

DMI Report 22-18

Middelvandstand & Altimetri

**Final scientific report of the 2021 National Centre for Climate
Research Work Package 1.3.2**

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Kolofon

Serietitel

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1. Scientific summary

Brief description

Observation-based, independent sea level data sets are needed to validate sea level predictions from ocean and storm surge models. Tide gauge observations cover several decades back in time with an hourly (or higher) temporal resolution, but are confined to coastal areas. Satellite altimetry represents the opposite case: time series are shorter and the repetition times of satellite tracks are several days apart, but they cover the open ocean. Here, an experimental, observation-based, sea level product covering the Baltic Seas was developed, taking advantage of these complementary types of observations, by combining satellite altimetry, tide gauge observations and storm surge model error statistics into a 3-day product. This work was initiated in the ESA project Baltic+SEAL.

Results

- A one year experimental product for the year 2017 with a temporal resolution of 3 days was developed by combining satellite altimetry, tide gauge observations and model error statistics using the DMI Optimal Interpolation (DMI-OI) method.
- The resulting product captures the sea level variability well, although with regional and seasonal differences. Bias wrt. independent tide gauge observations is $\pm 5\text{cm}$ and a RMSE of 5-20cm.
- 2 stations have higher bias and RMSE due to holes in the observational record in 2017.
- Extreme sea level is not always captured both due to the temporal resolution of the product (3-day averages) filtering out the high variability and that the repetition time of the satellite tracks is larger than 3 days. Hence, the chance of a satellite tracks being in the right time and place to capture extreme sea level is small. Additionally, satellite tracks represent a snapshot in time and might not be representative for the whole 3-day period.
- Compared to a monthly mean satellite-only sea level product (also developed in the ESA project Baltic+SEAL) clearly shows the superiority of a product with a higher temporal resolution.

Status and Perspectives

- Working on a manuscript. Aims to submit well before summer.
- This is an experimental product meant to investigate whether an observation-based high temporal resolution (in this case 3-days) sea level product is realistic and show potential for further development.
- No concrete plans for further development or specific applications.

2. Scientific publication

A manuscript is planned for submission in summer 2022.