



Land-Ocean Interactions in the Coastal Zone



INPRINT

Key topics identified for implementation of LOICZ future research – The broad scientific frame given by the LOICZ Science Plan articulates the breadth and diversity of issues and problems that exist in the coastal zone for which society looks to science to provide solutions. LOICZ has identified 5 scientific themes that represent a continuum of science research that is needed to address these issues/problems. To help facilitate the implementation of LOICZ, the project has focused on some key topics to which all of the themes outlined in the science plan are pertinent. Read all about it on page 15.



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LOICZ IPO at Institute for Coastal Research, GKSS Research Centre

Since the beginning of this year, the LOICZ IPO is housed in the Institute for Coastal Research at GKSS, Geesthacht, Germany. To give you an impression of our new hosting institute the following information will give a brief introduction on the Institute for Coastal Research, the departments within the institute and the research that is carried out by the several research groups. For more detailed information please also visit www.gkss.de.

Knowledge and understanding – the Institute for Coastal Research

Coastal systems are under constant pressure from short and long term natural influences, including erosion or sea level rise due to climate change, and from human endeavours, for example, transportation, land use patterns, tourism, etc. As a means to identify the potential for change, sustainability, and adaptation coastal research provides the tools, assessments and scenarios for managing this vulnerable landscape.

The Institute for Coastal Research (IfK) was formed in 2001. It is divided into two sections, "System Analysis and Modeling" (KS) and "Development of Operational Systems" (KO). Research activities span both the natural and human dimensions of coastal dynamics, analysing the coastal system in global and regional contexts, conducting assessments of the state and sensitivity of the coastal system to natural and human influences and developing scenarios of future coastal options.

At the GKSS Research Centre in Geesthacht near Hamburg, 150 employees of the Institute for Coastal Research (IfK) investigate the scientific foundations of sustainable coastal management.



The GKSS research vessel Ludwig Prandtl was designed specifically for use in shallow coastal waters.

This work is part of the MARCOPOLI Research Programme, which is being implemented under the auspices of the "Earth and Environment" research field of the Helmholtz Association. Here, GKSS is working closely on coastal issues with the Alfred Wegener Institute (AWI). We enter into such partnerships with other research centres to improve our understanding of the earth system. The IfK focuses on the vulnerability of coastal environments within the context of global change. Key issues in the IfK's investigation include the following:

- How does global change affect coastal regions?
- What is the present state of the coast and how is it changing?
- How can we monitor reliably and cost-effectively the state of the coast and control coastal processes?

Answers to these questions should create a scientific basis to assess observed environmental changes with respect to their future consequences, and to identify an intelligent and sustainable usage of ecosystems by humans.

On the national level the IfK belongs to the German Marine Research Consortium (KDM). On the international level it participates in the Land-Ocean Interactions in the Coastal Zone (LOICZ) project.

The research

The move of the LOICZ IPO to GKSS provides opportunity for close collaboration between LOICZ and researchers of the Coastal Institute who are engaged in a wide range of projects many of which share much in common with the questions and science direction articulated in the LOICZ Science Plan. The following series of articles serve to illustrate the range of current science activity engaged by the scientists of the GKSS Coastal Institute.

The series of articles starts with an article that reflects on the background of modelling in the context of mechanisms for coastal management. This is followed by a series of articles that look at programmes within the Coastal Institute with a focus on measuring and observation of coastal parameters. Work is on-going looking at tools for continual coastal and shelf observation and monitoring including, remote sensing, surface/atmosphere interactions; pollution; bio-toxins in the context of global change and health.

As well as being relevant for LOICZ science, many of these research programmes are also relevant and contribute to the wider ESSP science such as ecosystem, society and health.



Social Science and Coastal Management, Mechanisms and Models

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The EU defines integrated coastal zone management as "... a continuous process with the general aim of implementing sustainable development in coastal zones and maintaining their diversity. To this end, it aims, by more efficient management, to establish and maintain optimum (sustainable) levels of use, development and activity in coastal zones, and eventually to improve the state of the coastal environment."

(http://europa.eu.int/comm/environment/iczm/pdf/themf_ex.pdf)

Among the problems facing coastal zones, the EU Communication (COM(95)511) lists the following:

„demographic pressure, reduction of biodiversity, pollution of water resources, the impoverishment of the landscape, competition for space and resources, and the complexity of relationships between human activities and the coastal environment."

The Communication (COM(95)511) suggests addressing these problems in two ways:

"providing concrete technical information about factors and mechanisms which either encourage or discourage sustainable management of coastal zones [...] evaluated in a wide range of physical, cultural and socio-economic conditions."

This short discussion addresses Integrated Coastal Zone Management (hereafter ICZMan), Integrated Coastal Zone Mechanisms (hereafter ICZMech) and Integrated Coastal Zone Models (hereafter ICZMod). It proposes that ICZMan is an inappropriate conceptual reference for the undertaking of scientific activities. Definition of management include management as a verb, which refers to the act of administration or controlling, or the application of skills in the manipulation, use or control of things or persons; and as

a noun, the collective body of those who manage or direct, those skills necessary for "stimulating broad debate". Management and control are not within the typical scope of science. The focus of science should emphasize the study of ICZMech and the subsequent development of ICZMod, to be presented as ICZMan tools.

As an analytical concept "the coast" can be defined according to its specific properties: geo-physical specificity; ecological specificity; existing and potential resources; and the interaction of these with humans, in the forms of dwellers, visitors and users. These could be referred to as analytical coastal segments. The human segment, for the purpose of disciplinary based analysis, can be further divided into the sub-segments of economy and society. The interaction amongst and between all segments constitute mechanisms.

Most coastal research has tended to focus on biological and physical systems in isolation from human influence, or has considered humans and their activities as external perturbations to the functioning of bio-physical systems. Most social science research on coastal systems has focused on social, economic and political systems in isolation from the bio-physical context or, at best, considered the coastal environment as a mere background for the functioning of the social system.

Furthermore, coastal research, be it descriptive or statistical, often only demonstrates that a relationship is likely to exist, but provide no clue as to why this is likely to be the case indicating a failure to stipulate the mechanisms linking the explanans and the explanandum (The explanandum is the event or phenomenon or thing which is supposed to be explained. The explanans is the series

of statements which is supposed to do the actual explaining). The mechanism must be specified so as to provide an acceptable explanation if we wish to understand why we observe what we observe. What the social sciences should be able to contribute to coastal analysis is a sys-

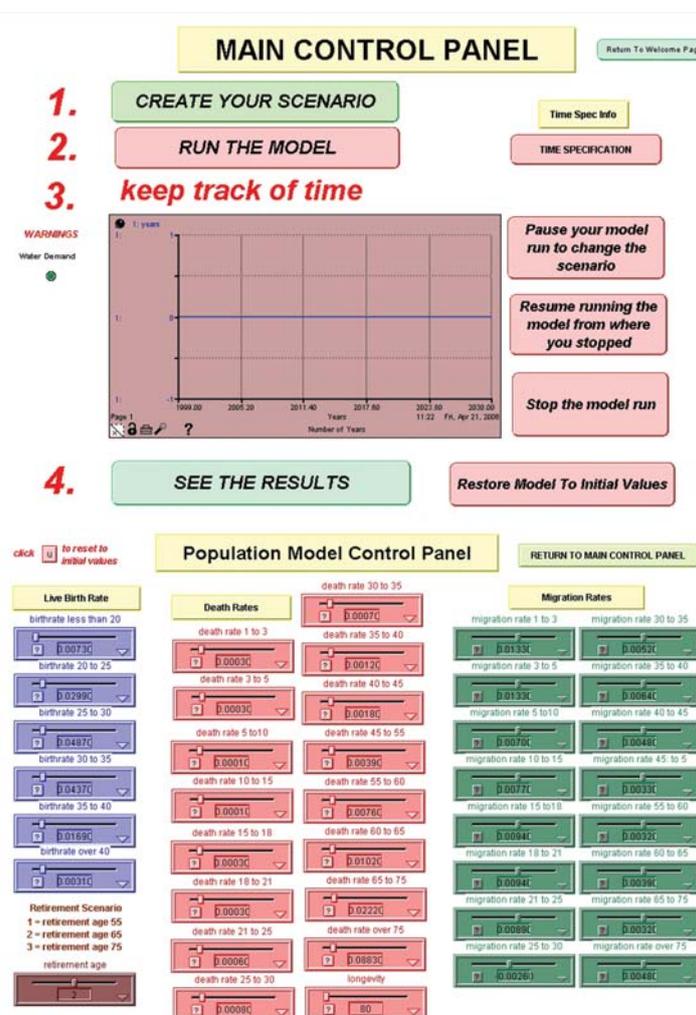


Figure 1: Example of Decision Maker Model Interface.

tematic explanation of the social mechanisms that generate and explain observed associations between humans and the coast.

What have most often been offered are conceptual or sensitizing schemes that lack in explanation and explanatory theory. To rectify this tendency and to provide a useful social science contribution to our understanding of human interaction with coastal regions it would be beneficial to turn investigation towards an analysis of mechanisms, not suggesting a mere description that accounts for a chain of events leading from one situation to another, but rather that there is an ensemble of mechanisms that are time and context specific.

Bunge (1967) provides a simple schematic that demonstrates mechanisms. Observations are made of a systematic, non-random relationship between two events, 1 and 0. The link between the two events is expressed as a mechanism M.

$$1 \rightarrow M \rightarrow 0$$

This explanation is characterized by the link between input and output. This is often precisely the missing link in coastal research. According to Hedström and Swedberg (1998) typically, M is assumed to be devoid of structure, or the structure is assumed to be of no inherent interest, possibly because it cannot be easily observed, measured or calculated, or perhaps because 0 can be predicted without consideration for M. Yet, it is precisely at M where management takes place. Typically, M is a human component, i.e. subsidies, prohibitions, market, etc. In the tradition of statistical causal modelling, M, the explanatory mechanism, is simply a statistical coefficient linking 1 and 0, and this coefficient is supposed to describe the causal influence.

