

Changing Holocene coastal zones of the Baltic Sea – a history of interrelation between geological processes, changing climate and socioeconomic development

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Abstract

The Baltic Sea with the uplifting Baltic Shield and its surrounding subsiding areas provides an ideal field to study the interrelation of natural and anthropogenic processes on a time scale of millennia. Models and empirical data analysis are combined in order to study as well the history of coastline change in the Baltic area through the Holocene as also to elaborate future scenarios. The development of models that mirror the relation between driving forces and reactions of the geo/eco/socio-economic system at the sinking coast of the southern Baltic Sea on time scales of millennia requires the analysis of qualitative and quantitative variables. Cause and effect relations are described by different types of models, from multivariate statistical approaches to 4D model systems aided by GIS technology. These models are used for reconstructions of the history of the system and its components as well as for the derivation of a prognostic scenario of relative sea level change by forward modelling. Proxy-variables derived from geological, archaeological, and biological sampling along the southern sinking Baltic coast play a key role in the historical reconstruction by calibrating the models for forward modelling. Results are presented as series of elevation models as functions of time. Prognostic coast line scenarios, integrating IPCC assumptions, but also statistical analysis of climate data demonstrate possible implications for the future. The social effects of the changing coastlines are demonstrated by the interpretation of pre-historical and historical data as well as recent strategies in coastal protection.