and which data are required to calibrate and validate them. The first processing results will be presented and discussed at the first user consultation workshop (16-17 November, 2010, in Frascati, Italy). The meeting is expected to result in fruitful and relevant suggestions with respect to regional algorithm development. Champion users contribute to project activities by providing in situ measurements of their test site for the validation process of the required algorithms. In addition they have the possibility to participate voluntarily in the Round Robin study.

The scientific community will be informed by reporting on CoastColour activities and progress to key organisations and groups including IOCCG, GEO, ChloroGIN, POGO and SAFARI. Another import channel for outreach will be LOICZ. Major findings of the CoastColour project will be disseminated via LOICZ reports and newsletter.

At the end of the project a document will be produced that summarises the experiences of the project in developing consensus Case 2 algorithms. This document will serve as a guide for further development of regional approaches for retrieval of water properties in optically-complex conditions.

### Contact:

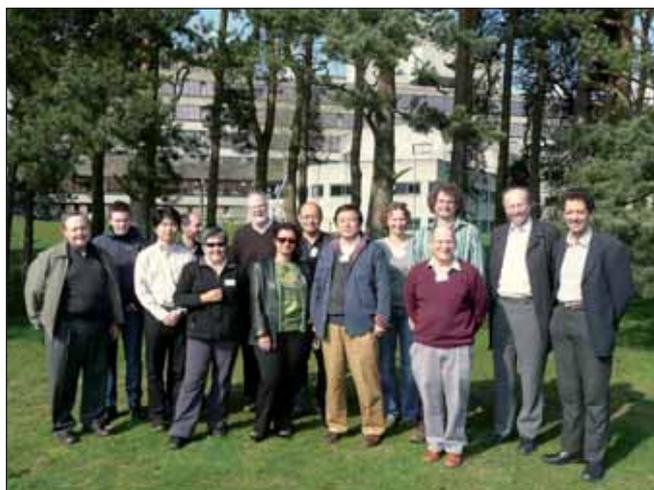
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## Hotspots



### Coastal Urbanisation and Megacities



*Photo: Tim Jickells, University of East Anglia, UK*

#### Megacities and the Coastal Zone – Air-Sea Interactions

13-15 April 2010 University of East Anglia, Norwich

Megacities are defined as having populations of over 10 million. There were 20 such cities in 2005, and with the world population and urbanisation growing, this number can be expected to grow in the future. While this definition of a megacity is useful, it is simplistic and underestimates the significance of megacities. For instance, the political boundaries of a city may be uncertain (Greater London has a population of 7.5 million while the London metropolitan area has a population in excess of 12 million) and in some areas several large cities are sufficiently close together that for some purposes that they become a single entity – Washington, New York and Boston may be an example. Regardless of the precise definition, megacities are now an important part of the contemporary Earth System.

Almost all current megacities are located close to the coast and so the environmental interactions between the megacities and the coastal zone are substantial. Many of these involve air-sea interactions and all have profound implications for the local populations. For instance, the halogens emitted from the oceans can affect the cycling of atmospheric pollutants such as ozone, and the discharge of nutrients to coastal waters (via the atmosphere or fluvial system) can alter marine productivity and perturb the coastal ecosystem. There are also feedbacks to consider such as the effects of changed

marine productivity on marine gas emissions and the occurrence of harmful algal blooms and the effects of changing climate on all of these interactions.

To address the scientific issues of megacity/ coastal zone air-sea interactions, a group of fifteen scientists from 9 countries gathered at the University of East Anglia between 13 and 15 April 2010 for a meeting sponsored by IGBP as a “fast-track initiative” with support from IGAC, LOICZ, SCOR and SOLAS. The meeting was structured around addressing 4 questions:

- How do marine emissions affect megacity air pollution?
- How do megacities affect coastal ecosystems?
- How do megacity/coastal interactions affect climate?
- How does atmospheric deposition impact marine emissions and other potential feedbacks?

These are challenging cross disciplinary scientific questions and the participants included experts in atmospheric chemistry, climate, marine biogeochemistry and social sciences. The discussion ranged far and wide and it became clear that the scale of the impacts of the megacity/coastal zone interactions are larger and more wide-ranging (geographically and scientifically) than any of the participants initially thought from their own disciplinary perspective. The results of our discussions are now being written up for peer-reviewed paper publications.

This was an exciting meeting demonstrating the value of interdisciplinary science, which all the participants will remember for a long time – if for no other reason than the difficulty they had getting home afterwards as the Icelandic volcano dust cloud closed European air space!

## Priority Topics

### Priority Topic 2

#### Workshop on linking nutrient fluxes, hypoxia and coastal fisheries

Denise Breitburg, Lori Davias, Karin Limburg,  
and Dennis Swaney

With support from LOICZ, the Smithsonian Environmental Research Center hosted a workshop on links between nitrogen fluxes, hypoxia and coastal fisheries for sites distributed around the world. Twenty-two participants representing institutions in five countries in Europe and North America participated in the 3-day meeting with the aim of synthesizing data including nutrient flux estimates, extent of hypoxia, and impacts on productivity and fish biomass and catch for around 70 sites worldwide.

Data were assembled from a variety of sources, including the LOICZ budget and environmental datasets, Global NEWS model nitrogen flux estimates, a variety of Ecopath and Ecosim coastal food web network model analyses, and three independent model-based estimates of atmospheric deposition to coastal waters, in order to examine relationships between ecosystem characteristics, their nitrogen inputs, and their ecological responses.

#### Day 1

Day 1 included presentations reviewing the components of the existing database: data sources, quality issues and details of derived variables. We developed a simple hierarchy of nutrient flux estimates, incorporating into a ranking scheme considerations of whether the estimates are measurement or model-based, derived from local or regional observations, and the size of the system considered. Where multiple estimates are available for a given site, the estimate with the highest quality rank is used. Similar considerations apply to other variables. Modelled N flux estimates (Harrison) generally showed good agreement with independent estimates from the literature.

Only about half the systems in the current database exhibit hypoxia. Based on preliminary analyses (Breitburg), about 60% of the variation in extent of hypoxia across systems can be explained by physical characteristics alone. Of systems with seasonally varying hypoxia, about the same amount of variation can be explained by variation of log DIN load. Based on early logistic regression results (Diaz), other factors which

appear to emerge as significant include system depth, DIN load, DIN:TN load ratio and degree of openness.

Various foodweb network complexity measures are available in the database because of the inclusion of information from Ecopath analyses. Interpretation of these measures were reviewed (Heyman, Christian, Coll, Morisette) and the group discussed which measures were most useful as predictors or response variables. These measures also may provide useful connections to various indices of ecosystem services of coastal waters (Limburg). Multivariate statistical techniques (Zajac, Rose, Hayek, Frisk) will prove essential to go beyond simple bivariate analyses, such as simple regressions and correlations. Because of the complexity, multicollinearity, and nonlinear relationships between variables, various approaches (PCA, NMMDS, etc) are useful to categorise and cluster the data into meaningful groups for analysis.

#### Day 2

Day 2 marked the organisation of breakout groups to study the dataset and formulate approaches to analyse the data, sift it for errors, and exchange ideas between groups. Three broad groups were formed, including a nutrients and physical drivers group, a food web/network analysis group, and a hypoxia and fisheries group. The nutrients group spent some time refining nutrient flux estimates and attempting to fill in residence time measures for systems lacking this data. A set of updated nitrogen flux estimates and “freshwater fill” times were prepared and analysed by the end of the day. The hypoxia group discussed the problem of the relatively weak “hypoxia signal” across systems (if it were strong we wouldn’t be here now). Alternate approaches for analysis were considered, e.g. “We always seem to try to explain effects on fish biomass by everything but hypoxia first, then explain hypoxia with residuals. We should put hypoxia in first rather than giving it the backseat, since there is so much collinearity.”

The potentially weak signal could be due to fisheries management, which is a thorny issue to resolve. An extreme example





Figure 1. Workshop participants. From left: Bob Christian, Bob Diaz, John Harrison, Dennis Swaney, Suzanne Bricker, Christoph Humborg, Ken Rose, Karin Limburg, Lori Davias, Denise Breitburg, Sheila Heymans, Lyne Morisette, Marta Coll, Roman Zajac, Olle Hjerne, Mike Frisk, Dave Chagaris, Behzad Mahmoudi. Not shown: Lee-Ann Hayek, Libby Jewett, Howard Townsend. Photo courtesy of Suzanne Bricker.

is when constant catch levels are reported with fluctuating biomass, exemplified by red snapper (*Lutjanus campechanus*) in the Gulf of Mexico. On the other hand, catches scaled by the biomass of the exploited taxa – a marriage of data and model estimates – may be a reasonable way of estimating fishing intensity in this dataset.

## Day 3

Day 3 included presentations from members of the breakout groups summarizing preliminary analyses with updated data. Independent estimates of net primary production based on SeaWiFS chlorophyll data and Ecopath models were compared with N load across the systems in the database (Harrison). Primary production estimates will be compared with independent estimates of fish production to begin to build a relationship with nutrients. Some preliminary clustering results based on nutrient load and physical characteristics (temperature, openness, flushing time) suggest that the systems break into three main groups (Swaney, Zajac). A suggested follow-up analysis is to cluster the systems based on physical characteristics alone, and based on nutrients and biological characteristics, and to then statistically compare the resulting cluster characteristics.

Multidimensional scaling and clustering techniques applied to the data suggest that permanently hypoxic systems fall into groups different from seasonally hypoxic systems (Zajac); seasonally hypoxic systems tend to fall into several stati-

tical categories, suggesting no single set of driving variables controlling their behaviour. Regression tree analyses (Diaz) explained a large proportion of the variability of systems, with nitrogen load as a primary factor, and extent of hypoxia, annual sea surface temperature, and upwelling index are also important.

