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The New GFZ EIGEN-GRACE06S Gravity Field Model Time Series

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Since launch of the GRACE Mission in March 2002, numerous global gravity field model time series have been published by different processing centers. They are used by a large number of geoscientists worldwide to investigate time-varying mass variation phenomena in the system Earth such as continental hydrology, ice mass change, post-glacial rebound or ocean mass variations. The different time series can be distinguished in unconstrained and constrained (e.g. by regularization, Kalman Smoother, etc.) solutions. Their temporal resolution varies from monthly over weekly or 10-day down to daily; their spatial resolution decreases with increasing temporal resolution from spherical harmonic degree and order 120 ($\sim$167km) down to degree and order 30 ($\sim$667km). However, the actual maximum spatial resolution is even worse as the solutions are affected by a large noise level, typically dominated by spurious N-S striping artefacts, which requires filtering and/or de-striping techniques by the users for further analysis.

The German Research Center for Geosciences (GFZ) as part of the GRACE Science Data System (SDS) is routinely processing its current EIGEN-GRACE05S (or RL04 in the SDS nomenclature) time series since end of 2006. This time series comprises unconstrained monthly solutions till degree and order 120 as well as unconstrained weekly solutions till degree and order 30. Using updated background models and modified processing standards, a consistently reprocessed time series of the complete GRACE mission called EIGEN-GRACE06S (RL05) will be provided by GFZ within the next few months. A first test year (2008) of preliminary unconstrained monthly RL05 solutions already indicates a notable noise reduction (25%-30%) compared to RL04.

In order to further improve the temporal resolution it is planned to derive daily gravity field products based on localized base functions and a Kalman Smoother which can then be applied for enhanced de-aliasing of the monthly solutions. In combination with a decorrelation of the GRACE K-band range-rate residuals w.r.t. the daily solutions, an alternative time-series of constrained monthly solutions with a significantly reduced noise level is planned to be provided as an alternative GFZ RL05 product.

The presentation will focus on the final test results of the unconstrained RL05 solutions and the comparison of these results with the latest results of the constrained solutions.