Geophysical Research Abstracts
Vol. 21, EGU2019-13324, 2019
EGU General Assembly 2019

Subduction zone model from satellite gravity gradients: case study Sumatra

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Satellite-derived gravity gradient models can provide new insights with respect to traditional seismic and tomographic models, to the geometry and density distributions of subducting plates. These data have been used in modelling of several different subduction zones, but not yet for the Sumatra subduction zone, because of its particular complex geometry. There, the gradients can shed light on the density distribution of the plate, and whether a highly-debated slab tear is present under northern Sumatra.

The WINTERC 3.2 model is used as an initial model for the density distributions of the region around Sumatra. A synthetic slab is created using a top-slab surface model combining information from SLAB1.0 and tomography models. The slab is modelled as a bilinear deforming slab with along-dip varying thickness and density and along-strike voxels. Furthermore, we include a slab conduction model to determine the 3D density structure of the slab and an isostatic compensation model for the density in the mantle. A spectral forward modelling method is used to identify signals related to the slab. Spectral analysis will determine the optimal spherical harmonic bandwidth that contains most of the slab signal. A sensitivity analysis is performed to quantify the error in the used models (e.g. Moho depths) and their implications on the final slab model.

This research is part of the ESA's Support to Science Element: 3D Earth – a Dynamic Living Planet