At the end of day three, a few additional variables and systems were proposed to be added to the database, with tasks assigned to the relevant participants. In addition, project outcomes were proposed. Five synthesis papers are planned as outcomes from the workshop, with expected submission dates in early 2011:

- 1) An overview the nutrient/hypoxia/fisheries question: science and management issues
- 2) Relationships between physical characteristics, nutrient loads and the extent and persistence of hypoxia
- 3) How do nutrient loadings and hypoxia, fishing pressure, system characteristics mediate biomass and catch?
- 4) Impacts on ecosystem services: Provisioning and regulating/supporting services
- 5) Stability/maturity/resilience of coastal food webs– nutrient and hypoxia impacts

## SSC News

### SSC members rotate off

By the end of 2010 the SSC Members Bernhard Glaeser, German Society for Human Ecology (DGH); Laurence D. Mee, The Scottish Association for Marine Science, and Stephen Olsen, Coastal Resources Center, University of Rhode Island, will finish their membership term on the LOICZ Scientific Steering Committee. We are very grateful for their support and great work for LOICZ in the last years particularly in shaping a new LOICZ in the challenging times of transition towards a truly interdisciplinary effort. We would greatly appreciate if they keep being actively related and participating in future LOICZ activities.

During the 21st LOICZ SSC Meeting held in March 2010 in Mamallapuram, India, Bernhard Glaeser and Stephen Olsen have given their LOICZ Heritage Lecture:

- **Bernhard Glaeser: Beyond Natural Hazards**
- **Stephen Bloye Olsen: Coastal Ecosystem Governance: What? Why? How?**



Please listen to their lectures on LOICZ Vodcast website:  
[http://www.loicz.org/mediacentre/heritage\\_lectures/index.html.en](http://www.loicz.org/mediacentre/heritage_lectures/index.html.en)

### New SSC Members to join in 2011 - Welcome on board!

LOICZ, following IGBP and IHDP approval, has appointed three new SSC members, who officially start their membership on 1 January, 2011. In the following we have the pleasure to introduce our new Scientific Steering Committee members to our global researches and stakeholders community:

**Joyashree Roy** is currently Professor of Economics at Jadavpur University, Kolkata in India, **Joan Nymand Larsen** holds a position as senior scientist at Stefansson Arctic Institute, Akureyri, Iceland, and **Mark Pelling** is a reader in human geography at King's College London.

**Mark Pelling** is Reader in Human Geography, King's College London. Before working at King's he held lectureships in Geography at the University of Liverpool, UK and the University of Guyana. Mark is a lead author for the Intergovernmental Panel on Climate Change and working on the 'Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation' (SREX) Report. He will contribute a section on urban issues in the 5<sup>th</sup> assessment report for IPCC Working Group II: Impacts, Adaptation and Vulnerability. His research focus lies in the sociology of disaster risk and adaptation to climate change with a special view on poorer countries and urban contexts.



*Mark Pelling  
Reader in Human Geography*

#### **Mark Pelling**

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**Joyashree Roy** is currently the Professor of Economics at Jadavpur University, Kolkata in India. She initiated and also coordinates the Global Change Programme at Jadavpur University ([www.juglobalchange-program.org](http://www.juglobalchange-program.org)) which focuses on selected aspects



of Climate Change research. She directs the SYLFF -Ryoichi Sasakawa Young Leaders Fellowship Fund (<http://www.ju-sylffprogram.org>) -Project on "Tradition, Social Change, and Sustainable Development: A Holistic Approach" at the same university.

She was a Ford Foundation Post Doctoral Fellow in Environmental Economics at the Lawrence Berkeley National Laboratory, California, USA. She has been one of the two Coordinating Lead Authors of the Chapter 7 of the Inter-Governmental Panel on Climate Change -IPCC's AR4, WGIII, "Climate Change 2007: Mitigation of Climate Change". IPCC is the 2007 Nobel Peace Prize Winner. Currently she is in steering committees of selected special reports of the IPCC 5th assessment report. She has been involved in preparation of the Stern Review, Global Energy Assessment and many other national and global efforts. In her independent research capacity she has authored books and written over sixty articles in peer reviewed leading professional journals and books.

Current research interests are: Economics of climate change, modelling energy demand, economy-wide modelling exercises for deriving policy implications, water quality demand modelling, water pricing, urban infrastructure development policy issues, sustainable indicator estimation, natural resource accounting, valuing environmental services, and developmental and environmental issues relevant for informal sectors. She is interested in multidisciplinary approaches to understanding development issues. She has widely travelled to almost every continent for her extensive research collaborations and capacity building efforts in the field of resource, energy, environment and the climate change.

#### **Joyashree Roy**

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**Joan Nymand Larsen** is senior scientist with the Stefansson Arctic Institute, Akureyri, Iceland, and lecturer with the Social and Economic Development and Polar Law Programmes, University of Akureyri. Originally from Denmark, she studied macroeconomics at the University of Copenhagen, and received her Ph.D. in economics from the University



of Manitoba, Canada, specializing in economic development and natural resource-based economies of the North. Her background includes more than 15 years of researching and publishing on the Arctic economy and quality-of-life in the North. Her research on northern economies and renewable and non-renewable resource extraction includes the impact of industrial development and global change processes for Northern regions and local and coastal communities.

Her current research focuses on the study and assessment of living conditions and quality-of-life across the circumpolar region, as well as the construction, measurement and testing of Arctic specific social indicators. She leads two international indicator projects - Arctic Social Indicators (ASI - I and II). She is also a coordinating lead author for the chapter on Polar Regions, for the 5th assessment report, WG-II, of the Intergovernmental Panel on Climate Change; and now leads and coordinates the work of the international working group on the second Arctic Human Development Report: Regional Processes and Global Linkages, which incorporates global change as a cross-cutting theme and puts focus on the impact of climate change for different dimensions of human development and core systems. She was Project Manager and co-editor of the first Arctic Human Development Report (AHDR) launched in 2004. Currently, she serves as President of the International Arctic Social Sciences Association, IASSA, and she is member of the international steering committees of the Arctic Research Program with the Swedish Foundation for Strategic Environmental Research; the Sustaining Arctic Observing Networks (SAON); and the Climate Change and the Arctic Cryosphere: Snow, Water, Ice and Permafrost in the Arctic (SWIPA). Her editorial work includes, among others, serving on the editorial board of the new Springer Encyclopedia of Quality of Life Research; and her editorship on economic issues for The Polar Journal.

#### **Joan Nymand Larsen**

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## LOICZ News

### LOICZ Open Science Conference 2011 “Coastal Systems, Global Change and Sustainability”

12-15 September 2011, Yantai, China

Land-Ocean Interactions in the Coastal Zone (LOICZ) is pleased to announce the LOICZ Open Science Conference 2011 (LOICZ OSC 2011), to be held on 12-15 September, 2011, in Yantai, China. The conference is organised in close cooperation with the Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, and the LOICZ Regional Nodes in Yantai, Singapore and Chennai.

The aim of the LOICZ OSC 2011 on “Coastal Systems, Global Change and Sustainability” is to bring together the international research community working on land-ocean issues, showcase the width and scope of ongoing research, help to build a community in this highly interdisciplinary field, and to inspire new research, theory building and applied science. The conference is integrative in nature, amalgamating different experiences and disciplinary “angles” worldwide to generate new levels of understanding and improve decision making in policy and practice. LOICZ particularly invites innovative approaches, coastal practitioners and early stage researchers.



Read more about the “Young LOICZ Forum 2011” in our section Young LOICZ on page 36.

**The next LOICZ SSC Meeting will take place in Yantai, China, from 8-10 September, 2011, in connection with the LOICZ Open Science Conference 2011 on “Coastal Systems, Global Change and Sustainability”, 12-15 September, 2011, Yantai, China.**

**Conference website: <http://www.loicz-osc2011.org>**



The LOICZ OSC will be arranged around the overarching topic on “Coastal vulnerability and sustainability to support adaptation to global change”. Bearing in mind the grand challenges presented in ICSU’s visioning process (<http://www.icsu-visioning.org>), LOICZ invites contributions to the following scientific themes and encourages the study of vulnerability, dynamics and resilience of land-ocean systems at local, regional and/or larger scales:

- Social-Ecological Systems and Scales
- Arctic Coasts: Peoples and societies
- Land Use in Coastal Zones
- Small Island Developing States
- Ecosystem Goods and Services and Environmental Economics
- Fluxes and Biogeochemistry
- River-Mouth Systems
- Estuaries and Lagoons
- Observation, Monitoring and Modelling
- Coastal Governance
- Urban Development and Megacities
- Coastal Hazards and Risk Governance
- Vulnerability, Resilience, Adaptation in Coastal Zones
- and others.



## IPO Notes

### As of 1 November, 2010, the LOICZ host GKSS-Forschungszentrum Geesthacht GmbH is renamed

#### Helmholtz-Zentrum Geesthacht Centre for Materials and Coastal Research

The new name emphasises the membership in the Helmholtz Association of National Research Centres. At the same time it refers to two important areas of our research: As a centre for materials and coastal research the Helmholtz-Zentrum Geesthacht is involved in the fields of materials science and technology, regenerative medicine as well as coastal and climate research.

As of the 1 November, they present themselves with a new name and a new appearance.

Helmholtz-Zentrum Geesthacht is looking forward to a continuing successful and good cooperation.

