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Data-driven forward modeling using a direct search approach

Tobias Baumann¹, Boris Kaus¹, Dave May¹

¹*ETH Zurich, Institute of Geophysics, Zurich, Switzerland*

tobias.baumann@erdw.ethz.ch

The inversion of a geophysical data set like gravity is known to be a highly non-unique problem. We combine a direct-search inversion technique (Neighborhood algorithm, [1]) with numerical forward models. This is done in order to derive models that are geodynamically consistent, which has two main benefits: Both, parameters of the structure and rheology can be constrained in a least-square sense. Moreover, the geodynamical consistency of the models helps to curtail ambiguities of the inversion results. In this work we employ a FD staggered grid mechanical stokes code to perform the forward modeling for two synthetic setups. Besides the gravity signal of the models we use surface velocities as a second data set to mimic GPS derived plate velocities.

References

[1] Sambridge, M. (1999), Geophysical inversion with a neighbourhood algorithm – I. Searching a parameter space, *Geophys. J. Int.*, 138, 479-494.