Management to bring about change, however, is about the actions and behaviours of people, not coefficients. Management needs to address a deeper problem: how (i.e. through what process) was this brought about and through what process could it be changed? It is necessary not only to describe the magnitude of occurrence but also to explain why this is likely to occur. A satisfactory explanation requires that those things that brought the relationship into existence be specified. Oddly enough, this is the component often missing in the natural science of coastal-environmental issues, while the social science contributions have been devoid of input and output, resulting in an inexplicit discursive analysis of process. Essentially then, a mechanism is part of an answer to a question about why something occurs, the equivalent of the mathematical operations of the function transforming variables, distinguished on the basis of functional form and parameter values.

After identifying the mechanisms, for the purpose of management use, it is applicable to present them in a

user friendly interactive model format, the ICZMod (see Figure 1). Models, for ICZMan should be constructed so as to be modular in design allowing for modification as new knowledge become available or new interests become the focus. The philosophy behind such a model is to construct a tool that is easily useable by decision makers and to provide an easy assessment of the results of the decisions they might make, advancing an integrated understanding of the coastal segments, and the spatial, temporal and decision making components of coastal change.

References

- Bunge, M. 1967. Scientific Research. Vol. 3 in Studies of the Foundations, Methodology and Philosophy of Science. Berlin: Springer Verlag.
- European Union. EU Communication (COM(95)511)
- Hedström, Peter and Peter Swedberg (eds.) 1998. Social Mechanisms: An Analytical Approach to Social Theory (Studies in Rationality and Social Change). Cambridge University Press.

Remote Sensing of Coastal Waters and tidal flats

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Monitoring of coastal zones has become an important task for environmental science and coastal zone management. Due to the high temporal and spatial variability, and limited available resources, scientists and administrators are looking for remote sensing techniques to both reduce effort and increase information flow. However, the development of optical remote sensing techniques for coastal waters such as those of the southern shallow part of the North Sea is a big challenge. Due to its complex composition of substances with different optical properties special algorithms are required not only for the retrieval of their concentrations but also for correction of the influence of the atmosphere.

The optical remote sensing laboratory at the GKSS Institute for Coastal Research is working on this problem, principally in conjunction with the Medium Resolution Imaging Spectrometer MERIS operated on board the earth observing satellite ENVISAT of the European Space Agency ESA, and for which our group is part of the Expert Support Laboratory and the validation team.

MERIS is a unique instrument that was developed to meet not only the requirements for blue water remote sensing but also for those of turbid coastal waters. With a spatial resolution of 300 meters, a revisit period of 2–3 days and its 15 narrow spectral bands with a high radiometric performance it fulfills the needs for coastal water remote sensing.

The development of proper retrieval algorithms requires expertise from various disciplines, so our group of 10–14 people includes physicists, geophysicists, biologists, geographer and instrumental and chemical engineers.

Over the past years we have been working on measuring the inherent optical properties, i. e. the absorption and scattering spectra of various substances, on modeling radiative transport in the water, at the surface and in the atmosphere, and on solving the inverse problem, i.e. to derive the concentrations of different substances from the reflectance spectrum as measured by the remote sensor. The derived algorithms have been implemented in the MERIS data processor at ESA.



Figure 1: A cast is being prepared to take water samples and to make measurements of optical properties of phytoplankton and suspended matter in the North Sea.

For measuring optical properties of the atmosphere we have set up an automatic sun photometer station on the island of Helgoland. It is part of the worldwide AERONET (Aerosol Robotic Network), which is coordinated by NASA. The data of this instrument are the basis for setting up a proper atmospheric correction procedure. Other optical instruments are used in water from a research vessel, such as a profiler for measuring vertical transects of downwelling irradiance and upwelling radiance spectra. Another set of spectrometers is used for determining water leaving (backscattered sunlight) radiance reflectance spectra, and in situ instruments are integrated into a water sampling frame to measure the absorption and backscattering properties of different water constituents. Along with these optical measurements, we run a chemical laboratory to analyze the phytoplankton pigments and the concentration and composition of suspended particles, as well as the absorption spectra of humic organic compounds.

All these data are used primarily for setting up bio-optical models, which describe the relationship between water constituents and the absorption and scattering of light, and to validate remote sensing data. These models are then used in radiative transfer calculations to simulate

what the remote sensor sees: the light spectrum reflected from the coastal sea. These simulations in turn are computed to train an artificial neural network that is used to solve the inverse problem, i.e. to determine the concentrations or optical properties from the reflectance spectrum.

One important issue is that the reliability of remote sensing data of coastal waters is not constant over the scanned area, but may vary from pixel to pixel. However, information about the error or confidence range is not properly communicated to the user of remotely sensed data. Presently only a system of different flags indicates when data are suspicious and should be treated with caution for various reasons. For the future we will try to improve this kind of information by providing confidence maps along with the product so that the user can better decide when he can accept the data with a certain error for his application.

One major application, besides monitoring water quality variables, is the determination of primary production in coastal waters. In turbid areas, available light is often the main limitation for primary production by phytoplankton. Since the turbidity is mainly controlled by the distribution of suspended matter, remote sensing can provide some key information to determine primary production in such areas. For this purpose we have developed a model that integrates remotely sensed fields of light attenuation of phytoplankton concentration, water temperature and water depth together with measured P-I curves to map the distribution of daily water column production.

Another important task of our group is the development and application of monitoring techniques for tidal flats. With an area of more than 10 000 km² the Wadden Sea with its tidal flats is a unique ecosystem, which has been protected in form of a National Park. It is the birthplace for many marine organisms and a key refuge for millions of migrating birds. During the past years we have been mainly engaged in establishing a map of the sensitivity of the German Wadden Sea against oil pollution. The German coastguard requires preparation of such a map for protection measures in case of a ship accident. By combining remote sensing and extensive ground work, a system of new GIS maps have been created showing the sensitivity distribution as derived from some twenty variables per point for different seasons.

New technologies for tidal flat monitoring were also developed in the EU funded project HIMOM. With partners from the Netherlands, UK, Ireland and Portugal, a hierarchy of methods were compiled and tested. All techniques are documented in protocols together with tutorials and the results of case studies along with an atlas showing the properties of different tidal flat areas in Europe.

One technical result was a video based multispectral camera system (MUVI Multispectral Video Imager), which is operated from light aircrafts such as a Cessna 172. Based on measurements of reflectance spectra of different tidal flat objects such as sandy and muddy sediments, sea grass and benthic diatoms, the cameras were equipped with different interference filters to match the spectral properties of these targets. The advantage of such a system is that it can be prepared and operated on short notice whenever low tide and weather conditions permit a flight. Good results can be achieved also when flying under a homogeneous cloud cover.



Figure 2: Distribution of macro alga (in red) in a tidal flat area derived from the MUVI (airborne MUlti spectral Video Imager).

For the future, remote sensing has to be combined with other observational techniques and models to utilize the synergy of different methods. One example is to combine with the FerryBox System that provides detailed information along a transect with a high temporal resolution of variables which cannot be monitored using remote sensing.

Monitoring of Coastal and Shelf Sea Ecosystems by in-situ FerryBox Observations

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Monitoring of highly dynamic systems such as coastal waters requires dense sampling in space and time in order to catch short-term events which might have a strong impact on the coastal ecosystem, such as exceptional phytoplankton blooms or changes caused by storms.

Existing observations mostly lack the spatial coverage and temporal resolution required to determine the state of the marine environment and changes therein. The lack of monitoring systems that provide continuous observations of the marine environment in the coastal areas and shelf seas of Europe is a serious hindrance to understand these systems.

In the "FerryBox-Project" supported by the European Union and coordinated by GKSS eleven groups worked together in order to enhance the use of Ships of Opportunity (SoO) for operational monitoring of the marine environment (Petersen et al., 2006a). SoO on regular routes offer a cheap and reliable measuring platform to obtain continuous and spatial high resolution observations of near surface water parameters. Such systems are able to measure a whole set of oceanographic and biological parameter. The principal design of the FerryBox developed by GKSS and now also commercially available by a German company (4H-Jena) is shown in Figure 1.

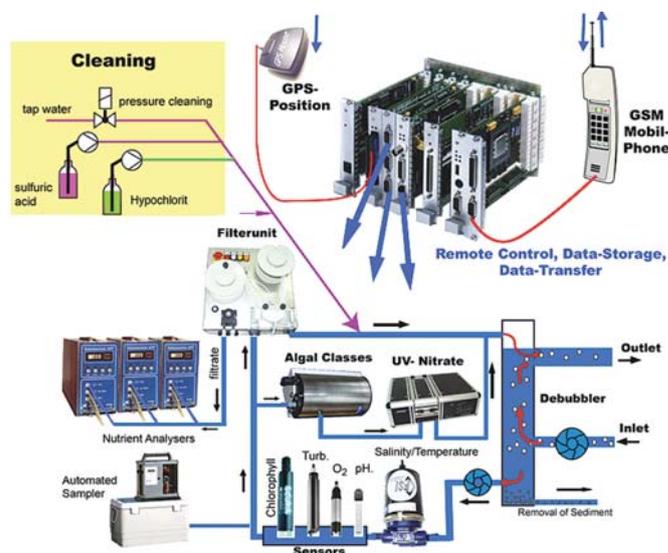


Figure 1: Schematically view of the FerryBox flow-through system.

The FerryBox continuously measures oceanographic parameters (temperature, salinity, turbidity) as well as bio-chemical variables such as chlorophyll-a fluorescence, nutrient and oxygen and pH. The main features of the system are the modular concept which is easily expandable for other sensors, the debubbling device for removal of air-bubbles and its self-cleaning feature. The latter ensures long-term stability and accuracy of the system by preventing biofouling. Controlled by GPS position the FerryBox automatically stops before reaching the harbour and the flow-through system will be flushed with acidified tap-water in order to clean the tubes and probes.