## Helmholtz-Zentrum Geesthacht

### Centre for Materials and Coastal Research



Photo: Helmholtz-Zentrum Geesthacht/SO

### Storm Surges Congress Risk and Management of current and future Storm Surges

Storm Surges Congress 2010 – reveals a kaleidoscope of views and perceptions on a global phenomenon and regional specifics

H. Kremer, M. Lange



#### Introduction

Hosted by the GKSS Research Centre, Geesthacht, Institute for Coastal Research (since 1 November, 2010, Helmholtz-Zentrum Geesthacht) in collaboration with the Climate Campus (CLISAP) of the University of Hamburg the international Congress on Risk and Management of Current and Future Storm Surges took place at Hamburg University between 13 and 17 September 2010.

Organised by LOICZ the congress formed a key scientific contribution to its focal themes on coastal vulnerability and management. With active support of almost 20 international and national partners (see list at the end) more than 200 participants representing over 30 nations from all over the world found their way to Hamburg to attend this only second international science congress addressing storm surges since the last two decades.

The main goal of this congress was to make initial steps towards overcoming the fragmented views and discussions that characterise the scientific as well as the user perspectives on this global coastal hazard and its regional specifics.

The variety of international and national supporting agencies reflected the wide and multidisciplinary interest that the congress attracted. The collaboration with UNESCO's Intergovernmental Oceanographic Commission, IOC, built on the findings and recommendations of the Storm Surge Congress organised by JCOMM in late 2007 in Korea (see below). It was also a contribution to the 50th anniversary which IOC is currently celebrating. Including support by further institutions such as the European Space Agency, ESA, as well as the National Oceanographic and Atmospheric Administration of the USA, NOAA, the coastal engineering network COPRI and multiple national organisations such as the Federal Maritime and Hydrographic Agency, BSH, the German Weather Service, DWD, and Hamburg Port Authority – just to name a



Participant reading the Storm Surges Book of Program  
(Photo: Ellen-Barbe Goldberg)

few – it was particularly possible to highlight the latest state of the art aspects of storm surge science and engineering as well as supporting many early stage researchers from developing economies all over the world.

In recognition of the regional and local relevance of the subject of the congress a side event was organised dedicated specifically to highlight these local and regional storm surge related issues and to discuss the latest state of the art of scientific knowledge, the role and improvement of forecasting services and questions of risk and uncertainty with national research and user communities. Here also issues of institutional dimensions were addressed that are relevant in dealing with and responding to storm surges, and response measures. This side event was organised by the Federal Maritime and Hydrographic Agency, BSH together with national partners.



Trainees Helmholtz-Zentrum Geesthacht: (from left) Patricia Jens, Vanessa Rahn, Lucie Lange, Carsten Brüggemann, Sascha Perplies  
(Photo: Christiane Hagemann)

## Background

Storm surges represent a central geo risk for many coastal regions in the world, and have been responsible for the biggest losses of life and property in different parts of the world. The 1953 and 1962 storm surges are well remembered in the Netherlands, the United Kingdom and Northern Germany, as are storm surges in Bangladesh and Myanmar in recent years and decades, which like in the case of “Nargis” killed more than 100,000 people. So far, the issue has been subject to scientific research in different professional communities, which were again fragmented by language - this congress was aimed to provide an opportunity to bring together the various strands on the global-concern issue of „storms surges“.

While in the only one preceding congress organised in late 2007 in Korea by the Joint WMO-IOC Technical Commission on Oceanography and Marine Meteorology, JCOMM, the focus was predominantly on technical issues and recommendations for improved observation and modelling, the scope here was supposed to be broader. Thus the 2010 Storm Surge Congress centred on questions of coastal system and community vulnerability, risk and risk perception as well as ways for adaptation. As a consequence the Congress invited numerous scientific experts from all traditionally involved disciplines plus a multiplicity of stakeholders, coastal users, the information services, the insurance and re-insurance business and decision-makers as well as city and coastal planners and engineering communities. A particular effort was undertaken to attract young research colleagues from developing economies enabling them to expose their science to the wider global audience of scientific peers and users.

In order to meet this challenge of being truly interdisciplinary and to attract both, the natural and social scientists as well as humanities the congress comprised five days of top-class interdisciplinary scientific sessions, two open panel discussions, a regional side event and a field trip illustrating past and current efforts of a tidal harbour and city to cope with flood risk and to prepare for future hazards. The overarching aim was to provide answers to the two questions:

**How do we deal with the present level of risk?  
How do we respond to changing future conditions?**



## Summary and key findings

While currently LOICZ in collaboration with the session conveners is taking the lead in arranging a special issue volume in a high ranking journal in the following section we try to list and briefly summarise those **key findings**. It is an obvious observation that the high class contributions presented at the congress reflect a multiplicity of disciplines and also include aspects pointing towards current and future adaptation and even the role of the humanities in dealing with this natural hazard phenomenon. In order to provide a more or less comprehensive overview we provide the findings in the sequence of the thematic sessions and in bullet points. Most of the underlying presentations and posters have been released by the authors for public access on the LOICZ website: <http://www.loicz.org/calender/Congress/index.html> en

### History and intercultural perception

(convenors and chairs: H. v. Storch, H. Glindemann, B. Ratter)

#### Key findings:

- Resilience of defence constructions has to have high priority but these constructions like dikes make people feel save. In absence of a “felt” risk people may not be adequately prepared for extreme situations and handling flooding, they are vulnerable. Maintaining risk awareness reduces vulnerability. Thus regional and personal memory is crucial and coastal protection measures need to come with continued information about risks.
- Climate change discussions need to include scenarios encompassing different time horizons to illustrate the variety of risks and options. These scenarios need to inform public and institutional discourse

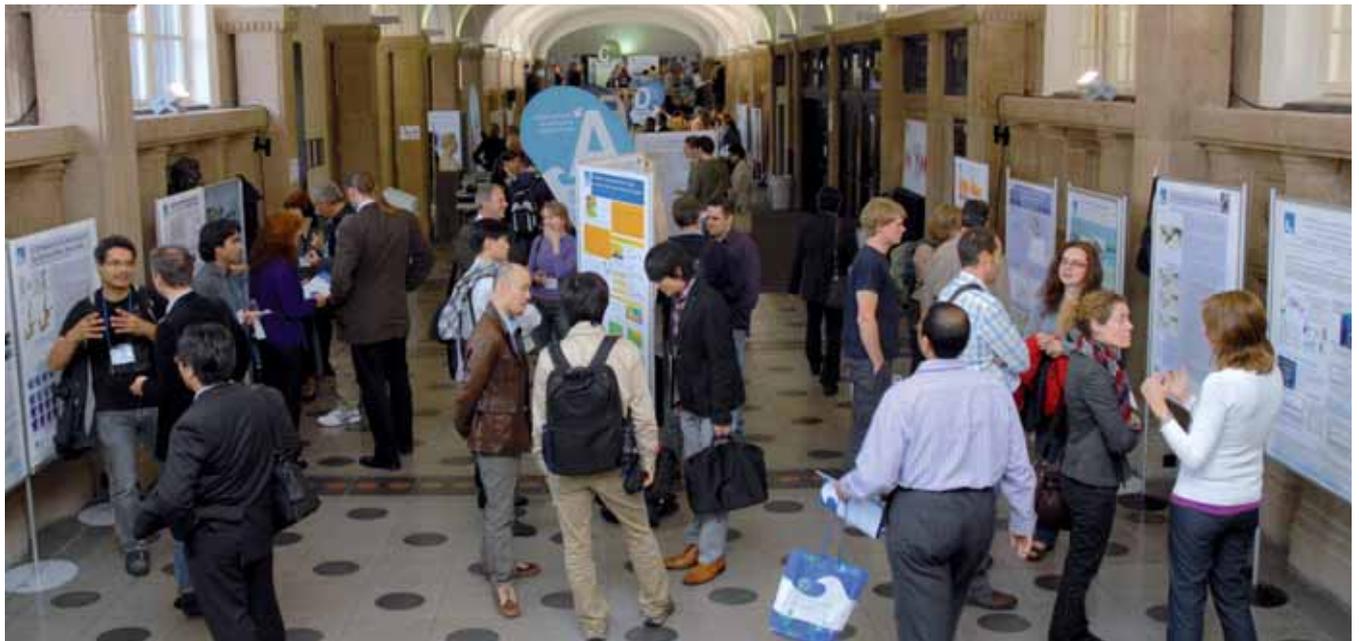
- Linguistics, religious beliefs and individual and collective memory matter. They play a critical role in determining risk perception and even more so the preparedness to respond. Initial observations indicate a mind shift away from traditional turning against nature (like in a war) more towards working with nature.

### Supporting storm surge applications using satellite data

(convenors and chairs: C. Donlon, B. Lee)

#### Key findings:

- Satellite data are contributing to storm surge monitoring, prediction, and related operation for disaster management. Satellite altimetry and scatterometry demonstrate their usefulness in detecting weather-sea state associated with storm surges and in improving model predictability. SAR has great promise for coastal studies despite present limits in coverage. Satellite data are complementary to in situ data and numerical modelling.
- Great potential lies here to enhance the overall storm surge predictability and management capabilities by extensive application of the available information from existing and planned missions.
- Although storm surges are regional/meso-scale phenomena, international and global efforts are required to solve scientific questions on improved forecasting, to monitor and process data with agreed standards, and to share available information and state-of-art technology between regions.



