

Record breaking sea levels in Baltic Sea projections

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An ensemble of regional sea level projections for the Baltic Sea is analyzed to answer the following questions: Does climate change as it is predicted by climate models lead to a higher probability of record breaking sea levels in the Baltic Sea? Will record breaking sea levels occur less frequently if climate change follows a more ambitious socio-economic scenario with lower CO₂ emissions? We first show that the model ensemble is capable of reproducing the observed statistics for record breaking sea levels in the past. In spite of post-glacial land uplift, projected sea level rise will lead to rising mean sea level relative to land along most of the Baltic Sea coast, except for the Bothnian Sea and the Bothnian Bay where relative sea level keeps falling. Our first objective is to show that the probability for record breaking sea levels rises significantly in the Kattegat, Belt Sea, Sound and the southern part of the Baltic Sea, including the Gulf of Riga. Our second objective is to demonstrate that the higher year-to-year expectation of a record breaking event can be attributed to this long-term trend in the combined land uplift and mean sea level rise signal: If we subtract the 20-year low-pass filtered sea level rise, the number of record breaking events is not significantly different from the assumption of a stationary climate. That is, we rule out the alternative explanation that the more frequently occurring record events are caused by an increased short-term variability in the sea level signal, as it could result from changes in the local wind statistics due to climate change effects. Our analysis shows that record breaking sea levels are to be expected less frequently in the RCP2.6 scenarios than in the RCP8.5 scenarios.