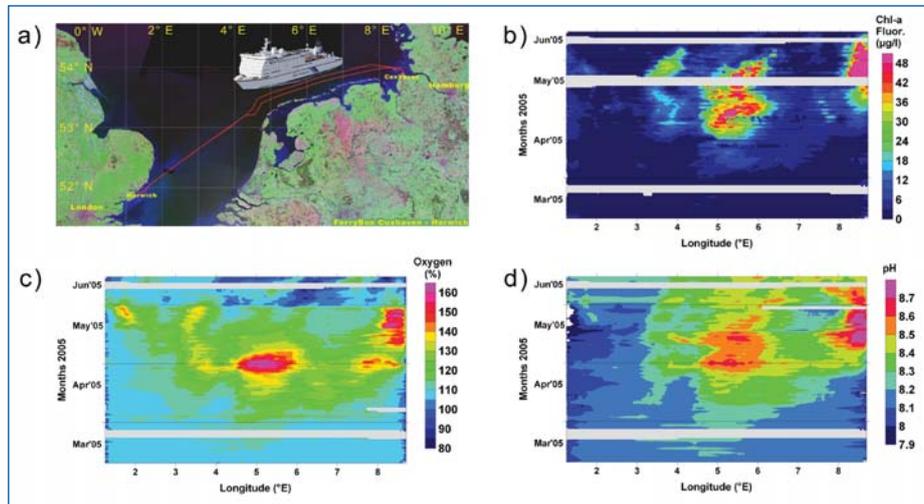
As an example of the results of the FerryBox measurements along one transect the development of the algal bloom in spring 2005 detected by chlorophyll-a fluorescence, oxygen and pH of the FerryBox is shown (Figure 2).



A weak spring bloom started in late March off the Dutch coast (4.5–6.2 °E). The bloom in the water mass reaching the ferry transect from the English Channel between 3.2°E and 4.2°E initiated at mid of April and lasted until June with a drift to the Dutch coast.

Figure 2:

- a) Route of the FerryBox in the Southern North Sea; Contour plots along the transect from March to June 2005,
- b) in-vivo chlorophyll-a fluorescence,
- c) oxygen saturation,
- d) pH.



A second bloom appeared later in water masses that reached the ferry transect from the English Channel between 3.2°E and 4.2°E. It started in mid-April and continued until June with a drift to the Dutch coast. Both blooms disappeared at the end of May and at the beginning of June 2005, respectively. A further intensive bloom was observed in the German Bight off the Elbe estuary starting in May and disappearing mid-June 2005. This bloom was characterised by very high chlorophyll concentrations. In Figure 2c the dynamics of the oxygen saturation values along the transect are shown. The major patterns of chlorophyll fluorescence correspond well with the oxygen dynamics. However, at certain times and on certain parts of the transect high oxygen saturation can be seen without corresponding high chlorophyll values. In particular, this was the case at the German coast near the Elbe estuary (7.5°E–8.4°E) at the end of April until beginning of May and near the English coast between 1°E and 2°E at the end of May. Most likely, these findings are caused by primary production from algae below the water intake of the ferry and diffusion of the produced oxygen towards the surface. At the beginning of June the algal break down was accompanied by oxygen depletion with saturation values of only 80 % along the eastern Dutch

coast (between 5.5°E and 6.5 °E).

Consistent with the algal blooms are the observed pH data along the transect as shown in Figure 2d. The pH increases significantly along the Dutch coast during the plankton bloom in May and pH values up to 8.8 have

been found along the German coast in water masses influenced by the Elbe estuary (8–8.7 °E).

The restriction of FerryBox data to the transect can be overcome for those variables which can also be observed by satellites (e.g. temperature, chlorophyll, tur-

bidity, yellow substances). Thus, the spatial distribution of the blooms at the locations observed by the FerryBox in 2005 can be extracted from remote sensing images and compared to the data of the FerryBox (Petersen et al., 2006b).

Figure 3 shows the distribution of derived chlorophyll-a concentrations by MERIS on 11th of April and on 28th of May. In addition to each image the comparison of the MERIS chlorophyll-a concentrations along the track of the ferry with the FerryBox chlorophyll-a fluorescence are shown. The FerryBox positions were drift corrected for

the time the satellite passed the North Sea by a numerical hydrodynamic model (BSH).

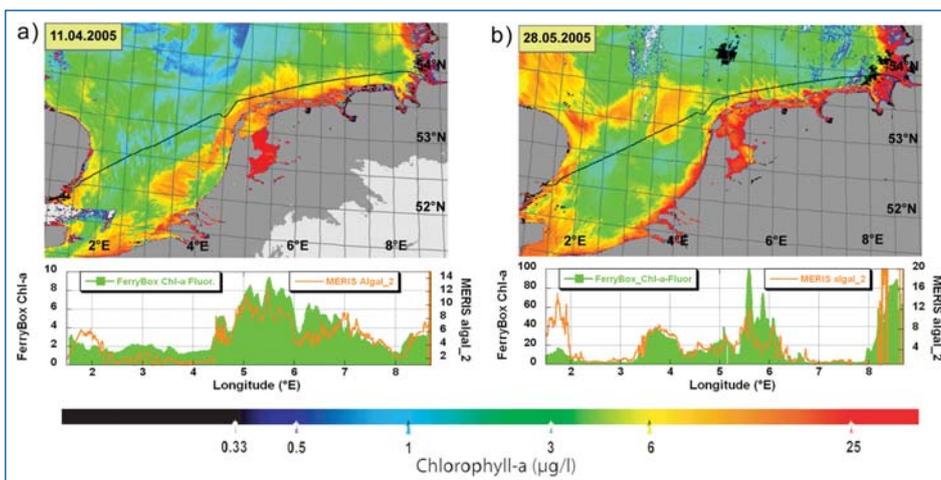


Figure 3:

Calibrated infrared surface temperature. Photo taken from the Tornado aircraft over a small part of the LITFASS area on June 17, 2003. (Picture by J. Bange, TU Braunschweig)

In general the comparisons showed a good agreement of main features between remote sensed data and FerryBox measurements. Some drawbacks are visible. For instance, at higher turbidities (English coast and Elbe Estuary) the estimated chlorophyll concentrations from the satellite image are too high. The algorithms used to

produce the remote sensed standard coastal data are not yet tuned to their optimum and the quality flags of the satellite images (e.g. disturbances by glint etc.) were not obeyed.

The results obtained in this investigation show that the combination of FerryBox data along a transect with satellite observations increases the information value compared with the use of either of the two individual information sources. By using FerryBox systems on more lines crossing the area of interest on different tracks the information density about the water quality could be significantly improved. In addition, by including the information about many other water quality parameters measured by the FerryBox (e.g. nutrients etc.) a much deeper insight in the processes controlling the water quality of coastal waters can be obtained.

Since both methods used in this investigation are restricted to the water surface conventional monitoring methods by buoys and research vessels are still necessary at strategic locations. This will be necessary, for instance, to get information about change of water constituents within the depth profile.

References

Petersen, W.; Colijn, F.; Dunning, J.; Hydes, D. J.; Kaitala, S.; Kontoyiannis, H.; Lavin, A. M.; Lips, I.; Howarth, M.J.; Ridderinkhof, H.; Pfeiffer, K.; Sørensen, K. (2006a): European FerryBox Project: From Online Oceanographic Measurements to Environmental Information. Proceedings Forth International Conference on EuroGOOS, Elsevier Oceanography Publication series, Amsterdam, Netherlands, in press

Petersen, W.; Wehde, H.; Krasemann, H.; Colijn, F.; Schroeder, F. (2006b): FerryBox and MERIS – Assessment of Coastal and Shelf Sea Ecosystems by Combining In-situ and Remote Sensed Data. Submitted to Estuarine Coastal and Shelf Science.

Current Research in the Department of Hydrometeorology

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Coastal areas represent a significant change in surface conditions. The representation of surface-atmosphere exchange processes in weather forecast and climate models influences the simulation of mesoscale coastal circulations. The investigation of turbulent exchange processes at the land surface through field experiments and numerical studies is a major focus of the department.

The determination of the area-averaged evaporation and

sensible heat flux over a heterogeneous land surface is a major issue of the Evaporation at Grid and Pixel Scale project EVA-GRIPS. EVA-GRIPS is funded under cluster 3 "Regional Process Studies in the Baltic Sea Area (BALTEX)" of the current Climate Research Programme (DEKLIM) of the German Federal Ministry of Education and Research. The spatial scale considered in EVA-GRIPS corresponds to the grid scale of a regional atmospheric NWP or climate model (here in particular the "Lokal-Modell", LM, of the Deutscher Wetterdienst, DWD, and the model REMO of the BALTIMOS group), but also to the pixel scale of currently available satellite images. Through a combination of near-surface and boundary layer observations, the analysis of satellite data and numerical simulations EVA-GRIPS aims at testing and implementing concepts for the description of area-averaged turbulent fluxes into land surface schemes namely TERRA (Majewski, 1991) and TOPLATS (Beven and Kirkby, 1979) as part of LM, SEWAB (Mengelkamp et al., 1999) as part of an hydrological model and the land surface scheme of REMO.

Experiment and modelling activities focus on an area of roughly 20 x 20 km² around the Meteorological Observatory Lindenberg (MOL) of DWD. The continuous measurement program of the MOL – a CEOP reference site (Beyrich, 2003) – formed the basis for a major field experiment (the LITFASS-2003 experiment) in May and June, 2003.



Figure 1:

Aerial view of the experimental site and LM grid boxes.

(Photo taken from CD "Deutschland aus dem All" 1997, Herold Business Data AG)

Eddy correlation instruments were placed at 13 sites over different land use types and vertical profiles in the boundary layer were sampled by lidar and radar. A set of scintillometers, a helicopter borne turbulence probe Helipod (Bange et al., 1999) and an infrared camera for surface photography on board a Tornado aircraft as well as satellite images completed the set of instruments. The spatial sampling and footprint scales of this suite of measurement systems covered five orders of magnitude (10^{-1} .. 10^4 m for the sampling scale) and three orders of magnitude (10^1 .. 10^4 m for the footprint scale), respectively.

Pronounced differences in surface characteristics (e.g. surface temperature) can be found over the different types of land use in the LITFASS area (Figures 2 and 3).



Figure 2:
Regional distribution of surface temperature in the LITFASS area measured by the Helipod during a grid flight pattern on June 17, 2003.

(Picture by J. Bange, TU Braunschweig)

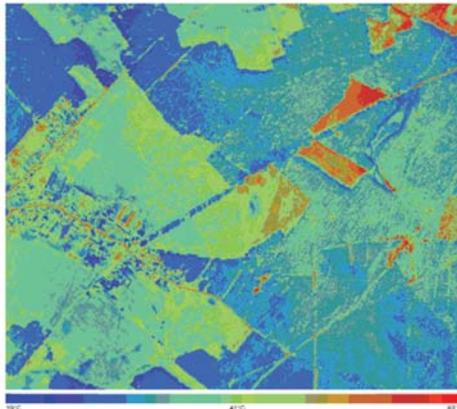


Figure 3:
Calibrated infrared surface temperature. Photo taken from the Tornado aircraft over a small part of the LITFASS area on June 17, 2003.