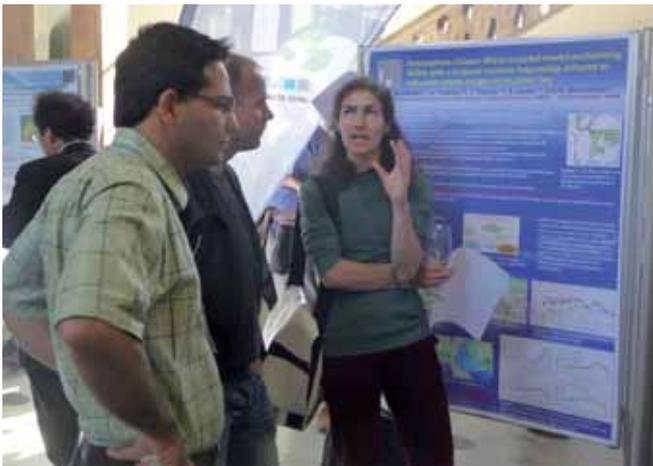
Poster session on Poster Islands on Wednesday 15 September 2010  
(Photo: Ellen-Barbe Goldberg)

### Driving factors and scales of storm surges

(conveners and chairs: S. Solomon, P. Tkalich, S. Müller-Navarra)

#### Key findings:

- Human activities exacerbate storm surge magnitude and impacts (e.g., gas, water and aggregate extraction, river engineering, sediment loss).
- Climate variability and change (e.g., changing storm tracks, wind/wave regimes) result in geographic and magnitude changes of exposure to storm surge impacts (areas previously considered “safe” may not be in the future)
- Processes acting at very fine spatial and temporal scales are important for accurate modelling (e.g., wind gusts, waves, failures)
- Storm surges impact availability and quality of drinking water (salinization and contamination such as arsenic poisoning in Bangladesh)
- There is a need for continued development of efficient, accurate open source models (i.e. stochastic models to characterize uncertainty, instantaneous forecast models, optimization models, e.g., countermeasures, risk analysis)



participants discussing in front of their posters on their poster island  
(Photo: Ellen-Barbe Goldberg)

### The climate of storm surges

(conveners, chairs: R. Weisse, K. Horsburgh)

#### Key findings:

- Regional perspective of studies is useful as storm surge hazard is a regional phenomenon. A global framework, however, should enable inter-comparison among studies and results as to overcome the regionally fragmented view we have on global storm surge climate.
- Current studies mostly focus on the storm surge hazard, not the risk. Developing methods and frameworks to extend present studies would be desirable, including analysis of hazards, i.e. storm surges combined with waves, bathymetry, sea level changes etc.

- Uncertainty is a major issue in addressing future storm surge risk. A common framework on how to address uncertainty is urgently needed. This includes a common framework on detection and attribution of long-term changes.
- Efforts into communication to other disciplines and cross disciplinary learning are critically important.

### Institutional and economic dimensions - dealing with uncertainty and disaster reduction

(conveners, chairs: B. Lee, G. Tetzlaff, P. Ciavola)

#### Key findings:

- Rising global mean sea level increases flood risk and so do anthropogenic factors
- Tools for hurricane surge hazard forecasting and risk assessment, including measures of uncertainty, are improving, however, suppressing variation in factors that contribute to surge under-predicts hazard/risk
- Research should target a detailed examination of the surge-critical aspects of the driving meteorology (NWP), and also the momentum coupling between wind, waves and surge
- Short-range goals for improvements to surge forecast models include reliable model tidal predictions and cooperative regional multi-model ensembles
- Incremental improvements to coastal flood forecast accuracy can lead to large savings
- Operational models that include some probabilistic treatment of uncertainty lead to better risk management, and inform high-level policy decisions
- Practices and potential adaptation of coastal flood prevention and protection need to be continuously reviewed and improved applying a system-wide perspective in examining the total impacts (e.g., risk analysis maps and protection facilities such as dikes and dunes)
- Community resilience does not solely depend on good forecasting – an end-to-end warning system is required, with enhanced awareness of the public on hazards and risk management. Thus national and regional platforms for disaster risk reduction should take into account interdisciplinary scientific developments, and engage the civil society





*Helping hands from Hamburg and Kiel University assisted the international guests in navigating through the Storm Surges congress (Photo: Ellen-Barbe Goldberg)*

### Contemporary risk and management

(conveners, chairs: K. Thompson, R.J. Nicholls, J. Jensen)

#### Key findings:

- **Partnerships amongst researchers, practitioners and end-users are critical; including:**
  - Financial, private and government sectors working together to spread the risk of living and working in the coastal zone;
  - Oceanographers partnering with municipal planners to define building codes and development zones;
  - Scientists and the public working in focus groups to define a community response to climate change;
  - An ongoing dialogue of researchers and policy makers calling for strategies like a “sequential process of adaptation”
- **An accelerated “co-evolution of knowledge” is required that needs to rely on:**
  - Common terminologies and definitions of key concepts (e.g., risk, uncertainty);
  - Clear statements of end-user needs, mapped against honest assessments of what researchers can really provide and by when; this is an iterative process.
- **Growing complexity of coupled models, their drivers (not just SLR), and uncertainties (errors of omission and commission) is daunting. Examples included:**
  - GCM downscaled by RCM to force a coastal erosion model;
  - Two-way coupled surge and wave models;
  - Ecosystem sub-models based on concepts of ecosystem services;
  - Models linking hazards, risk and response, and possible nonlinear feedbacks by allowing value to depend on risk.

- **Based on recent experience with the simpler problem of coupling atmosphere and ocean models, a need is anticipate for:**

- Common terminology (e.g., “hindcast “ is used differently by atmospheric and ocean modellers, which is a major impediment to communication until this problem was identified and an agreed shared term defined);
- Clear statement of each model’s strengths and weaknesses, and agreed upon metrics to define model uncertainty and skill;
- Community software that is readily available, well documented and tested.
- International activities to compare and improve models (e.g., model inter-comparison).

### Social dimensions of risk and vulnerability

(conveners, chairs: J. Weichselgartner, C. Kuhlicke)

#### Key findings:

- Analysis of historic loss records indicates that past time increases from natural disasters observed world wide are primarily caused by increasing exposure and value of capital at risk. Anthropogenic climate change has not had a significant impact so far.
- In the future, assets at risk of flooding and potential casualty risk will increase, due to sea-level rise, increasing river discharges. But demographic change and assets value play an equally important role.
- From a global comparison it follows that for the period up to 2040, the contribution from increasing exposure and value of capital at risk to changes in economic losses is likely to be (much) larger than the anticipated impacts from anthropogenic climate change
- This comes with a changing landscape of risk responsibility (intended and unintended consequences) and risk perception/communication remains a challenge for risk managers
- The underlying structures/processes of social vulnerability are important
- Social, structural, and functional barriers at the science-practice interface hinder a more effective knowledge production and application (needs to be overcome)
- There is a lack of systematic evaluations of the effects of communication and its contribution to social capacity building
- Practical recent experience from Europe indicate that political regulations and choices increased vulnerability (positive retroactions), instead of curbing the trend towards disaster (negative retroactions).

### Building with nature (BwN)

(conveners: P. Kabat, E.v. Slobbe)

#### Key findings/innovations:

- People live in vulnerable places, e.g., deltas. The question is how to create more resilience in these areas and how can society move to a more “eco-centric” thinking, i.e. finding relations between humankind and nature (a dynamic social-ecological system perspective)?
- Current public perception in certain regions acknowledges to a growing extent that there is a need to develop new storm surge protection strategies that forge partnerships between ecological and human development.
- This new paradigm is not without risks. More science-based interdisciplinary research and experiments in the field of Building with Nature (BwN) are needed.
- BwN is becoming increasingly attractive, pilot experiments are carried out and more are needed; the goal is to avoid negative consequences as best as possible
- BwN is also confronting population with risk of storm surges/sea level rise more than traditional hard structures like dikes – a matter of perception, acceptance, culture, value and believe systems thus intercultural learning and communication;
- BwN also means a paradigm shift in classical engineering.

### The role of scientific information - dealing with uncertainty

(conveners, chairs: S. Dube, I. J. Moon, G. Goennert)

#### Key findings:

- Uncertainty still remains in predicting storm surges for short and long term periods as well as in managing the risk and decision - making
- Major sources of uncertainty are from driving atmospheric forcing (requires multiple ensemble predictions), parameterization of physical processes (such as wind stress, bottom stress, and dissipation), the wave-wind-tide-surge interactions, wave setup, and impacts of sea level rise and climate change
- Regional operational models are greatly improved mainly due to enhanced grid resolution, improved monitoring skills and better handle on the above forcing functions. But there is still room for considerable improvement
- Proper storm surge projections under future climate conditions are required to consider all atmospheric and oceanic variables. Considering only future sea surface temperature may lead to overestimation of extreme surge heights
- Reduced vertical temperature gradients, which most IPCC climate models project, may lead to preventing further intensifications of tropical cyclones in future warmer conditions.

### Conclusions

In the conclusions presented hereunder we also draw on the key statements made during two international thematic panels on risk and vulnerability research and the role of science.

The Congress acknowledged that today it is widely accepted that the “risk” is some product of the hazard (climate change) and the vulnerability or exposure (differences are prominent in risk definition on individual level, on institutional and insurance level and within the modellers community – i.e., clarified and harmonised terminology matters – and participants encouraged LOICZ and GKSS to elaborate on this in a potential next congress in the years to come)

Whilst inroads are being made to quantify the uncertainty of the hazard, it is equally important that the vulnerability is correctly measured and the exact means of combining the two quantities is transparent. The increases in coastal flood insurance damage over recent decades have been primarily driven by increased exposure with more infrastructure and population moving into at-risk areas. In other words social choice and human behaviour matters.

An important issue was the clear understanding that man-made climate change is merely one issue when dealing with the hazards of storm surges – other issues such as water works and upstream river management and land-use change, coastal urban development and population growth in general, extraction of sand and gas are often of equal or even larger importance for changing local risks than climate change. Regional examples for this can be found a.o. in the highly populated sub tropical delta areas.



