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# GOCE gravity gradient data for lithospheric modeling and geophysical exploration research

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GOCE gravity gradient data can improve modeling of the Earth's lithosphere and upper mantle, contributing to a better understanding of the Earth's dynamic processes. We present a method to compute user-friendly GOCE gravity gradient grids at mean satellite altitude, which are easier to use than the original GOCE gradients that are given in a rotating instrument frame. In addition, the GOCE gradients are combined with terrestrial gravity data to obtain high resolution grids of gravity field information close to the Earth's surface. We also present a case study for the North-East Atlantic margin, where we analyze the use of satellite gravity gradients by comparison with a well-constrained 3D density model that provides a detailed picture from the upper mantle to the top basement (base of sediments). We demonstrate how gravity gradients can increase confidence in the modeled structures by calculating the sensitvity of model geometry and applied densities at different observation heights; e.g. satellite height and near surface. Finally, this sensitivity analysis is used as input to study the Rub' al Khali desert in Saudi Arabia. In terms of modeling and data availability this is a frontier area. Here gravity gradient data help especially to set up the regional crustal structure, which in turn allows to refine sedimentary thickness estimates and the regional heat-flow pattern. This can have implications for hydrocarbon exploration in the region.