(Picture by J. Bange, TU Braunschweig)

These differences in land use and surface characteristics result in significant evaporation differences both in numerical models and estimates from satellite data. The direct intercomparison of LM results and NOAA images does not only reveal spatial patterns due to surface heterogeneity but also differences in magnitude and in the spatial distribution of evaporation which have to be investigated in detail.

EVA-GRIPS will therefore combine model and satellite data with in-situ measurements to finally analyse the representativeness and validity of the evaporation parameterisation in atmospheric models.

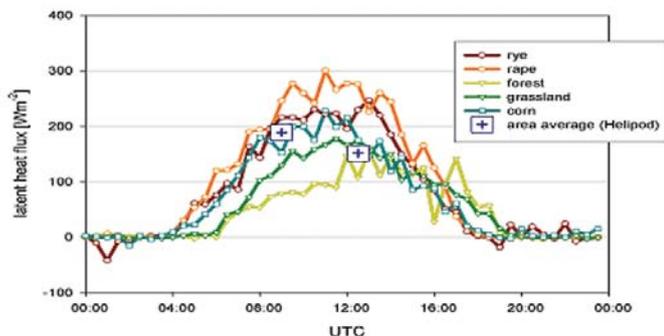


Figure 4: Diurnal cycle of latent heat flux over various land use types for June 7, 2003. (Figure by M. Mauder, University of Bayreuth, including data by GKSS, DWD and TU Braunschweig)

Locally measured water vapour fluxes over different types of land use were found to show significant differ-

ences (Figure 4). Area averages of grid-size representative fluxes will be derived from the surface observations over various land use types by a suitable averaging strategy and will be compared to the fluxes determined from area-averaging measurement systems (Helipod, scintillometers, lidar-radar combination).

Participants in EVA-GRIPS:

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- Deutscher Wetterdienst (DWD) – Meteorologisches Observatorium Lindenberg (MOL),
- Meteorologisches Institut der Universität Bonn,
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References

- Bange, J. and R. Roth, 1999: Helicopter-borne flux measurements in the nocturnal boundary layer over land – a case study. *Boundary-Layer Meteorol.* 92, pp. 295–325
- Beven, K. J., 1997: Distributed hydrological modelling, applications of the TOPMODEL concept. *Adv. Hydrol. Proc.*, Wiley & Sons, pp. 348
- Beyrich, F., 2003: Lindenberg: One of the BALTEX reference sites for CEOP. *BALTEX-Newsletter* 5, pp. 5–8
- Majewski, D., 1991. The Europa Modell of the Deutscher Wetterdienst. *ECMWF Seminar Proceedings on Numerical Methods in Atmospheric Models*, 16–18 Sept. 1991, VOL. II., pp. 147–190
- Mengelkamp, H.-T., K. Warrach, E. Raschke, 1999: SEWAB – a parameterization of the surface energy and water balance for atmospheric and hydrologic models, *Adv. Water Res.* 23, 2

Occurrence and air/sea-exchange of novel organic pollutants in the coastal and marine environment

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The pressure on coastal and marine ecosystems caused by anthropogenic substances is subject to short-term and long-term alteration due to changes in industrial production pathways, environmental awareness and legislation, consumer demands and the development of novel chemicals. The joint application of sophisticated numerical models and analytical measurement techniques enables assessment of the present state and future scenarios for hazardous chemicals in the coastal and marine environment.

The Department for Environmental Chemistry focuses on novel organic pollutants that are of future concern for the coastal and marine environment because of their

- persistence, bioaccumulation and toxicity (pbt-substances) and/or
- endocrine disrupting potential.

For the latter group a number of studies have been carried out in different compartments of the North Sea using ship-borne air and water samples.



Figure 1:
Ship-borne air-sampling.

Concentrations of alkylphenols (namely: tertiary-octylphenol, nonylphenol and) were determined in North Sea water and were found to be three orders of magnitude lower than those determined in the River Elbe, Rhine and their estuaries.

Concentration gradients from the coast-line to the central North Sea

indicated that rivers are the main input sources for this group of endocrine disruptors (Xie et al., 2006). Atmospheric concentrations over the North Sea were in the lower ng/m^3 range and comparable to those found in rural areas of Southeastern Germany.

For phthalates, another group of substances with endocrine disrupting potential, it was shown that the atmosphere is an important input pathway into the North Sea (Xie et al., 2005). The air-sea exchange is significant and the modelled net fluxes based on measurement data indicate that the North Sea, the open sea and even polar areas will be extensive sinks for phthalates. Since phthalates are continually produced and consumed in huge amounts worldwide and since they tend to become partitioned within the suspended matter fraction after atmospheric deposition (slowing down photo- or biodegradation processes), they are supposed to be a relatively persistent form of marine pollution (Xie et al., 2005).

Present field research activities are very much related to polyfluorinated organic compounds (PFCs) that are of growing concern due to their extremely high persistence and potential for bioaccumulation. PFCs represent a diverse class of chemicals produced in large amounts since the 1950's. Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) have been determined in remote marine and polar ecosystems although they are almost non-volatile and hardly water-soluble. Perfluorooctane sulfonamides and fluorotelomer alcohols

(FTOHs) are possible precursors of PFOS and PFOA, being neutral and volatile, therefore having the potential for long-range atmospheric transport. High-volume air sampling and determination by GC-MS has been developed, including full method validation. The method is presently applied to air samples taken during two cruises of RV Polarstern to the Northeast Atlantic and the European Arctic (ARK-XX/1 & 2) and during the Atlantic transfer from Bremerhaven, Germany to Cape Town, South Africa (ANT-XXIII/1). Results will be available soon.

The application of advanced numerical models to simulate the atmospheric transport and fate of POPs is another essential tool for estimating the risk these substances display to humans and ecosystems. Computer models, once validated, can be used to assess the effect that different emission or climate scenarios can have on concentrations of POPs in the air or their depositions to the ground and possible enrichment in certain areas. In this way, they allow for validating the impact of past and future regulatory measures such as banning or reducing certain substances and, thus, serve as a decision support tool for regulatory authorities. Instead of building a model from scratch the Department for Environmental Chemistry has adapted the well established US-EPA Community Multiscale Air Quality modelling System (CMAQ) to handle semivolatile POPs like polycyclic aromatic hydrocarbons (PAHs) over Europe at different temporal and spatial resolutions. PAHs are of particular concern for coastal ecosystems because they arise from, among others, fuel combustion in ship engines. Ship traffic in the North Sea follows mainly the coast line. It is likely to increase within the coming decades and is highly variable in terms of engine type and fuel qualities used. Thus, PAH emissions from ship traffic suggests the construction of different emission scenarios and the application of an advanced air quality modelling system to assess the adverse effects the ship traffic in the North Sea can have on its coastal ecosystems. Currently, model runs of Benzo(a)Pyrene (B(a)P) – one of the most harmful PAHs – for 2001 are being carried out and the results are compared to ground measurements, where available, for a first validation of the model. The first results are promising so that we will shortly carry out simulations for a longer time period to assess a trend in PAH concentrations and depositions.

(Figures 2 and 3 on page 12.)

References

- Zhiyong Xie; Ebinghaus, R.; Temme, C.; Caba, A.; Ruck, W. (2005): Atmospheric concentrations and air-sea exchange of phthalates in the North Sea (German Bight), *Atmospheric Environment*, 39, 3209–3219
- Xie, Z., Lakaschus, S.; Ebinghaus, R.; Caba, A.; Ruck, W. (2006): Atmospheric concentrations and air-sea exchange of nonylphenol, tertiary octylphenol and nonylphenol monoethoxylate in the North Sea, *Environmental Pollution*, on-line available

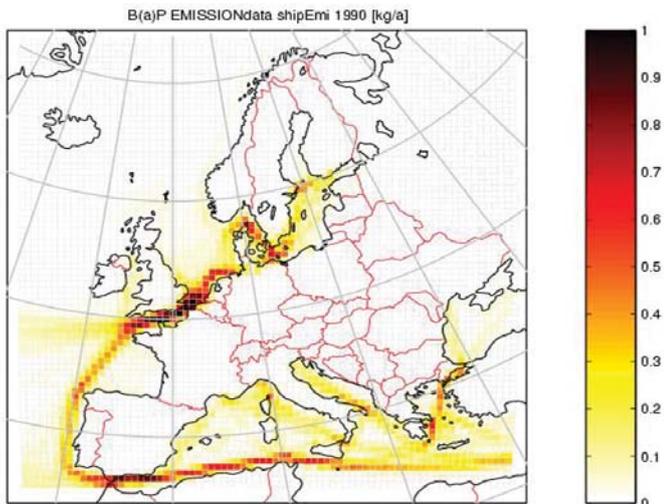


Figure 2: B(a)P Emissions from ship traffic within Europe in kg/y. The reference year is 1990.

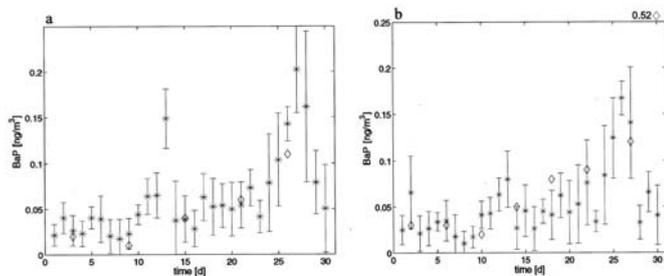


Figure 3: Comparison of daily mean atmospheric concentrations calculated from simulations (asterisks) with available measured daily means (rhombs) in September 2001 at Bornhoeved, DE (a) and Zarrentin, DE (b). The error bars show the standard deviation of the calculated means with $n = 24$.

Chemical interactions: ecological function and effects

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Current research activities in the department for Marine Bioanalytical Chemistry are an integral part of the Topic "Coastal Dynamics and Causes of Change" of the MARCOPLI Programme within the research field "Earth and Environment" of the Helmholtz Association of German National Research Centres (HGF). The mission of our department is to determine the nature, extent and function of chemical interactions in coastal ecosystems, including the cause and effect relationships between naturally occurring bioactive compounds or anthropogenic trace substances, respectively, and marine organisms. The present investigations form the basis for future effect-orientated monitoring tasks with respect to Ecosystem Health.

