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The SINCOS Project – Geosphere Ecosphere and Anthroposphere of the Holocene Southern Baltic Sea

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SINKING COASTS – GERMAN RESEARCH PROJECT COMPLETED

Sea level change has to be regarded as a global problem, particularly at sinking coasts where this process has to be integrated into long–term planning concepts for sustainable development of the coastal zone. Climatically and isostatically forced coastal regression is influencing the human population not only in present days. Even in early phases of cultural development human populations have been faced with marine transgressions and changes of climate and the natural environment and reacted by adjusting their economic systems, social structures, and communicative networks to the changing environment. Based on available historical records, the last millennium has been investigated intensively over years and is still targeted by ongoing national and international research projects.

In order to investigate longer termed trends (on the millennial time scale) of complex coastal processes and their description by cause/effect relations of the geo–/ecosystem and social environment, an interdisciplinary research project *Sinking Coasts—Geosphere Ecosphere and Anthroposphere of the Holocene Southern Baltic Sea (SINCOS)* has been carried out from 2002 to 2009, funded by the German Research Foundation.

The Baltic Sea has been selected as a model region because changes in crustal vertical displacement interacting with eustatically driven sea level rise and climatic–meteorological influence to coastal morphogenesis can be studied in an exceptional manner, here. No tides are masking the interaction of these processes in the Baltic Sea. In the southern Baltic area where sinking coasts cause permanent transgression of the sea, remnants of human settlements are preserved under water, recording the reaction of the human population living in the ancient coastal zones since Mesolithic times. The complexity of scientific questions raised with the research project did bring together geoscientists (geologists, geographers, geodesists), climatologists, biologists (palaeobotanists, dendrochronologists, archaeozoologists) and archaeologists from different universities and research institutes in the Baltic area and partners from overseas.

As study area served the southern coast of the Baltic Sea where the process of a retreating coastline initialized by the Littorina transgression about 8 000 cal. BP that shifted the environment from fresh water to brackish/marine conditions can be studied here directly in relation to global sea level rise. The results of the research programme have been presented at a workshop held at the Leibniz–Institute for Baltic Sea Research Warnemünde on May 14–15, 2009. Two main tasks have been targeted:

Acquisition and interpretation of proxy data

For the development of a model first, proxy data have been acquired in order to reconstruct the process and the effect of Litorina transgression within the research area. Data acquisition was mainly bound to fieldwork, i.e. sea and land expeditions. Here samples and information have been acquired which did provide the proxy data for the reconstruction of palaeoclimate, water level rise, neotectonic movements, coastal morphogenesis, and the palaeoecological and socio–economic development of the human population having lived along the palaeo–coastlines.

Modelling

The aim of the modelling procedures is twofold. On the one side, the palaeoenvironment have been reconstructed by the solution of inverse tasks. On the other side, models have been developed and used for the future projection of coastal formation. For both tasks numerical models had to be developed for cause/effect relations as well as methods of graphical display of coastal scenarios.

For the historical reconstruction a GIS approach was deployed to derive transgression–regression scenarios for the development of the Baltic Sea basin after the Litorina transgression. Regional and local models have been elaborated for the time span between 8 000 and 3 000 cal BP — a time of rapid sea level rise. As key areas for local models served the Wismar Bight, the Darss–Zingst Peninsula, and Rügen Island. For future projections of coastline scenarios models of vertical crustal displacement have been superimposed with sea level predictors. For the latter ones results from climate modelling based on IPCC greenhouse gas emission scenarios have been deployed. The results of coastline change simulation can be directly used for sustainable planning of coastal zone development. But, additional effort is to be spent in future studies to model coastal sediment dynamics on the centennial to millennial time scale.

The outcomes of the first work phase of the SINCOS project will be published in a special issue of the Reports of the Roman Germanic Commission (Harff, Lüth 2009). A second volume with the final outcomes of the project is in preparation. More information is available at http://www.sincos.org/.

Reference

Harff, J., Lüth, F. 2009. Sinking Coasts – Geosphere Ecosphere and Anthroposphere of the Holocene Southern Baltic Sea. *Berichte der Römisch Germanischen Kommission 88,* 2007 (2009).