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GNSS-based SSH observations from ships combined with satellite altimetry and tide gauge readings

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Geoscientists and many parts of society rely on precise information of the sea surface height (SSH) and its temporal behavior. Satellite altimetry and tide gauges are the standard source for SSH measurement data. Different studies demonstrated how ships can be used to gather additional SSH observations. These three techniques have their individual pros and cons in case of e.g. spatial and temporal resolution. It is most likely that combined solution, using all available sensors can improve the quality of models.

Four ships will be used for measuring the SSH within a project at the Jade University in Oldenburg. The ships, two ferries and two research vessels, are operated in the German Bight of the North Sea. The resulting measurements will be integrated into a multi-technique model that will combine all three data types. The tidal parameters will be estimated for a grid while coastlines and islands are taken into account during grid generation. Since the number of unknowns is related to the number of grid knots, the normal equation system is usually underestimated. Hence auxiliary constraints have to be introduced to ensure the resolvability of the normal equation system.

In this contribution the necessary processing steps - from GNSS observations aboard a ship to an instantaneous SSH - will be shown. A first approach for the combination method will be explain and first results of this multi-technique model will be presented.