The integration and close collaboration of areas of expertise, such as Chemistry, Biology, Ecology and Veterinary Medicine within our department allows us to determine not only the concentrations of anthropogenic substances, but also to investigate the functional significance of both anthropogenic and natural substances in coastal ecosystems. The focus is on the molecular and biochemical processes in the course of coastal ecosystem function, its status and causes of change. Current research areas are:

- marine toxins from micro algae and jelly fish, which can synthesize and discharge a cocktail of poorly or even uncharacterized substances. They can damage microbial associations and cause ecological imbalances in marine habitats,
- biochemical indicators of immune-modulatoric processes for early diagnosis of the health status of marine mammals, such as harbour seals and harbour porpoises. Marine mammals are top predators in the marine food web and may serve as indicators of ecosystem status and change.

Species under investigation represent groups of organisms of regional relevance in temperate coastal zones, such as the North Sea.

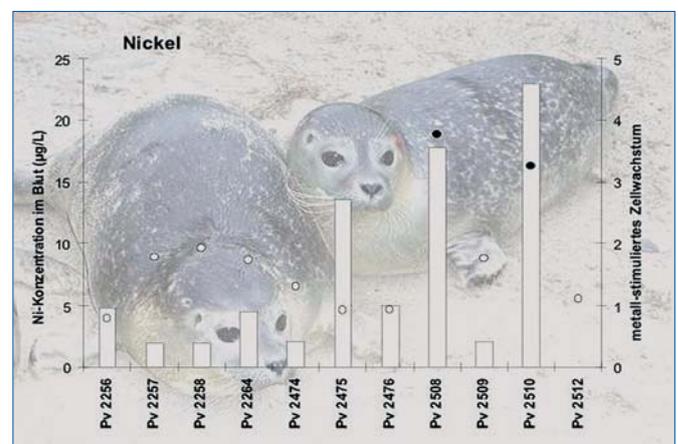


Figure 1: For the harbour seals (*Phoca vitulina*) in the North Sea, a relation between the metal load (white bar = concentration in blood) and metal-specific proliferation of the immune cells (black points = increased irregular proliferation) has been observed for example for the element nickel. The increased proliferation indicates a hypersensitivity with respect to nickel and suggests an immunomodulation induced by the metal. (Foto: Antje Kakuschke, GKSS)

The habitats that comprise the Coastal zones as treasured habitats are characterized as regions of high productivity, sustaining both high biomass and biodiversity. This in turn yields a multitude of natural compounds involved in critical inter and intra-specific responses such as prey and predator relationships. However, anthropogenic stressors, such as hazardous substances can adversely affect marine organisms, species interactions,

and ecosystem functions via acute toxicity or sub-lethal inhibitory effects on immune systems. Key questions in this context are:

- How do natural and anthropogenic compounds interact with and influence coastal biota?
- What tools and methods are required for functional diagnostics of the coastal ecosystem?
- What are the consequences of the propagation of toxic chemicals in the food web on ecosystem function and the health of humans and marine mammals?

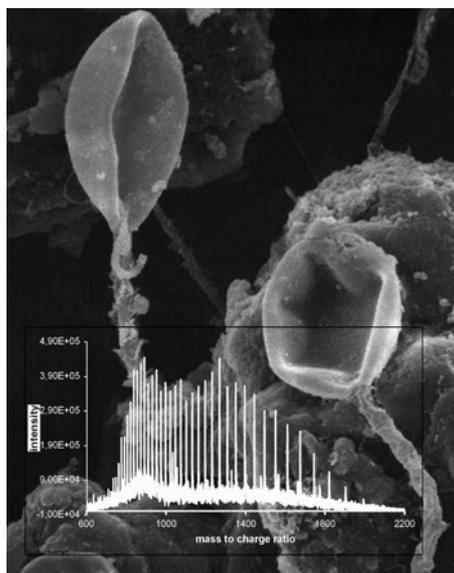


Figure 2:

The toxic cnidaria e.g. Jellyfish contain specialized cell organelles (cnidocytes) as functional units. The Raster Electron Microscopic picture shows two discharged cnidocytes. Cnidocytes contain a cocktail of different toxins, which play an important role for prey capture and defense. The toxin mixture is purified by liquid chromatography and proteinaceous toxins can be detected and characterized by mass

spectrometry as demonstrated by the protein ion spectrum (A) of a 42kDa protein as example.

(Foto: Michael Gedde AWI, Heike Helmholz, GKSS)

With regard to marine toxins, the objects of investigation are marine protists, such as *Alexandrium spec.p.* and *Prymnesium spec.p.*, which are prominent representatives in algal blooms in the North Sea. These are known to be potent producers of lytic and ichthyotoxic, probably small molecular weight toxins. Unidentified substances with proven ecological effects on competing micro-algae are being isolated and chemically and functionally characterized.

In contrast to the unicellular protists, higher organisms such as cnidarians, e.g. the Lions Mane jellyfish *Cyanea specp.*, have developed highly specific release mechanisms for complex, toxic venoms. With the help of this potent toxin cocktail they exhibit successful foraging behaviour and a proven stinging capacity. Proteinaceous toxins with lytic and electrophysiological cellular effects are expected to be found.

The substances of interest are separated from their natural matrix and are characterized according to their chemical

structure. To date, two different *Cyanea* species collected at the Scottish Orkney Islands and the Hebrides are under investigation. They are being compared to those collected around the Island of Helgoland in the German Bight, a more anthropogenically influenced area. The cytotoxic and hemolytic activities of the venoms from the toxigenic organs, the oral arms and the fishing tentacles are being determined. A multidimensional purification process has been developed in order to isolate and characterize the causative toxins. The Research on their mode of action is being accomplished with the help of purified compounds and finally their ecological functions will be revealed/disclosed.

The research on marine toxins is being performed in close collaboration with the Marine Ecological Chemistry Group at the Alfred Wegener Institute in Bremerhaven and Helgoland.

The second research topic of our department concerns the health status of marine mammals. Harbour seals (*Phoca vitulina*) represent one important biological parameter of the Trilateral Monitoring and Assessment Program (TMAP) in the Wadden Sea within which their health status is of particular interest.

The focus of the research is on the immune system of the animals as an early indicator of anthropogenic influences. Important parameters of the investigations are the lymphocyte function, and the cytokine expression as well as parameters of the acute phase reaction. With special particular regard to the influence of pollutants, we have started with investigations on the immunosuppressive and stimulating effects of metals. First results show clear evidence for metal-specific hypersensitivity in free-living animals and suggest a relationship between levels of metals in the blood and immunological dysfunction in marine mammals.

The influence of organic pollutants on marine mammals is being investigated with the help of primary cell cultures obtained from tissue samples of seals (*Phoca vitulina*), which are then exposed to relevant pollutants, such as PCBs and PCDDs. Protein expression profiling of samples from these incubation experiments should identify up and down-regulated proteins as potential biomarkers. The proteins or protein sequences identified and characterized should contribute to the development of effect monitoring on the influence of pollutants on marine mammals.

The research on marine mammals is being performed in close collaboration with the Ecology of Birds and Mammals Group at the Research and Technology Centre in Büsum as well as with the Seals' Station in Friedrichskoog.

Dynamics and change of beach erosion, accretion and nourishment in Rio Grande do Sul, Brazil

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Introduction

A study on erosion and accretion along the coastline of the Rio Grande do Sul (southern Brazil, Figure 1) was developed in liaison with mapping of sand deposits occurring in the adjacent inner continental shelf. The beach line established by DGPS in 1997 was compared with that reproduced from Brazilian Army Charts collection from 1965/1966. The temporal analysis among these studies was accomplished through geoprocessing techniques.

The results of these 33 years of temporal analysis (1964–1997), show that the beach line is characterized by erosive and accretionary conditions, showing 442 km of beaches in retreatation, 173 km under progradation conditions and 6 km without significant variations. The erosive processes with rates larger than 80 m extends for 257 km, while the accretional areas present smaller values.



Figure 1:
 Location of the study area
 in southern Brazil.

Results

To illustrate erosional and depositional aspects of the coastline, results from the area between Lagoa dos Patos inlet to Cidreira beach are presented. The shoreface topography of the central coast of Rio Grande do Sul consists of a broad area of smooth bottom surface with mean slopes of 1:100. The 10 m isobath was used as the shoreface seaward limit as presented in the Brazilian Navy bathymetric map. The mean shoreface width changes from less than 1 km along the coast with erosion process and 3 km along the accretion areas at Mostardas and Dunas Altas beach (Figure 2). Measurement of changes in shoreline position and beach system morphology show extensive shore retreat along areas where there is an increase of the longshore flux energy, e. g., where the shoreline alignment is more exposed to the southerly wave action. The resultant energy flux into the surf zone and related longshore transport decreases to the north, from 2.9 million m^3/yr^{-1} south at Mostardas beach to 2.3 million $m^3/year$ between Mostardas and Dunas Altas beach, and 1.5 million m^3/yr^{-1} to the north of Dunas Altas beach (Fig. 2). Along the central coast a reduction in transport flux is evident due to changes in the shoreline

alignment implying that there is a block in the longshore transport (Toldo et al., 2004). These descriptions indicate a coupling between the net longshore balance and the spatial change on the shoreface. Analyses of satellite images in this area reveal the presence of short-term coastal current circulations overtopping the shoreface that has not been studied in detail before, but suggests that in some instances this current can lead to more suspended sediment diffusion outward from the surf zone. A strong alongshelf jet characterizes this coastal current (Figure 3). The occurrence and evolution of this jet is closely related to the passage of cold fronts, which are formed early in the winter.

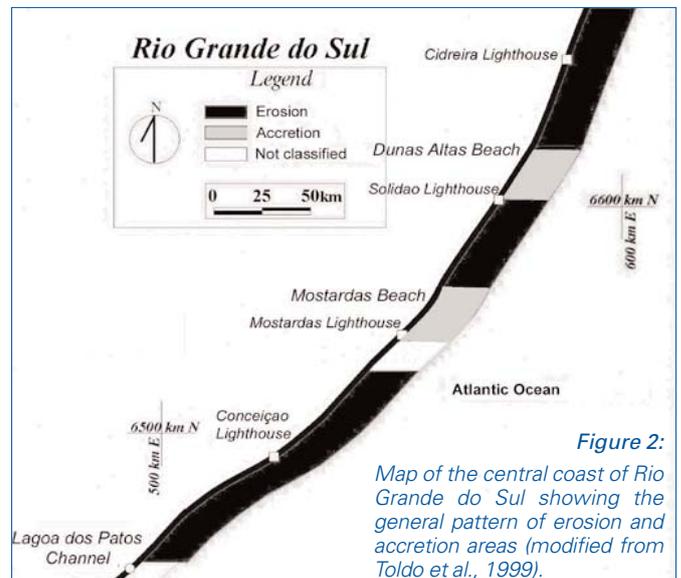


Figure 2:
 Map of the central coast of Rio Grande do Sul showing the general pattern of erosion and accretion areas (modified from Toldo et al., 1999).

