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Cross-overs for evaluating GOCE gravitational gradients

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ESA's Gravity field and steady-state Ocean Circulation Explorer GOCE determines the earth's gravity field with unprecedented accuracy and spatial resolution.
In 2011, the third generation of the official GOCE gravity field models has been released. ESA has implemented a new data processor for the determination of GOCE gravitational gradient products and the GOCE mission lifetime is extended until the end of 2012. So far the mission is a big success and shall further be exploited in an optimal way.
Beyond the original goal of determining a static gravitational field, more possible applications and even approaches to the study of time-varying effects in the GOCE gravitational data are investigated at present. In all applications, data quality remains of paramount importance. To ensure the high quality of the GOCE products, a variety of validation and calibration approaches is applied to both 'raw' measurement quantities and GOCE gravity field solutions. For the quality assessment of the 'raw' measurements, especially the GOCE gravitational gradients, the cross-over approach has been developed. It is an independent approach in which almost exclusively GOCE measurements are used and which is based on the comparison of measured gravitational gradients in satellite track cross-overs.
To enable the comparison of two three-dimensional measurements, namely the gravitational gradient tensors, these have to be transformed into the same coordinate system. Which preprocessing steps are necessary to allow for tensor rotation, how the results of the cross-over approach look like and which data quality the GOCE gravitational gradients really reach, are discussed in this paper here.