Panel discussion “The role of risk and vulnerability aspects in current research agendas on 15 September, 2010.

From left: Kevin Horsburgh (NOC), Hans v. Storch (HZG), Peter Koltermann (IOC/UNESCO), Robert Nicholls, University of Southampton (Photo: Nicole Hulka, Helmholtz-Zentrum Geesthacht)



Finally, it is self-evident that decisions are made by decision makers. Scientific tools, used correctly in a decision making framework, are key; and despite the foregoing uncertainties they remain the best tools. But they can only inform, and they do not remove the need for a decision to be taken with incomplete information which is what many decisions are.

So one key function for today's science and information services is to provide at least highly accurate, relevant and timely storm induced coastal inundation information, clearly communicated, which will result in significant reductions in loss of life and assist to ensure all coastal communities are optimally resistant and resilient to inundation impacts. This may foster scientific information and knowledge products to

- Drive community planning to reduce risk to life and property
- Train and educate population to respond to threats appropriately
- Infuse state of the art science and technology to refine risk assessment and reduce unnecessary evacuations
- Communicate street level impacts that result in appropriate personal and community response before, during and after the events (which during the congress was phrased as the big challenge to bridge the "last 100m" of information flow).

In conclusion, what appears critical in overcoming the fragmentation when dealing with storm surges as a global coastal hazard but on multiple scales is to enable and improve ways of enhancing cross disciplinary and cross cultural collaboration. The Hamburg Storm Surges 2010 Congress was a show case for the willingness and ultimately also the ability of different disciplines including humanities to exchange their views and actively contribute to this process. It also was a show case of non sensational communication incl. recognition of alternative knowledge claims and sharing this with public media. It will be interesting to speculate on preparations for, and structure of, a follow-on Symposium in say three years where issues of harmonisation of terminologies (e.g., risk, hind-casting), of human health issues and cross cultural communication will complement the latest developments of modelling and forecasting. The hosts (former) GKSS now HZG and CLISAP and organisers (LOICZ) anticipate to also continue the learning of the latest further developments in the discourse on the economic risks by inviting again the international insurances, engineers and environmental economists.

### Acknowledgements: Supporting institutions

**The Storm Surges Congress 2010 on Risk and Management of Current and Future Storm Surges has been organised with the support from (in alphabetic order):**

AVH

Alexander v. Humboldt Foundation

BAW

Federal Waterways Engineering and Research Institute

BSH

Federal Maritime and Hydrographic Agency of Germany

COPRI

Coasts, Oceans, Ports, And Rivers Institute -  
An Institute of ASCE, USA

DKKV

German Committee for Disaster Reduction

DWD

German Weather Service

ESA

European Space Agency

FREIE UND HANSESTADT HAMBURG

Free and Hanseatic City of Hamburg

GF

Gesellschaft zur Förderung  
des GKSS-Forschungszentrums e.V.

HPA

Hamburg Port Authority

IASC

International Arctic Science Committee

KlimaCampus Hamburg

Excellence Cluster 'Integrated Climate Analysis and  
Prediction' (CliSAP)

LSBG

Agency for Roads, Bridges and Waters

MLUR

Ministerium für Landwirtschaft, Umwelt und ländliche Räume

NOAA

National Oceanic and Atmospheric Administration

UHH

University of Hamburg

UNESCO/IOC

United Nations Educational, Scientific and Cultural Organization/  
Intergovernmental Oceanographic Commission

UNU-EHS

United Nations University, Institute for Environment and  
Human Security

I am Zoe Vosberg, Geography student from Kiel, and in summer 2010 I spent nine weeks at the LOICZ IPO as an intern.

When I joined the IPO in August there were only few weeks left to organise the Storm Surges Congress at the University of Hamburg. My main task was to coordinate the student helpers for the congress. First I assessed how many students would be needed and after recruiting them



I compiled their work schedules. Apart from this I was to some extent responsible for the setup of the venue. I made up the plan of how to arrange the poster islands and I created the signposts needed to find the way around the university building. As the congress moved closer and the left-over time decreased I also assisted the IPO staff in editing the congress programme, communicating with some of the participants, uploading the lectures on the conference laptop and other smaller things. Fortunately, during the week of the congress almost everything worked out as planned and apart from working together with the other student helpers I found time to listen to some of the very interesting talks. I especially enjoyed the internationality of the congress and the high scientific level of the lectures. After the congress week I still had some weeks of internship left. Enough time to prepare the congress presentations for being uploaded on the LOICZ website and to evaluate the participant's feedback.

Overall I had a great time at the LOICZ IPO. I have learned a lot for my studies, my future career and for life itself. Thank you Hartwig, Juergen, Barbe, Christiane and Marcus for letting me be part of your team, for trusting me and for giving me such interesting and responsible tasks!

## Evaluation of the Congress

Compiled by Zoe Vosberg

On 16 and 17 September, evaluation sheets were handed out in the lecture room. In total, 87 sheets have been returned (61 on Thursday and 26 on Friday). In the following, the results will be presented. The complete evaluation sheet is attached to this document.

Overall, the participants seem to have been satisfied with the congress. The SSC 2010 as a whole has on average been rated with "good" (value of 1.76). The best marks (with an average of 1.28 - "excellent") have been given to the staff of the congress, the worst (with an average of 2.27 - "good") to the Copernicus congress website. The congress dinner has also been rated as excellent (average of 1.49), all the other categories have on average been rated as "good" (see the table and charts below).

We are particularly glad to see a very positive ranking of the poster set up and session. The aim was to present the posters organised in thematic islands which are to be presented by one person to the whole audience. This moderated "Island hopping" gave a good introduction into the highlights of the posters and motivated considerable discussion and exchange between authors and the scientific and user audience. The fact that the posters were displayed throughout the week gave specific room to the excellent science presented in the posters. Furthermore participants appreciated that the congress was run without parallel sessions which would not have been possible without an attractive poster session.

*Table 1: Results of the evaluation - counts for each response option and the calculated average mark  
(average marks: 1.0 - 1.49 = excellent; 1.5 - 2.49 = good; 2.5 - 3.49 = ok; 3.5 - 4.49 = poor; 4.5 - 5 = poor)*

	excellent	good	ok	poor	very poor	not answered	total	average mark
<b>SSC as a whole</b>	29.5	49	6.5	1	0	1	87	1.76
<b>Preparation</b>	26.5	37	20	2.5	1	0	87	2.02
<b>Website</b>	12	42	29	3	0	1	87	2.27
<b>Venue</b>	31	40.5	11	1.5	0	3	87	1.80
<b>Structure</b>	42	36	6	2	0	1	87	1.63
<b>Design</b>	41	40	4	0	0	2	87	1.56
<b>Poster Session</b>	28	42	11	2	0	4	87	1.84
<b>Staff</b>	64	22	1	0	0	0	87	1.28
<b>Overall logistics</b>	29	49	7	0	0	2	87	1.74
<b>Conference opening</b>	15	42	12	0	0	18	87	1.96
<b>Senate reception</b>	20	32	10	5	0	20	87	2.00
<b>Fieldtrip</b>	33	26	9	0	0	19	87	1.65
<b>Congress dinner</b>	20	13	2	0	0	52	87	1.49
<b>Cost-benefit ratio</b>	24	38.5	18.5	2	1	3	87	2.02



## Documentation of the Storm Surges Congress

### Congress Presentations Session A - I



<http://www.loicz.org/calender/Congress/presentations/index.html.en>

### LOICZ Vodcast



<http://www.loicz.org/mediacentre/vodcast/index.html.en>

**Sturmflutkongress in Hamburg.** [13.09.2010]  
NDR aktuell. 01:44 min

**Sturmflutkongress in Hamburg. Experten warnen vor erhöhtem Sturmflutrisiko.** [13.09.2010]

**Hamburg 1.**  
**Institut für Wetter- und Klimakommunikation GmbH.**  
Von Frank Böttcher. 01.55 min

### LOICZ Podcast



<http://www.loicz.org/mediacentre/podcast/index.html.en>

1. **Hamburg borrows ideas from nature to improve its port's design.** [EN]  
From Chelsea Wald. Deutsche Welle. [08.10.2010]  
64kbit/s | 05:25 min
2. **Wenn das Wasser kommt.** [DE]  
Von Tomma Schröder für: Deutschlandfunk [17.09.2010]  
Länge 04:02 min
3. **Sturmflutrisiko.** [DE]  
Von Joern Freyenhagen für:  
Logo das Wissenschaftsmagazin auf NDR Info  
[17.09.2010 | 22:00 Uhr]  
[Abschnitt 15:09 - 20:55] Länge 05:46 min

### Online articles



<http://www.loicz.org/press/news/index.html.en>

## YOUNG LOICZ

### Young LOICZ Forum (YLF 2011) Enhancing Capacities for Global Change Mitigation in Asia-Pacific Coastal Zones



At its international Open Science Conference (OSC) on Capacity Building in the Asia-Pacific Region: Coastal Systems, Global Change and Sustainability, LOICZ will address the integration and future perspectives of changing coastal areas. In order to build strategic capacities for sustainable coastal zone management and effective responses to global environmental change in the Asia-Pacific Region, LOICZ is organising a special event around the OSC: the Young LOICZ Forum (YLF 2011) Enhancing Capacities for Global Change Mitigation in Asia-Pacific Coastal Zones for early-career scientists and managers. This targeted training programme offers the opportunity to enhance soft skills as well as to learn about drivers and pressures on coastal systems and thus to better define their future professional role in coastal management. It provides the next generation of scientists and decision makers with knowledge and practical skills that they can apply in their own country and an opportunity to interact and network with their peers.