Final Remarks

The serious problems of erosion registered along the southern Brazilian and Uruguay coastlines, stimulated a detailed study of sand occurrence from the area for beach nourishment along the inner continental shelf. There sand deposits must be close enough to the eroded beach, to be economically viable and have a mean grain-size compatible with the replenishment area. Beach nourishment usually is not a permanent answer for the restoration of beaches and sometimes represents a short-term solution, requiring repeated renourishment. However, the method is useful to restore beach profiles. Agencies like the Coastal Engineering Research Center – CERC, Mineral Management Service – MMS (USA) and others prefer this approach to solve coastal erosion problems, rather than by conventional man-made structures.

In the present study area, research on sand resources of the inner continental shelf was developed with the purpose of a) to map areas with occurrence of quartzose sand and bioclastic sand down to a limit of the 30 meters isobath, using a detailed analysis of the seismic sono-

graphic and bathymetric profiles, geological cores and surface samples, and b) to indicate the main potential target areas in terms of sand concentration with physical and chemical requirements for beach nourishment. Four lithofacies were identified based on sediment characterization by grain-size, mineralogy, special framework and energy level of the environment of deposition. Of these, two were deemed to have the highest potential source for beach nourishment – quartzose sand and quartzose sand with carbonate shell fragments. Another area of bioclastic gravel and sand were considered as a resource itself.

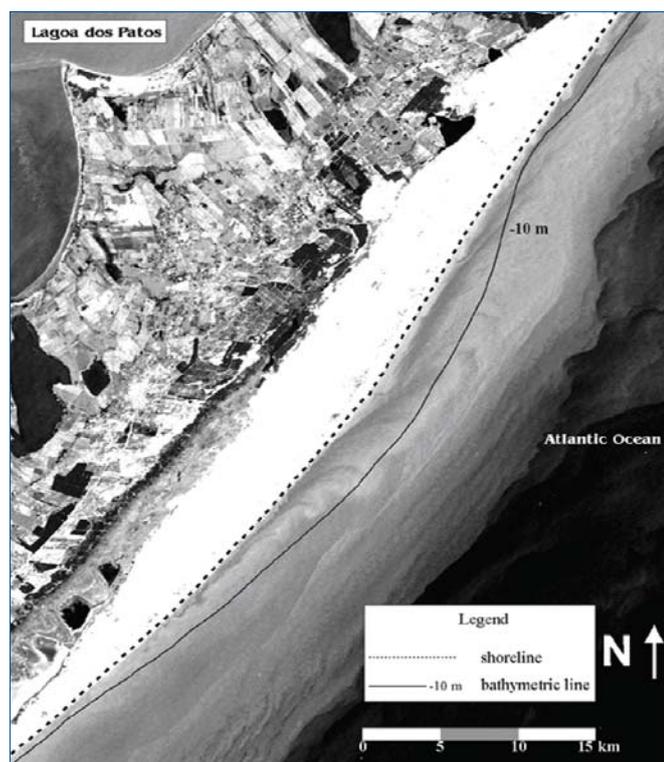


Figure 3: Satellite image highlighting dynamics and changes in the shoreline alignment in Mostardas beach and the presence of alongshelf jet and shoreface accretion. This image focuses on an episodic event in May 20th 2000, at that time the characteristics of the circulation pattern over the shoreface consisted of the northward alongshelf current intensified by the south and southeast winds and a wide plume clockwise-rotating gyre (Toldo et al., 2004).

The sediments were analyzed and interpreted according to the late Quaternary paleogeographic evolution of the continental margin and the modern hydraulic conditions actually found from the beach to the 30 meter isobath. Studies were conducted in the area potentially suitable for beach nourishment. An amount of 9.6 billions of cubic meters of sand for beach replenishment was mapped along this portion of the inner continental shelf (Martins et al., 1999). The impact from dredging of the sand must be analyzed in terms of circulation of the continental shelf, as well as in terms of economic and touristic activities such as fishing and considering the local biota.

Impacts must be eliminated or minimized through careful planning, environmental impact assessment to avoid ecologically sensitive areas and maintaining monitoring programmes for both seafloor and water the column.

Acknowledgments

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References

- Martins LR, Martins IR, Wolf IM. 1999. Sand Deposits along Rio Grande do Sul (Brazil) Inner Continental Shelf. In: Martins, L.R. and Santana, C.I. (eds.). Non Living Resources of the Southern Brazilian Coastal Zone and Continental Margin. Editora CECO-IG-UFRGS, pp. 26–38.
- Toldo Jr. EE, Almeida LES, Barros C, Martins LR. 1999. Retreat of the Rio Grande do Sul coastal zone, Brazil. In: Martins, L.R. and Santana, C.I. (eds.). Non Living Resources of the Southern Brazilian Coastal Zone and Continental Margin. Editora CECO-IG-UFRGS, pp. 62–68.
- Toldo Jr. EE, Nicolodi JL, Almeida LESB, Corrêa ICS, Esteves LS. 2004. Coastal Dunes and Shoreface Width as a Function of Longshore Transport. *Journal of Coastal Research*, SI 39 (Proceedings of the 8th International Coastal Symposium), Itajaí, SC – Brazil.

LOICZ News

Key topics identified for implementation of LOICZ future research

The broad scientific frame given by the LOICZ Science Plan articulates the breadth and diversity of issues and problems that exist in the coastal zone for which society looks to science to provide solutions. LOICZ has identified 5 scientific themes (see back page) that represent a continuum of science research that is needed to address these issues/problems. To help facilitate the implementation of LOICZ, the project has focused on some key topics to which all of the themes outlined in the science plan are pertinent.

Each topics forms a cohesive science question that can run within and between the themes and have been identified to provide the scientific frame in which LOICZ aims to be value adding to individual research projects as well as to broader scale initiatives and organisations. The topics are:

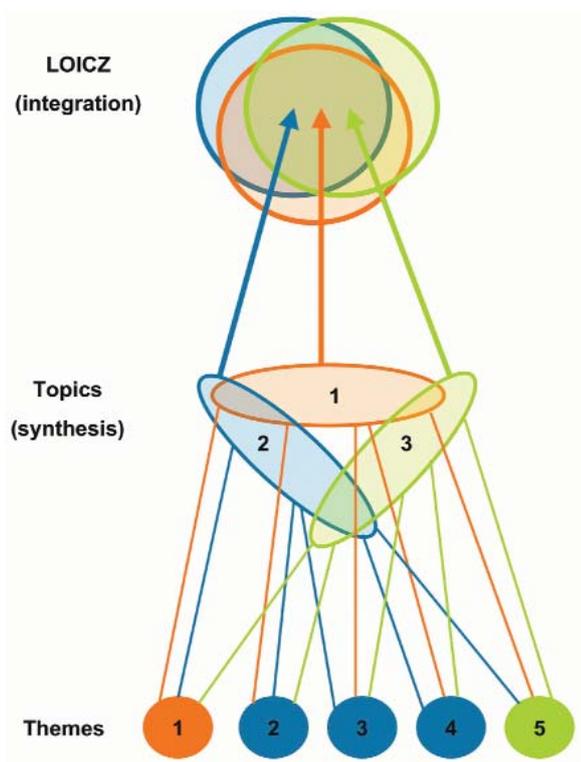
- What are the implications of ecological and economic change for patterns of land and sea use?
- What are the effects of changes to the flows of freshwater and materials to estuaries and shelf seas?
- How can comparative analysis inform the improvement of the governance of human activities in changing coastal ecosystems?



LOICZ will engage in these topic areas through the following operational mechanisms:

- Clustering existing or proposed scientific research activities on local, national regional and global scale primarily through the network of affiliated projects.
- Designing and implementing targeted or open scientific workshops and congresses to work on a specific question or a subset of those along the LOICZ scientific priorities.
- Designing and promoting targeted LOICZ research activities.
- Encouraging and promoting as well as co sponsoring, scientific synthesis.
- Dissemination, and communication, capacity building and training.

A more detailed outline of each of the three topics follows:



Topic 1:

What are the implications of ecological and economic change for patterns of land and sea use?

This topic encapsulates much of the content of Themes 1, 2 and 5 of the LOICZ science plan. The ecosystem approach (underlying “ecosystem based management”) regards humans to be an integral part of current natural systems. There are large numbers of deterministic and stochastic models that examine various facets of the nat-

ural environment, and similarly large numbers of models dealing with human social systems. However, there have been very few attempts to couple them together into a single socio-ecological system that consider the system to consist of an assemblage of interdependent life forms – including humans – and their non-living habitats and resource base, the integrity of which is highly dependent upon human decisions.

A number of conceptual models have been employed to describe coupled socio-ecological systems, but such an interrelated and interdependent system poses a major challenge to the modeller who is always forced into making some assumptions in order to understand the system. This leads to models with a large range of complexity, from the huge mechanistic models used by many natural scientists to the probabilistic formulations employed to describe human decision making (e.g. game theory) or “market mechanisms”. It is the difference between the approaches taken by humans observing nature and humans observing humans that make it difficult to model socio-ecological systems.

Work within this topic will focus on:

Conceptual modelling

LOICZ will explore how models can incorporate dynamic interpretations of data and source empirical data to populate models.

Quantitative models

Mechanistic or stochastic models operate at various different scales and levels of complexity and this topic will explore how scale affects system properties requirements for data as well as mixed methodology approaches to accommodate the entire scale of systems.

Scenario-building and decision support models

One of the most exciting challenges for system models is to gain insights on the likely future state of the marine environment through their application in various economic and social scenarios.

The objective of the topic is to gain insights on the likely future state of the marine environment in various economic and social scenarios.

