

Regional Mean Sea Level Changes in the German Bight in the 20th Century

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Changes of global mean sea level and the possibility of future accelerations in global mean sea level rise are of outstanding relevance for both, scientific and public interest. Sea level is not expected to rise uniformly across the globe, but deviations on regional and local scale being the result of various processes are likely to occur. Here we address regional mean sea level changes in the German Bight, the south eastern part of the North Sea bounded by the Netherlands, Germany and Denmark. Changes are analyzed based on a homogenised data set from 15 tide gauges ranging back up to 1843 at maximum. Different methods for constructing a representative time series are employed ranging from simple arithmetic averaging to investigating the covariance structure of the data by means of empirical orthogonal functions. While some differences can be identified the methods provide broadly consistent results with long-term trends ranging from about 1.6 to 2.0 mm/yr depending on the period considered and with considerable inter-annual and inter-decadal variability superimposed. While rates of sea level rise are somewhat higher towards the end of the analysis period, they are comparable with those derived for earlier periods and no outstanding acceleration could be identified. While the long-term trend of the regional mean sea level in the German Bight appears to be comparable to the long-term global mean sea level rise, there are considerable deviations on inter-annual and decadal scales. The latter appears to be linked and can be largely explained by long-term changes and variability of the large scale atmospheric pressure fields. Using the techniques developed, presently an attempt is underway to consistently analyse tide gauges from all countries surrounding the North Sea to obtain a spatially more detailed picture of regional mean sea level changes in the North Sea.