Master thesis project

The utilization of shipboard GNSS data

Research context. One of the most wonderful datasets in marine geoid modeling is offered by radar altimetry. These data have a very good spatial coverage and also a very homogenous spatial resolution compared to, e.g., shipboard gravity data. The only exception, however, are the coastal regions were altimeter data suffer from poor tropospheric corrections and a contamination of the recorded waveforms by land topography. In these regions, shipboard GNSS can take over. These data are routinely acquired during bathymetric surveys by the Hydrographic Service of the Royal Netherlands Navy but have never been utilized for geoid computations. Another new application of shipboard GNSS measurements of the instantaneous sea surface heights is the validation and calibration of models used to predict storm surges. So far, the model validation calibration relies on tide gauges. These instruments are, however, mostly located along the coast. Radar altimetry cannot help here as these data lack sufficient temporal resolution. Shipboard GNSS data do not have this problem and are also acquired in various parts of the model domain were no tide gauge data are available. Hence, their use for storm surge model validation/calibration is very attractive.

Purpose of the research. The primary objective of this research is to assess the added value of shipboard GNSS data for geoid computations and storm surge model validation/calibration. Three parts are considered. First, the student needs to develop and evaluate a proper processing methodology of the data including a data editing strategy. In this part, you will also conduct a thorough validation of the data by using nearby tide gauges and/or radar altimeter data sets. In the second part, the added value of using these data in geoid computations will be assessed by computing and validating a geoid for the North Sea area. The last part comprises a thorough comparison of the observed instantaneous water levels with water levels obtained from a high-resolution storm surge model. Furthermore, the possibilities to assimilate the data into the model will be explored.

Supervision. The work will be partly performed at the chair of Physical and Space Geodesy, partly at the chair of Mathematical Geodesy and Positioning, partly at the Hydrographic Service of the Royal Netherlands Navy, and partly at Deltares in Delft under the daily supervision of, respectively, Cornelis Slobbe, Hans van der Marel, John Loog, and Martin Verlaan.

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