

Refinement of gravimetric quasigeoid modelling in the Gulf of Finland using SWOT-derived geoidal height constraints: contribution to the NKG2026 project

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A significant multinational effort has been dedicated over several decades to gravimetric quasigeoid modelling in Northern Europe, with the most recent regional models being NKG2015 and BSCD2000. A new NKG2026 project has now been initiated. The planned quasigeoid modelling benefits from marine gravity data collected during the FAMOS/BSCD2000 and subsequent BalMarGrav projects. However, further improvements in gravity data quality and spatial coverage are still required in some areas, with one of the most critical being a large gravity data void in the eastern Gulf of Finland. Due to restrictions in that area, a gravity data patch was synthesised from the GO_CONS_GCF_2_DIR_R5 global geopotential model, evaluated to spherical harmonic degree and order of 240, for the NKG2015 project and later adopted during the FAMOS/BSCD2000 project. Recent comparisons with a SWOT-derived geometric geoid surface have revealed discrepancies of up to approximately 2 dm within the patch region in the NKG2015 and BSCD2000 models. Therefore, an improved and better-tuned gravity data patch is required, the derivation of which is the focus of this study. Alternative patches are derived from available global models and evaluated through comparisons with gravity observations, GNSS-levelling control points, and SWOT-derived geometric geoid estimates. The quality of the alternative patches is further assessed through their impact on gravimetric quasigeoid modelling. It will be demonstrated that SWOT-derived geometric geoid estimates can provide valuable constraints for refining gravimetric models offshore, serving a role analogous to conventional GNSS-levelling control points in quasigeoid model validation.