DECADAL TO INTER-DECADAL SEA LEVEL VARIATIONS: AN ATTEMPT TO QUANTIFY THE FORCING FACTORS

H.-P. Plag
Norwegian Mapping Authority, Honefoss, Norway (plag@statkart.no)

Main factors contributing to coastal relative sea level variations at decadal to century time scales are (1) steric, i.e. changes in the volume of the sea water, (2) mass exchange with the continental cryosphere and hydrosphere, (3) post-glacial rebound, (4) local vertical movement of the crust, and (5) variations in the atmospheric circulation. The different forcing factors are associated with distinct spatial "finger-prints". First, these "finger-prints" are obtained from model predictions (General Circulation Models for steric effects, geophysical model for post-glacial rebound), theoretical fingerprint functions (for mass exchange with the cryosphere, where the static sea-level equation is used to compute the finger-print functions for the sea-level signal due to linear trends in the Antarctic and Greenland ice sheets), and observational data (steric effect, atmospheric circulation, local vertical land motion). Then, based on the large and global database of monthly mean sea level values collected at the Permanent Service for Mean Sea Level, an attempt is made to detect these "finger-prints" in the sea level trends observed at the tide gauges. For that, a complex regression model is used. For each forcing factor, a parameterised contribution is included in the regression. In an inversion, these parameters are determined for large sets of models and/or assumptions. Particular emphasis is on the correlation between the geographical "finger-print" patterns for the different forcing factors as sampled by the tide gauge locations. The correlation is found to be as high as 0.4 in some cases, thus hampering the separation of the different factors on the basis of the tide gauge data alone.