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Shipborne Gravimetry Data Processing: Case Studies in the Baltic Sea and North Sea using GNSS-derived kinematic vertical accelerations

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Shipborne gravimetry is an essential technique in measuring the Earth's gravity field in the coastal and offshore areas. It has advantages of providing high-accuracy and high-resolution measurements in coastal areas compared to other techniques (e.g., satellite gravimetry, airborne gravimetry, and altimetry). However, data processing strategies have to be adapted based on the characteristics of the gravimeter and quality of the measurements since the gravity measurements are dominated by high-frequency noise depending on the environmental conditions. In this contribution, we investigate case studies from our shipborne campaigns in the Baltic Sea and North Sea where we examine the most suitable data processing strategies using GNSS-derived kinematic vertical accelerations and cross-over point analyses to eliminate disturbing accelerations and deliver high quality Chekan-AM gravity measurements. Special attention is paid to the characteristics of the disturbing accelerations, namely seiches and squat effect in the shallow waters which degrade the quality of the gravity measurements and have to be removed. We identified that the GNSS-derived kinematic vertical accelerations can help to improve the shipborne gravimetry results in particular areas in the Baltic Sea. Final products of shipborne gravimetry measurements are successfully used to verify the previous gravimetry data and improve the current geoid models in the Baltic Sea and North Sea.