



A novel tide gauge dataset for the Baltic Sea – Part 1: Spatial features and temporal variability of the seasonal sea level cycle

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In this contribution we present an integrated analysis of the coastal and open ocean seasonal mean sea level cycle in the Baltic Sea using tide gauge records, satellite altimetry observations, hydrographic profiles, and ocean reanalysis data. Within the project “AMSeL Baltic Sea”, which is funded by the German Federal Ministry of Education and Research (BMBF) from 2015 until 2018, the tide gauge database in the Baltic Sea is significantly improved, by collecting high resolution tide gauge records along the Baltic coastline with a focus on the southwestern part. Altogether we collected 160 tide gauge records with different temporal resolutions covering a period from 1777 (only Kronstadt) till 2015. Alone 64 tide gauges of these are located at the German Baltic coastline. The observation period exceeds 100 years for 28 stations. The longest record is Travemünde with 189 years of data. From this extensive database we calculate 121 monthly MSL records with a time series length of at least 19 years.

In this first part we use this comprehensive database to analyze the seasonal MSL cycle with its temporal and spatial variations along the Baltic coastlines. We also examine different gridded satellite altimetry products and compare them with the tide gauges to identify possible couplings/de-couplings between coastal sea level and seasonal variability in the basin interior. The analysis of observational data is further complemented with ancillary data from ocean and atmospheric reanalyses to identify possible contributors to the seasonal MSL cycle budget.