#### What is the YLF 2011?

The YLF is a well-balanced combination of OSC sessions and specific targeted activities for early-career scientists and young coastal managers, including training workshops and practical exercises. It brings together senior scientists, international organisations, and early-career scientists and young coastal managers from various countries for both formal training and open discussions on relevant global environmental change topics. The training programme includes tutorials, exercises, and open-discussions to provide cross-disciplinary learning; original workshops provide both practical skills and scientific knowledge. Special attention is given to career advice, including acquiring transferable and soft skills, training-through-research and one-to-one mentorship (one senior scientist will be appointed to each YLF participant). A job shop offers the opportunity to network with and meet potential employers; field trips and social events will support cultural understanding. Other features are the YLF statement 'The Future we Sea' and a carbon offset activity. On the basis of the performance in and produced outcome of the different training units, awards will be given to the best YLF participants.

#### Where is the YLF 2011?

The LOICZ OSC 2011 is integral part of the Young LOICZ Forum. The YLF 2011 takes place from 8-15 September, 2011, in Yantai, China.

#### Who can attend?

We specifically target and invite early-career scientists and young managers and practitioners from local authorities. A relationship to coastal management is required and the maximum age is 35 years. The selection of YLF participants will be based on geographical and gender balance, personal history, and scientific quality, with a focus on recently identified coastal 'Hotspots'. The selection committee will focus on candidates' qualifications and merits, potential benefits they may gain from the YLF participation in the conduct of daily professional duties and future roles they may play as scientists or decision makers in policy and practice.

#### How to apply?

##### YLF applicants are required to submit

- 1) a scientific poster,
- 2) the completed application form, and
- 3) a letter of recommendation.

Incomplete applications and applications submitted past the official closing date of 1 April, 2011, cannot not be considered.

##### 1) Scientific Poster

The main criteria are scientific quality, field of expertise, and compatibility with the OSC themes. Additional consideration will be given to geographical and gender balance. Critical for the selection is the quality of the scientific poster on one of the following thematic hotspots: **river-mouth systems, small island developing states, coastal urbanisation and megacities, and Arctic coasts**. These terms should be somehow included in your poster title. Your poster can present original research you already carried out as well as a proposed research idea. However, in both cases the research has to relate clearly to one of the hotspots. The structure of your poster should follow scientific guidelines and be composed of: title, contact details, introduction, methods, results, discussion, references, and acknowledgements:



- **Title** (not more than 2 lines; refer to one of the hotspots): The title should convey the „issue“ and the approach; it needs to be catchy in order to „reel in“ passersby. A suggested title format is 90-96 point size (pt) Helvetica or Arial, use bold/shadow as this reads better from a distance; subtitles should be 72pt.
- **Contact details:** Your name including affiliation and e-mail address (36-48pt). Do NOT include an abstract!
- **Introduction** (ca. 300 words): Get your viewer interested about the issue or question while using the absolute minimum of background information and definitions. Quickly place your issue in the context of primary literature and give a clear statement of your hypothesis. Provide description and justification of your approach and hint at why you are appropriate for such research. If available, use a photograph in this section if it can get your viewers oriented on your study question quickly. The introduction and the other poster text should be 18pt; space and a half; never smaller than 14pt;
- **Methods** (ca. 200 words): Briefly describe methods and/or experimental equipment, but not with the detail used for a scientific paper. Use figures and tables to illustrate your approach and flow charts to summarise reaction steps or timing of procedures. Include photograph; mention the methods you use (or will use) and how they allow you to address your hypothesis and research questions.
- **Results** (ca. 200 words excluding figure legends): Briefly describe (expected) qualitative and descriptive results. Then present data analysis that more specifically addresses the hypothesis and refer to supporting charts or images. This section should be the largest section of your poster.
- **Conclusions** (ca. 300 words): Remind the reader of hypothesis and result, and quickly state whether your hypothesis was (how it will be) supported. Discuss why your results are (will be) conclusive and interesting.
- **References** (not more than 5 citations): Use only essential references and follow standard format.
- **Acknowledgements** (ca. 40 words): In this section you can thank for support or funding.
- **Information** (ca. 20 words): Provide a little box with your e-mail and web site address (if possible, a URL where interested viewers can download a PDF version of the poster).

Please use the poster template on the LOICZ website and save it as a PDF-file as following: yourlastname-YLF-1.pdf



<http://www.loicz.org/calender/y1f2011/Application/index.html.en>

## 2) Application Form

Please complete the application form which you will find on the LOICZ website and save it as a PDF-file as following: your-lastname-YLF-2.pdf



<http://www.loicz.org/calender/y1f2011/Application/index.html.en>

## 3) Letter of Recommendation

The reference letter provided by a referee should contain the following components:

- The applicant's full name and affiliation
- The length of time the reference has known the applicant and in what capacity
- How the applicant is exceptional to others with similar backgrounds or in similar positions. Please provide specific examples.
- The applicant's professional qualifications (years of experience, academic credentials, etc.) and competency in his/her profession, with examples of specific accomplishments and achievements.
- The applicant's character traits relevant to the YLF and the OSC themes. Traits worth noting include: ability to communicate (written and verbal), self-reliance, initiative, flexibility, responsibility, energy level, scientific direction, interpersonal skills, teamwork, level of commitment, etc.
- Contact information of the referee (in case of questions regarding the applicant).

The letter of recommendation should be saved as a PDF-file as following: yourlastname-YLF-3.pdf

## Deadline

A complete PDF application package (i.e., all parts 1-3 named as explained above) should be sent by email to YLF2011@gmail.com. Deadline is 1 April, 2011. The selection of participants will be in April 2011; notification of acceptance will be sent to applicants by 1 May, 2011.

## Who are YLF trainers?

Senior scientists with experience in capacity building and youth education will provide special training seminars on soft skills and on coastal issues. So far, the following scientists confirmed their participation:

- Emilie BRÉVIÈRE (IFM-GEOMAR, Germany)
- Tim CARRUTHERS (University of Maryland, USA)
- Ilan CHABAY (Chalmers University of Technology, Sweden)
- Manuel CIRA (World Ocean Network, France)
- Franciscus COLIJN (Helmholtz-Zentrum Geesthacht, Germany)
- Anantha DURAIAPPAH (IHDP, Germany)
- Adriana IGNACIUK (ESSP, France)
- Mark PELLING (King's College London, UK)
- Ramachandran RAMESH (Anna University, India)
- Fabrice RENAUD (UNU-EHS, Germany)
- Joyashree ROY (Jadavpur University, India)
- Juergen WEICHSELGARTNER (Helmholtz-Zentrum Geesthacht, Germany)

## What are YLF training seminars?

The YLF trainer team created well-targeted training units on scientific techniques, soft skills, and understanding of pressures and drivers in coastal areas in order to prepare future decision makers for their professional role in coastal management. So far, the following training seminars are offered:

- The Landscape of International Global Environmental Change Programmes (E. BRÉVIÈRE)
- Turning Science into Action with effective Science Communication (T. CARRUTHERS)
- Professional Science Communication: Engaging, Learning, and Collaborating (I. CHABAY)
- YLF Statement: The Future we Sea (M. CIRA)
- Coastal Challenges: Monitoring Human Impacts on Coastal Zones (F. COLIJN)
- Building Capacity in Human Dimensions Research (A. DURAIAPPAH)
- How to do Integrative Science? Addressing Environmental Challenges (A. IGNACIUK)
- Indicating Adaptive Capacity in Urban Risk Management Systems (M. PELLING)
- Processes, Analysis, and Consequences of Nutrient Over-Enrichment (R. RAMESH)
- Risk and Vulnerability: From Theory to Capturing Key Factors through Questionnaires (F. RENAUD)
- Economic Valuation of Coastal Ecosystems: A Fad or Reality? (J. ROY)
- Why not becoming an Influential Scientist? Scientific Writing and Publishing (J. WEICHSELGARTNER)

More information about the content of the training seminars can be found on the LOICZ website:

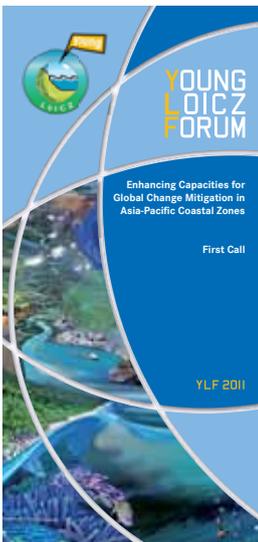


<http://www.loicz.org/calender/ylf20117trainingseminars/index.html.en>

### YLF2011 Contact

Feel free to contact the YLF Team:

E-mail: YLF2011@gmail.com



## Programm News

### International SOLAS Update

The international SOLAS (Surface Ocean - Lower Atmosphere Study) project is an international research initiative comprising of over 1600 scientists in 75 countries. Its primary objective is „to achieve quantitative understanding of the key biogeochemical-physical interactions and feedbacks between the ocean and atmosphere, and of how this coupled system affects and is affected by climate and environmental change.“ The present article reports on currently underway and future activities, for an update on the main SOLAS activities of the past 12 months, please refer to the SOLAS News issues 10 (January 2010) and 11 (September 2010), available at [www.solas-int.org](http://www.solas-int.org).

\* The 5th SOLAS Summer School will take place at the Institut d'Etudes Scientifiques de Cargèse, Corsica, France, 29 August - 10 September 2011. Applications are open and will close on 15 November 2010. Organised by the SOLAS International Project Office and directed by Véronique Garçon, the school will welcome 72 PhD students and early career scientists from around the world and from a wide range of scientific backgrounds, covering all of the SOLAS foci. The summer school will offer, once again, young researchers the opportunity to expand their knowledge of all aspects of SOLAS science and to create and strengthen future collaborations with SOLAS scientists worldwide. The textbook *Surface Ocean- Lower Atmosphere Processes*, based on the lectures from the SOLAS Summer School 2007, will be distributed to the school participants.

