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Geophysical subsurface modelling based on the updated, enhanced regional gravity field solution in Antarctica

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The gravity field reflects mass inhomogeneities (mostly) inside the Earth. Therefore, gravity inversion and geophysical gravity field modelling are important tools to study the Earth's inner structure and tectonic evolution. In Antarctica, it is extremely challenging to carry out geoscientific studies due to its harsh environment and difficult logistics. Additionally, the continent is covered by an up to 5 km thick ice sheet. However, in the framework of IAG Subcommission 2.4f “Gravity and Geoid in Antarctica” (AntGG) a large database of airborne, shipborne and ground based gravity data has been compiled. Especially airborne data have been acquired during recent years, among others in the area of the polar gap of satellite gravity data. Now, in a joint project funded by the German Research Foundation (DFG) all existing and new gravity data were processed to infer an enhanced gravity field solution for Antarctica (see contribution by Scheinert et al., session G1.5). Processed data e.g. gravity disturbances on the ground or a constant height and other functionals will be provided on a regular grid with 5 km grid spacing. Subsequently, the new Antarctic gravity field solution can now be used for further geophysical and tectonic studies. We use the newly calculated gravity disturbances to study subglacial topography, sediment thickness and Moho depth and to improve respective existing models in Antarctica. For this, we apply 2D Parker-Oldenburg inversion in combination with results from other gravity based studies and further constraining data (e.g. seismic data and ice penetrating radar). We investigate how the higher resolution (5 km) of the new Antarctic gravity field solution facilitates the study of smaller regions in more detail, specifically parts of Wilkes Land, Dronning Maud Land and the Weddell Sea. Additionally, we will infer accuracy estimates for the resulting boundaries in terms of the used inversion parameters (density contrast, average density and filter wavelengths) and their respective gravity signal. Thus, the challenges of gravity field inversion in Antarctica will be discussed in detail and first results of the subsurface modelling will be presented.