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Estimation of the potential value of given sea segments for certain time periods

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Since Gauss (1828), the theoretical shape of the Earth has been defined as a distinct potential surface of the gravity field that best fits the sea level at rest. The gravity field is described as a sum of spherical function series whose coefficients are calculated from satellite and in situ gravity measurements. Sea levels have been measured in harbours since the 18th century using mareographs, and are now often supplemented by data from nearby GNSS stations.

In our work, we developed a program to determine the potential value for a given height from mareograph data. This allows us to use the data available from the stations to determine what this value was in an earlier period as well. Furthermore, if more than one dataset is available for a particular sea segment, the average value for that sea over a certain period can be given.

We tested the method in the Japanese Sea, where we had data from 9 stations. These were averaged every 5 years and the resulting data were used to calculate the potential values, as well as the average value for the sea segment for the latest period 2016-2020. In the future, we plan to use this method to perform such calculations for more sites, which would also provide information on the effects of tectonics and global sea level change.

Gauss, C. F. (1828) *Bestimmung des Breitenunterschiedes zwischen den Sternwarten von Göttingen und Altona*. Vandenhoeck und Ruprecht, Göttingen, 84 p.

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