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Euler deconvolution in satellite geodesy

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Euler deconvolution—a standard tool of geophysical prospection—was used first for the evaluation of magnetic field data. However, since the 1990s, research started on the aspect that it is possible to apply Euler deconvolution also to terrestrial or airborne measured gravity gradiometry data.

In this approach, we investigate if the Euler deconvolution is also applicable to GOCE gravity gradiometry data and if the results of the Euler deconvolution can be used for geodetic or geophysical purposes. Knowledge about locations of mass anomalies might help to improve geoid models. But further research is necessary.

The Euler deconvolution makes use of Euler's theorem of homogeneous functions in order to estimate the unknown coordinates of the location of some magnetic or gravity anomaly. Commonly, for prospection purposes the Euler deconvolution is conducted by means of the least squares model (LS). In this model, the measured gravity gradients are put into the design matrix. However, as measured quantities usually are erroneous, this error is also introduced to the estimated coordinates of the anomaly.

A more geodetic approach to solve Euler's equation would be the total least squares model (TLS). Its advantage is that measured quantities are considered to be unknowns as well, hence the errors in the measured data is considered as well. First results show that the TLS solutions are more lumped in comparison to the LS solutions.