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Estimating the rates of regional sea level change from the Estonian tide gauges with different noise models

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Multi-decadal data series from the tide gauges along the Estonian coast in the Baltic Sea reveal spatially and temporally variable rates of mean relative sea level change, primarily due to the combined effect of ongoing postglacial land uplift and climate-driven sea level variations. Concurrently, the satellite altimetry data collected now over two decades allow to determine the linear trends of absolute mean sea level rise in the Baltic Sea with high spatial resolution.

The objectives of this research are to estimate the rates of relative sea level change by analyzing the longest time series (about 60...70 years) available from the network of Estonian tide gauges, and to compare these rates with the predictions from different land uplift (LU) and glacial isostatic adjustment (GIA) models. The results are further used to validate the regional trend of the Baltic Sea level rise from the time series of satellite altimeter missions.

Sea level observations exhibit temporal and spatial correlation, which sometimes are ignored in the estimation process of the rates of sea level change. Neglecting such correlations could have an impact on the estimated rates but also could cause an underestimation of the rate uncertainty. Different stochastic noise models were used in data analysis to quantify the noise properties of the sea level observations and the effect of temporal correlation on the estimated rates of mean relative sea level change.

Keywords: sea level rise, postglacial rebound, noise model, Baltic Sea