\* SOLAS has developed and matured considerably since it was “born” with the publication of its Science Plan and Implementation Strategy in 2004. At the annual scientific steering committee meeting in 2008, the progress and future of SOLAS was reviewed. The committee brainstormed to identify the key, pressing scientific issues and areas where progress can be accelerated significantly with the support of an international programme such as SOLAS. Seven strategic themes were identified for further consideration which are illustrated by the sequence of images displayed in the figure on the following page.



Recognizing that the SOLAS programme had “matured”, this list of topics was referred to as the “SOLAS Mid-Term Strategy” and the name has stuck. Background and progress related to many of these topics can be found on the SOLAS website and in the SOLAS News Issue 11 (summer 2010). Community discussions on these topics took place at the open science conference in Barcelona in November 2009, and additional dialogue is either underway or planned.

The Mid-Term Strategy highlights areas that SOLAS considers are not only important but require a special “push” in order that rapid progress can be made. The overall approach for implementation of the Mid-Term Strategy is to use SOLAS resources to:

- Highlight/advertise/define/refine the topics and their associated scientific questions. White papers were written in the last year and are available on the SOLAS website at [www.solas-int.org/mts](http://www.solas-int.org/mts)
- Identify groups of investigators worldwide that are capable of tackling the topics;
- Motivate these groups to coordinate their proposal writing and link their experimental/modelling activities at the international level
- Plan and conduct the research with a view to facilitating data and idea exchange that will permit an international, comprehensive synthesis. This might include design of common experiments to be conducted in different geographical regions, jointly planned field programmes, student exchanges between groups, intercalibrations and data exchanges, workshops, etc.



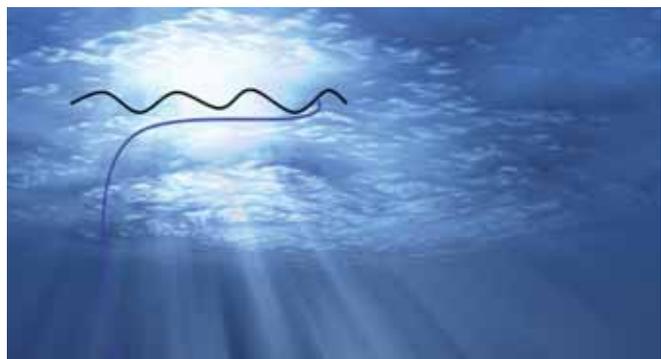
*Sea-ice biogeochemistry and interactions with the atmosphere  
(Photo: SOLAS)*



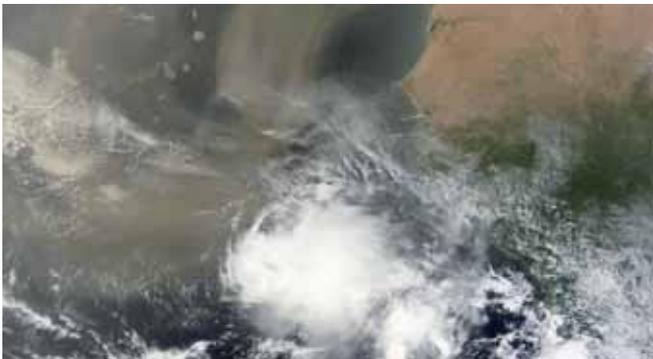
*Ship plumes: impacts on atmospheric chemistry, climate and nutrient supply to the oceans (Photo: SOLAS)*



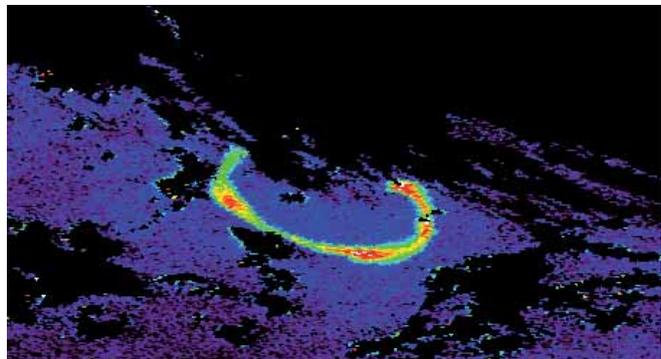
*Ocean-derived aerosols: production, evolution and impacts  
(Photo: SOLAS)*



*Air-sea gas fluxes at Eastern boundary upwelling and Oxygen Minimum Zone (OMZ) systems (Photo: SOLAS)*



*Atmospheric control of nutrient cycling and production in the surface ocean (Photo: SOLAS)*



*SOLAS large-scale field experiments - a compendium of proposals  
(Photo: SOLAS)*

Reference:

Corinne Le Quéré & Eric S. Saltzman (2009):  
Surface Ocean- Lower Atmosphere Processes. Geophysical  
Monograph Series, Volume 187, 350 pp., hardbound, ISBN  
978-0-87590-477-1, AGU Code GM1874771.

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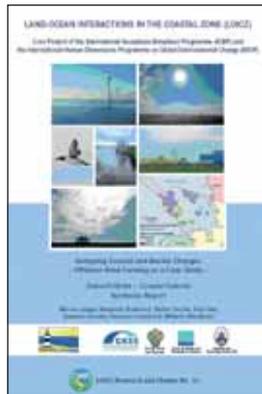
*SOLAS observatory and MOIN: the Minimalist OceanSITES Interdisciplinary Network (Photo: SOLAS)*



## Publications

### LOICZ R&S Report No. 36: Zukunft Küste - Coastal Futures Synthesis Report Analyzing Coastal and Marine Changes: Offshore Wind Farming as a Case Study

Coastal and marine areas experience physical and ecological as well as social and economic change, caused by pressure from climate change and globalization related processes. This change may include changes in species composition, hydrodynamic and morphological patterns, but also new patterns of land and sea use, all together translating into challenges for planning and management.



As a response new forms of coastal (and marine) management approaches like Integrated Coastal Zone Management (ICZM), Ecosystem Based Management (EBM) and Adaptive Management evolved as alternatives or additions to traditional ad hoc and sector-based planning and management. Within this context inter- and transdisciplinary research, which addresses the numerous ecological, perceptual, normative, cultural and economic interactions between society and coastal (eco)systems becomes more and more prominent.

The LOICZ R&S Report No. 36 describes the German research project Zukunft Küste - Coastal Futures (in short: Coastal Futures) as an example of an interdisciplinary research approach. Coastal Futures was LOICZ affiliated project and one out of two research projects funded by the Federal Ministry for Education and Research (BMBF) from 2004 – 2010. In order to accompany the process of developing a national ICZM strategy for Germany the Coastal Futures approach analytically integrates not only results of social and natural science investigations, but also links qualitative empirical research and quantitative modelling. The approach aims to understand the impacts of offshore wind farming as part of a wider systems perspective. It had been designed to gain new insights into the complex social-ecological system of the German North Sea coast by applying a range of tools from natural and social sciences and linking them together as part of a common methodological framework and by focusing on a particular case study.



### “Global Threats to Human Water Security and River Biodiversity”

The DIVERSITAS-freshwater BIODIVERSITY project and the ESSP-Global Water System Project are pleased to announce the publication Vörosmary McIntryre, et al. “Global Threats to Human Water Security and River Biodiversity” in Nature (30th September).



<http://www.nature.com/nature/journal/v467/n7315/full/nature09440.html>

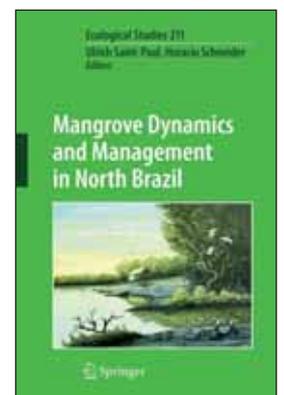
### Mangrove Dynamics and Management in North Brazil

Mangrove ecosystems are being increasingly threatened by human activities. Their biotic productivity supplies food and other resources to the human populations that inhabit or make use of them. This volume highlights the results of a ten-year German/Brazilian research project, called MADAM, in one of the largest continuous mangrove areas of the world, located in northern Brazil. Based on the analysis of the ecosystem dynamics, management strategies for the conservation and sustainable use of mangroves are presented and discussed. Beyond the scientific results, this book also provides guidelines for the development of international cooperation projects.

2010. XVIII, 400 p.  
(Ecological Studies, Vol. 211)  
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## Ocean Yearbook Call For Papers – Volume 26

For over 20 years under the senior editorship of the late Elisabeth Mann Borgese, the Ocean Yearbook has published leading edge articles, reports and reference materials devoted to the issues and concerns affecting the world's oceans. Marine biologists, oceanographers, and specialists in foreign policy, ocean development, coastal zone management, international law, and strategic studies around the world have found the Ocean Yearbook an invaluable tool for research on this vital global resource. Editorship of the Ocean Yearbook is a cooperative effort of the International Ocean Institute and the Marine & Environmental Law Institute at Dalhousie Law School. Published previously by the University of Chicago Press, the Ocean Yearbook is published by Martinus Nijhoff, an imprint of Brill.

The Ocean Yearbook co-editors invite submissions for Volume 26, to be published by Brill/Martinus Nijhoff. Articles on issues and prospects, ocean governance, living resources of the ocean, non-living ocean resources, transportation and communications, environment and coastal management, maritime security, military activities, regional developments, training and education, and ocean polar issues will be considered.