Topic 2:

What are the effects of changes to the flow of freshwater and materials to estuaries and shelf seas?

This topic encapsulates much of the content of themes 3 and 4 of the LOICZ science plan,

1. examining the changes in loads associated with human activities in coastal watersheds as well as other human-induced effects, and
2. examining the response of coastal and shelf ecosystems to these changes.

To the extent that we can extend or develop LOICZ approaches to apply to coastal governance, activities under this topic will also address theme 5 of the LOICZ science plan.

Runoff, groundwater flows, nutrient and sediment loads are all affected by human activity and especially human-induced changes in climate and landuse. These may be addressed using a variety of relatively simple analytical tools, including nutrient accounting approaches and large-scale hydrologically based models. Several activities are proposed to extend existing approaches either geographically or methodologically, to permit estimation of nutrient loads, their uncertainty and variation.

The response of coastal and shelf systems has been addressed in LOICZ I by estimating the metabolism of coastal and shelf ecosystems using the LOICZ budget methodology. This methodology will be refined and extended under LOICZ II, and specifically in an attempt to address issues of coastal sustainability and governance. The use of additional modeling approaches will be evaluated to determine whether such approaches are more appropriate to address particular coastal management questions.

Topic 3:

How can comparative analysis inform the improvement of the governance of human activities in changing coastal ecosystems?

This question integrates across the five themes of the LOICZ Science Program. It addresses the primary goal of LOICZ II: "to provide knowledge, understanding and prediction to allow coastal communities to assess, anticipate and respond to the interaction of global change and local pressures in determining coastal change". A coastal community is defined to include policy makers, managers and stakeholders. The term "coastal ecosystems" embraces large marine ecosystems (LMEs), coasts and their associated watersheds.

The approach will be to select sites for an analysis of success factors in bridging between ecosystem science and governance. The analysis will focus upon successes and failures in instigating the changes in human behaviour (institutions, markets and civil society) that mark the implementation of a coastal ecosystem management initiative. In all cases the analysis will examine coastal governance within the context of the next larger system – a watershed, a Large Marine Ecosystem or geographic region. The analysis will address three central questions:

1. How are overviews of ecosystem condition being developed and trends being communicated?
2. How can coastal ecosystem governance initiatives affect the behavior of societies more effectively?
3. What are the resulting outcomes and how can we improve upon them?

News from the LOICZ Regional Nodes

The first major activity of the LOICZ SEAsia/Asia Regional Node shall commence this 2006 with the project entitled **Integrated vulnerability assessment of coastal areas in the Southeast and East Asian region (IVA-SE/EAsia)**.

The project was one of 27 proposals short-listed for funding at the 2nd stage of the APN's 2005 Annual Regional Call for Proposals (ARCP) Process. Only 30 % of the short-listed proposals were eventually selected to receive funding support from APN in 2006/2007.

The focus of the project shall be on:

- Capacity building: Training of regional scientists, analyses and synthesis workshops, meetings; and
- Data acquisition and research for qualifying countries.

With the overall goal to:

- Determine vulnerability gradients across the coastal areas of the SEA-EA region considering the coupled human and ecological systems;
- Understand multi-scale dimensions and inputs on the adaptive capacities of human communities toward the vulnerability of coasts, of conflicts and competition over lands, sea areas, and resources in the region; and
- Determine efficient and effective strategies to link GEC research results with policy making, governance and conflict resolution.

This project is spearheaded as a collaborative effort of the Marine Science Institute, University of the Philippines at Diliman (L. David), the Institute of Statistics, INSTAT & The School of Environmental Science and Management SESAM, University of the Philippines at Los Baños (F. Lansigan), the Southeast Asian START Regional Centre, Chulalongkorn University (A. Snidvongs & A. Pomsagun) and SEA LOICZ II Node (c/o Natural Sciences and Science Education, National Institute of Education, Nanyang Technological University) (B. Goh).

Another proposal that has been successful in getting funded by APN is of LOICZ SSC member and co-ordinator of the South Asia Regional Node in Sri Lanka, Nalin Wikramanayake, entitled:

Implementation of the LOICZ II Science Plan through Regional and National Workshops, Synthesis and Policy Assessment, Gap-filling Studies, Capacity Building and Networking in the South Asian Region

The goal is to support the implementation of the LOICZ II Science Plan in the South Asian region by the established Regional Node of LOICZ. The overall thrust of the activities is to assess current policies using the LOICZ framework, support integrated, interdisciplinary studies, assess the policy and management implications and communicate them to planners and decision-makers



using a regional network and regional and national workshops. Supplementary funds to integrate on-going research, regional gap-filling studies and capacity building are integral components of the project.

For more information on these projects please visit the APN website <http://www.apn-gcr.org> or get in touch with the LOICZ Regional Nodes.

LOICZ at the Earth System Science Partnership Global Environmental Change Open Science Conference, 9–12 November 2006, Beijing, China

At the ESSP OSC there will be a strong LOICZ presence through joint sessions and a special session. The call for abstracts has already passed but here below a short overview of the sessions and their contents. For registration and more information on these and other sessions in the ESSP OSM visit the conference web-site: www.essp.org/ESSP2006/

Joint sessions:

GECHS/ LOICZ/ UGECH:

Global Environmental Change, Natural Disasters, Vulnerability and their Implications for Human Security in Coastal Urban Areas

The catastrophic events that have affected societies around the world in recent years underscore the close linkages between global environmental change, human security and urbanization, as well as the marginal attention to multidimensional perspectives capable of providing comprehensive and integrated approaches to better understand those events and the alternatives to adapt and minimize their negative consequences.

In response to these challenges, three IHDP projects, Global Environmental Change and Human Security (GECHS), Land Ocean Interactions in Coastal Zones (LOICZ), and Urbanization and Global Environmental Change (UGECH) are jointly organizing a panel for the ESSP Open Science Conference. The panel focuses on Global Environmental Change, Natural Disasters, Vulnerability and their Implications for Human Security in Coastal Urban Areas. Rather than presenting research results of projects on natural disasters, panelists are invited to reflect on the interactions between biophysical and social variables of global environmental change that lead to risks for human security in coastal urban areas from multidimensional perspectives.

GWSP/LOICZ:

Coastal zone – global water system interfaces

Global Water System Project (GWSP) and LOICZ are jointly organizing a session to provide a forum to discuss topics

and plan out activities of mutual interest pertaining to the global water system and the coastal zones. These topics include (1) governance of freshwater and the coastal systems, (2) saltwater intrusion in coastal aquifers, (3) environmental flows of freshwater and estuarine systems, (4) effects and impacts of river diversions, growth of megacities, and climate change on the coastal processes, and (5) characterizing large scale nutrient cycles, among others. The session aims to define strategies and to initiate the development of collaborative studies and partnership among interested researchers and research groups in the scientific community as well as the resource managers and institutions involved in freshwater and coastal regions/systems.

NOAA/WCRP/IOC/LOICZ:

Sea-level Rise, Vulnerability and Impact

Sea-level rise and variability is a global issue impacted by the breadth of the Earth sciences – including not just changes within the oceans, but also the ice caps and glaciers, terrestrial water storage, and land movement. At the same time, sea-level rise and variability is an issue that cuts across the full disciplinary scope of the Earth sciences in the global coastal regions – and challenges the research community to truly integrate a focus on coastal people, infrastructure, ecosystems and their goods and services. This special session will feature results from the WCRP/COPES workshop (June 2006), “Understanding Sea-level Rise and Variability”. Factors contributing to observed sea level rise and variability, and the error budget for each, will be identified, as well as the associated requirements for new and/or augmented research, technical developments, and the collection of sustained, systematic observations needed to reduce the associated uncertainties. The special session will also address consequences of present uncertainties in sea-level rise and variability and expected impact scenarios, to be facilitated by LOICZ. Through global and regional synthesis and initial modeling efforts including the examination of case studies, it will look at global change factors that determine vulnerability of the socio-ecological coastal systems and ways for adaptation and new responses to avoid and/or mitigate impact of sea level rise on our coasts.

LOICZ Special Session at ESSP:

Young scientists in LOICZ Projects

LOICZ will be hosting a special workshop session at the ESSP conference. The details of the workshop are still being organised but there will be a focus on participation of Young scientists and exploring opportunities for Young scientists to become involved in LOICZ projects. Anyone interested in taking part in this workshop should contact the LOICZ IPO (loicz.ipo@loicz.org) to be kept informed of developments.

The backbone of LOICZ: affiliated projects

LOICZ has a mandate to address key issues of coastal change and use in the context of scenarios of future human activity and environmental change. LOICZ endorses and seeks to support both fundamental coastal zone research and research that synthesises and up-scales results for dissemination within the scientific community, and outreach to policy makers and the public.

This research is partly carried out by groups of scientists, aided and supported by the LOICZ IPO, Regional Nodes and/or SSC, with funds that LOICZ has secured from external funding agencies. Another important part of the LOICZ project is carried out by researchers who affiliate their projects to LOICZ thereby becoming part of the global network of LOICZ. These projects build the backbone for up- and down-scaling of LOICZ results and the LOICZ synthesis. LOICZ has recently restructured the affiliation process so that applications for affiliation will be reviewed by the IPO and the coordinator of the theme/topic they are contributing to most. This new procedure will allow LOICZ to maintain an up-to-date record of global research activity as relates to the LOICZ Science Plan as well as ensure that affiliated projects are given opportunity to fully participate in LOICZ activities such as workshops and joint projects.

LOICZ provides a forum to assimilate, integrate and synthesise the outputs of affiliated projects. Additionally, it provides an opportunity to communicate and disseminate these outputs making them available not only to other scientists, but also the public, decision-makers and managers. Information on affiliated projects is held on a central database that will in the near future be made available on-line so that basic information and regular updates are available to the wider community as well as to LOICZ for its own reporting requirements.

An essential element that applies for all LOICZ interdisciplinary studies within and beyond the project is data sharing and exchange. To facilitate this exchange LOICZ has developed a Data Policy to help affiliated projects and LOICZ to fully benefit from each other. Both documents, the Terms of Reference for affiliated activities and the Data Policy, can be found on the LOICZ website.