Details online:



[http://law.dal.ca/Files/MEL\\_Institute/OYB/OYB\\_2010/OYB\\_Call\\_For\\_Papers\\_Volume\\_26-2011.pdf](http://law.dal.ca/Files/MEL_Institute/OYB/OYB_2010/OYB_Call_For_Papers_Volume_26-2011.pdf)

The Ocean Yearbook has initiated an annual competition for students writing research papers on marine affairs subjects. Details online:



[http://law.dal.ca/Files/MEL\\_Institute/OYB/OYB\\_2010/Student\\_Prize\\_2011.pdf](http://law.dal.ca/Files/MEL_Institute/OYB/OYB_2010/Student_Prize_2011.pdf)

To order the Ocean Yearbook, see Brill online:



<http://www.brill.nl/default.aspx?partid=227&pid=28158>

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## Have you seen?

**START**, the global change **SysTem** for **A**nalysis, **R**esearch and **T**raining is pleased to announce the Call for Proposals (CFP) for the **2011 START Grant Awards for Global Environmental Change Research in Africa**.

The Grant Awards will be offered to African scientists to support collaborative research with other African scientists and/or with scientists in other areas of the world. Successful proposals will be selected through a peer review process.

Application materials and instructions for submission of proposals can be found at the START website at: <http://start.org/programs/africangec/2011-call-for-proposals-start-grants-gec-research-africa>.

Proposals are due on 6 December, 2010.

### Arctic Report Card: Update for 2010

Return to previous Arctic conditions is unlikely. Record temperatures across Canadian Arctic and Greenland, a reduced summer sea ice cover, record snow cover decreases and links to some Northern Hemisphere weather support this conclusion.

Of particular interest this year is the short video.

Highlights are:

- Four years of record minimum sea ice extents
- Record temperatures and ice loss in Greenland
- Strong links between the Arctic and mid-latitude weather in winter 2009-2010



Read more: <http://www.arctic.noaa.gov/reportcard/>

### Geoscience World Congress

Geoscience World Congress will be held at the Brisbane Convention and Exhibition Centre, 5-10 August 2012. The scientific programme will cover all aspects of the geosciences. It will demonstrate how geoscience knowledge and applications are contributing directly to meeting societal needs, for example through innovation in the resources and energy based industries, better informed land and water management, enhanced understanding and mitigation of climate change and geohazards, and building major cities and infrastructure.

The 34th IGC will incorporate the 2012 meetings of IUGS' Commissions, Task Groups and Joint Programs, as well as the 2nd Young Earth-Scientists (YES) Congress.

### Planet Under Pressure: new knowledge towards solutions

The International Council for Science's global-change programmes (DIVERSITAS, IGBP, IHDP, WCRP) will hold a major international science conference in London in 2012 in advance of the Earth Summit, aiming to attract 2500 scientists. A meeting clash has forced a change in the dates announced originally. Below are new proposed dates for the conference, entitled **Planet Under Pressure: new knowledge towards solutions**.



**26-29 March 2012 (New DATE !!!)**



[www.planetunderpressure2012.net](http://www.planetunderpressure2012.net)

## XVIII. INQUA-Congress

### Sea-level jumps: evidence from Quaternary proxy records

Conveners: Roland Gehrels (University of Plymouth, UK),  
Antony Long (Durham University, UK)

Abstracts due 30 November

The latest IPCC report and subsequent debate have shown that future sea-level predictions based on computer models have inherent problems. The largest uncertainty is arguably posed by the dynamical instabilities of ice sheets, i.e. processes such as ice-sheet bed lubrication, ice-stream flow and ice-shelf calving that are notoriously difficult to model realistically. In recent years, therefore, several new (semi-)empirical approaches to future sea-level predictions have been suggested, including those based on extrapolating into the future relationships between temperature and rates of sea-level rise from either historical or palaeo-records. These novel ways of predicting future sea-level change have re-invigorated the significance of palaeo-sea level studies and highlight important lessons that can be learnt from the Quaternary record of sea-level change. Quantification of the magnitude, timing, origin and driving mechanisms responsible for periods of rapid sea-level change poses significant challenges for palaeo- and modelling communities. This session addresses these challenges by bringing together scientists working on different aspects of rapid sea-level change, including palaeo- and historic records as well as ocean-atmosphere and ice sheet modelling.

This session will focus on episodes of rapid sea-level rise from Quaternary proxy records on several timescales. In particular we invite papers on: (1) rapid sea-level rise during previous interglacials; (2) deglacial meltwater events; (3) evidence for Holocene sea-level fluctuations and their mechanisms; (4) historical sea-level accelerations; and (5) modelling abrupt sea-level change.

Speakers are encouraged to explore how their findings can increase our understanding of the driving mechanisms of sea-level change and how rates of sea-level rise revealed by palaeorecords can constrain predictions of future sea-level change.

Keynote papers will be presented by Edouard Bard (Université Paul-Cézanne Aix-Marseille; CNRS, France) and Mark Siddall (University of Bristol, UK)

Session supported by IGCP-588, PAGES (PALSEA), INQUA CMP

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### INQUA CONGRESS SESSION - Late Quaternary records of coastal evolution (in association with INQUA1001 "Impacts of sea level change and extreme marine inundation on coastal environments")

Abstracts due 30 November

This session invites contributions investigating driving mechanism behind coastal change over a range of spatial (global to local) and temporal (millennia to years) scales. This includes changes in sea level, sediment supply and accommodation space, environmental conditions and human interaction with coastal environments. This session will also examine how these driving mechanisms influence coastal landscape and ecological change. Determining impacts of the driving mechanisms behind coastal change is vital in understanding how coastal systems operate today and the potential impacts of environmental change in the future. Accordingly this session will have a wide interest to the Quaternary, Earth Science, and marine scientists. Its strong applied component will be directly relevant to coastal managers concerned with coastal forecasting and future sea-level change as well as those investigating human adaption to sea level and coastal landscape change.

Conveners: Craig Sloss, Yongqiang Zong



<http://www.inqua2011.ch>



## Calendar

### 2010

#### IGCP 588/INQUA Conference:

Preparing for Coastal Change  
30 November – 4 December, 2010, Hong Kong, China  
<http://www.hku.hk/science/igcp588/>

#### 5. International Nitrogen Conference:

Reactive Nitrogen Management for Sustainable Development  
3–7 December, 2010, New Delhi, India  
[www.n2010.org](http://www.n2010.org) and [www.initrogen.org](http://www.initrogen.org)

#### Symposium: The Wadden Sea Region:

Towards a Trilateral Research Agenda  
8–10 December, 2010, Leeuwarden, Netherlands  
[www.waddenacademie.knaw.nl](http://www.waddenacademie.knaw.nl)

### 2011

#### AGU Chapman Conference on Source to Sink Systems Around the World and Through Time

Recent Advances in Understanding Production, Transfer, and Burial of Terrestrial and Marine Materials on the Earth Surface. Oxnard, California, USA, 24–27 January, 2011  
<http://www.agu.org/meetings/chapman/2011/acall/>

#### ASLO 2011 Aquatic Science Meeting

13–18 February, 2011, San Juan, Puerto Rico  
<http://www.aslo.org/meetings/sanjuan2011/>

#### Resilience 2011

Arizona State University will host Resilience 2011, an international conference on the dynamics of interconnected social-ecological systems, 11–16 March, 2011. The conference will bring together scientists from a broad spectrum of disciplinary backgrounds interested in the major science and policy challenges that face us all as a result of global change. Resilience 2011 is organised around intellectual themes that aim to integrate knowledge from multiple perspectives.  
<http://www.resilience2011.org/>

#### Arctic Science Summit Week (ASSW) 2011

which will be held in Seoul (Korea) on 27 March – 1 April, 2011.  
<http://www.assw2011.org/>

#### European Geosciences Union General Assembly

3–8 April, 2011, Vienna, Austria  
<http://meetingorganiser.copernicus.org/EGU2011/provisionalprogramme>

#### 7. International Symposium:

Coastal Engineering and Science of Coastal Sediment Processes  
2–6 May, 2011, Miami, USA  
<http://coastalsediments.cas.usf.edu>

#### International Symposium:

Integrated Coastal Zone Management  
3–7 July, 2011, Arendal, Norway  
<http://www.imr.no/iczm>

#### XVIII. INQUA

(International Union for Quaternary Research) Congress,  
20–27 July, 2011, Bern, Switzerland

Once every four years Quaternarists from all over the world meet at the INQUA Congress to exchange on latest research results and develop agendas for the years to come. In 2011, the Congress will be held in Switzerland's capital city, Bern.  
<http://www.inqua2011.ch/>

#### The 7th IAHR Symposia on River, Coastal and Estuarine Morphodynamics

Tsinghua University, Beijing, China, 6–8 September, 2011.  
<http://sklhse.tsinghua.edu.cn/rcem2011/rcem2011.html>

#### LOICZ Open Science Conference 2011

Coastal Systems, Global Change and Sustainability  
12–15 September, 2011, Yantai, China  
<http://www.loicz-osc2011.org>

### 2012

#### 34th International Geological Congress (IGC): AUSTRALIA 2012.

Brisbane Convention and Exhibition Centre, 5–10 August, 2012  
First Circular for the 34th IGC  
<https://mymail.ezemsgs.com/download/files/08781/1261286/34th%20IGC%20First%20Circular.pdf>

#### Planet Under Pressure: new knowledge towards solutions

26–29 March, 2012, London  
[www.planetunderpressure2012.net](http://www.planetunderpressure2012.net)

#### IPY Conference:

From Knowledge to Action  
22–27 April, 2012, Montreal, Canada



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