Call for research proposals concerned with Land-Ocean Interactions in the Coastal Zone

As described earlier in this issue, LOICZ has developed three key topics that will form the focus of research interest in the coming years. Within all three topics, LOICZ seeks to expand its network of scientists by endorsing research activities concerned with any of these 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 projects.** As well as fundamental science projects, we also seek projects that have a multidisciplinary perspective, especially combining natural and social sciences. Projects can have global, regional or local scales and be focussed on coastal sciences and/or coastal management. Projects that collaborate with other Earth System Science Partnership (ESSP) projects, especially with other Core Projects of IHDP and IGBP, are sought in particular, as well as projects that synthesise and analyse research outcomes already available or involve dissemination and outreach that will lead to better public knowledge. Examples of projects already affiliated to LOICZ can be found on the LOICZ website under Projects.

Although LOICZ cannot offer funding to affiliated projects, its endorsement provides the following benefits:

- support in proposing for funding;
- promotion of the project and associated activities, its contributing team, outputs and outcomes through the LOICZ website and/or newsletter;
- contribution to workshops, conferences and meetings organised by LOICZ and hence establish linkages to other projects operating in similar fields and/or addressing similar issues; and
- access to a wide circle of information related to funding and the science community that is available through the LOICZ database.

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



What's on the wwwweb

IGOS Coastal Theme Report is available for downloading at <http://www.igospartners.org/Coastal.htm>

School on coastal dynamics modelling

More information at:
<http://lseeet.univ-tln.fr/ecoleete/ecole25eng.html>

The East Asian Seas (EAS) Congress 2006

http://pemsea.org/eascongress/participation_prereg.hm

The **ACCCA project website** is now on-line:

www.acccaproject.org.
Please visit the site to learn about the ACCCA project.

Newly revamped UNEP/GPA website

www.gpa.unep.org/
Find a wealth of information about the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities including: latest information and news about the GPA Programmes, advanced search feature and a documents library.

The Researcher's Mobility Portal:

<http://europa.eu.int/eracareers/>

Note that the freshwater **BIODIVERSITY Science Plan and Implementation Strategy** of is now online to be downloaded at: www.diversitas-international.org

Publications

Special COAST volume available

17-paper COAST Special Section in the Journal of Geophysical Research.

This volume is available for purchase through COAST for \$65. If you are interested in purchasing a copy please contact Pat Wheeler at pwheeler@coas.oregonstate.edu.

Rybski, D., A. Bunde, S. Havlin, and H. von Storch, 2006: **Long-term persistence in climate and the detection problem**

Geophys. Res. Lett. 33,
L06718, doi:10.1029/2005GL025591

pdf available for download at:
<http://w3g.gkss.de/staff/storch/pdf/rybski-etal.2006.pdf>

LUCS Synthesis volume, Springer/IGBP series:

Land-Use and Land-Cover Change – Local Processes and Global Impacts.

Lambin, Eric F.; Geist, Helmut J. (Eds.). 2006, XVIII, 222 p., 44 illus., 19 in colour, Hardcover. ISBN: 3-540-32201-9.

<http://www.springer.com/uk/home/generic/search/results?SGWID=3-40109-22-126972716-0>

Coast Map News is back, all electronic and monthly with the same mission, providing news and articles about marine and coastal data and information, but in a new, all electronic, format.

If you used to receive the paper version, or are a new subscriber, please send a blank e-mail to: subscribe@coastmapnews.mailer1.net.

IOP launches new open-access environmental science journal

The Institute of Physics (IOP) proudly presents the world's first open-access journal to cover the whole of environmental science. Environmental Research Letters (ERL) will serve the entire environmental science community, bringing together the research, policy and business communities concerned with environmental change and management. The journal will offer a stimulating combination of research Letters, commentaries, job and other advertisements, reviews and news items covering topics across the whole of environmental science.

All journal content will be completely free to read at <http://erl.iop.org>.

Have you seen

COST Open Call for Proposals to support Scientific and Technical Collaboration in Europe

COST (European Co-operation in the Field of Scientific and Technical Research) is inviting researchers throughout Europe to submit proposals for research networks. This open call invited researchers throughout Europe to submit proposals for research networks and use this unique opportunity to exchange knowledge and to embark on new European perspectives. The proposals are for new COST Actions contributing to the scientific, economic, cultural or societal development of Europe.

A first collection date for preliminary proposals is 31 May 2006.

A two stage process will be followed to assess proposals. Preliminary Proposals should provide a brief overview of the proposal and its impact. A pre-selection will rank the remaining Preliminary Proposals of which some 75 per collection date will be invited to submit a Full Proposal.

Details are available on the COST website:
<http://www.cost.esf.org/index.php?id=721>

Update us so we can update you

LOICZ INPRINT informs you about the LOICZ Project and its activities. But LOICZ has access to much more information and wants to make this information available to you as effectively as possible. To be able to provide you with LOICZ information that fits your expertise and interests most, we need input from your side telling us what your interests in LOICZ are and how we can contact you. Please complete the form on the next page.

Update us so we can update you

Please complete the following form where applicable and return by fax, post or e-mail to the LOICZ IPO.
(An electronic version of this form can also be found on www.loicz.org under Newsletter.)

First name:	
Last name:	
Organization/Institution:	
Address:	
Place:	
Postal code:	
Phone (include country code):	
Fax (include country code):	
e-mail:	
(Organization's) website:	
Field of expertise:	

Please indicate which LOICZ theme(s)* you are contributing to:

- Theme 1
 Theme 2
 Theme 3
 Theme 4
 Theme 5

Please indicate which LOICZ key topic(s)** you are interested in:

- Topic 1
 Topic 2
 Topic 3
 other

How do you want to receive the LOICZ Newsletter in the future?

- hardcopy
 pdf-file via e-mail
 e-mail alert
 not at all

* The LOICZ Research Themes are listed on page 2 of **INPRINT** and more detailed information on the themes is available in the Science Plan on the LOICZ website (www.loicz.org).

Detailed descriptions of the topics are featured in this first issue of **INPRINT.

Please return this form by:

- e-mail to loicz.ipo@loicz.org (electronic version on www.loicz.org)
- fax to +49(0)4152 87 2040
- mail to:
LOICZ IPO – GKSS Research Centre
Institute for Coastal Research
Max-Planck-Strasse 1
D-21502 Geesthacht, Germany





Calendar

LOICZ 17th SSC meeting, June 13 & 15, 2006, Geesthacht, Germany

LOICZ-GKSS joint Minisymposium – Linkages between German Coastal Research and LOICZ, 14 June 2006, Geesthacht, Germany

NERC Earth Observation Conference 2006 Dynamic Earth, June 21, 2006, Edinburgh, Great Britain

This conference aims to bring together scientists actively engaged in research into environmental sciences using Earth Observation, and to promote cross-disciplinary research.

THEME: Biodynamics: Modelling and Observation of the Biosphere

For further details please go to:

<http://www.nerc.ac.uk/funding/earthobs/conference> or

<http://www.geos.ed.ac.uk/research/eo>

Summerschool on Biodiversity and Ecosystem Services: Ecological and Socio-economic Aspects, August 27 to September 8, 2006, Peyresq, Alpes-de-Haute-Provence, France. More information can be found at: <http://portal.pik-potsdam.de/education/alter-net>

Summer School on Biodiversity of Coastal Habitats, September 6–14, 2006, Island of Sylt, Germany and September 14–20, 2006, Island of Helgoland, Germany

http://www.awibremerhaven.de/Benthic/CoastalEco/guests/summer-school_2006/first-announcement.htm

Young Scientist Network meeting, September 9–10, 2006, Mexico City, Mexico

organized by Analysis, Integration and Modeling of the Earth System (AIMES) project of the International Geosphere-Biosphere Project (IGBP).

The meeting will focus on urbanization interactions with biogeochemistry and climate.

For more information see

<http://www.cgd.ucar.edu/tss/staff/mahowald/ysn>

5th International Human Dimensions Workshop 2006: Institutional Dimensions of Global Environmental Change: Water, Trade, and the Environment, October 13–26, 2006, Chiang Mai, Thailand.

More information on <http://www.ihdp.org>

Call for Papers and Announcement:

Remote Sensing of the Marine Environment (AE103)

Part of SPIE's Fifth International Symposium on Asia-Pacific Remote Sensing, November 13–17, 2006, Marriott Hotel, Panaji, Goa, India

Conference web site:

<http://spie.org/conferences/calls/06/ae/>

SPICE/LOICZ/SEACORM South-East Asia Coastal Governance and Management Forum: Science Meets Policy for Coastal Management and Capacity Building, 14th–16th November 2006, Bali, Indonesia.

Call for papers:

2006 Berlin Conference on the Human Dimensions of Global Environmental Change: Resource Policies: Effectiveness, Efficiency, and Equity. November 17–18, 2006, Berlin, Germany.

<http://web.fu-berlin.de/ffu/akumwelt/bc2006>

The International Conference The Humboldt Current System: Climate, ocean dynamics, ecosystem processes, and fisheries

organized by IMARPE (Peru), IRD (France) with the technical support of FAO and sponsored by CNES (France), CPPS, GLOBEC, ICES/CIEM, IMBER, NASA (USA), PICES, SIMRAD, will be held in Lima (Peru), November 27 to December 1, 2006.

Contact: hcsconference@amauta.rcp.net.pe or

<http://irdal.ird.fr/hcs-conference.imarpe.fao.ird.php3>

Abstract submission deadline: June 10th, 2006

Arctic Frontiers Science conference on Food web dynamics and biogeochemical fluxes in the Arctic Ocean. January 21–26, 2007, Tromso, Norway.

www.arctic-frontiers.com

ERF 2007, November 4–8, 2007, in Providence, Rhode Island, USA. The Estuarine Research Federation is currently accepting proposals for scientific sessions and workshops for this meeting.

<http://www.erf.org/newsletter/Sp06-ERF07-CFS.html>

For more meetings and regular updates please also visit the LOICZ website www.loicz.org



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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 of Coastal Research at GKSS Research Centre which is part of the Helmholtz foundation.

LOICZ research as outlined in the science plan and implementation strategy is organised around five themes:

- Vulnerability of coastal systems and hazards to society
- Implications of global change for coastal ecosystems 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 from the LOICZ IPO.

Get involved

If you wish to contribute to LOICZ INPRINT please send an e-mail to: loicz.ipo@loicz.org and/or visit the LOICZ website www.loicz.org for article requirements.

If you have a project you would like to affiliate to LOICZ please go to www.loicz.org and click on projects for detailed information.

