Towards combined global monthly gravity field solutions

Adrian Jaeggi (1), Ulrich Meyer (1), Gerhard Beutler (1), Matthias Weigelt (2), Tonie van Dam (2), Torsten
Mayer-Gürr (3), Jakob Flury (4), Frank Flechtner (5), Christoph Dahle (5), Jean-Michel Lemoine (6), and Sean
Bruinsma (6)

(1) University of Bern, Astronomical Institute, Berne, Switzerland (adrian.jaeggi@aiub.unibe.ch), (2) Université du
Luxembourg, Geophysics Laboratory, Luxembourg, Luxembourg, (3) Technical University of Graz, Institute of Theoretical
Geodesy and Satellite Geodesy, Graz, Austria, (4) University of Hannover, Institute of Geodesy, Hannover, Germany, (5)
German Research Centre for Geosciences, Potsdam, Germany, (6) Centre National d'Etudes Spatiales, Toulouse, France

Currently, official GRACE Science Data System (SDS) monthly gravity field solutions are generated independently by the Centre for Space Research (CSR) and the German Research Centre for Geosciences (GFZ). Additional GRACE SDS monthly fields are provided by the Jet Propulsion Laboratory (JPL) for validation and outside the SDS by a number of other institutions worldwide. Although the adopted background models and processing standards have been harmonized more and more by the various processing centers during the past years, notable differences still exist and the users are more or less left alone with a decision which model to choose for their individual applications. This procedure seriously limits the accessibility of these valuable data.
Combinations are well established in the area of other space geodetic techniques, such as the Global Navigation Satellite Systems (GNSS), Satellite Laser Ranging (SLR), and Very Long Baseline Interferometry (VLBI). Regularly comparing and combining space-geodetic products has tremendously increased the usefulness of the products in a wide range of disciplines and scientific applications. Therefore, we propose in a first step to mutually compare the large variety of available monthly GRACE gravity field solutions, e.g., by assessing the signal content over selected regions, by estimating the noise over the oceans, and by performing significance tests. We make the attempt to assign different solution characteristics to different processing strategies in order to identify subsets of solutions, which are based on similar processing strategies. Using these subsets we will in a second step explore ways to generate combined solutions, e.g., based on a weighted average of the individual solutions using empirical weights derived from pair-wise comparisons. We will also assess the quality of such a combined solution and discuss the potential benefits for the GRACE and GRACE-FO user community, but also address minimum processing requirements to be met by each analysis centre to enable a meaningful combination (either performed on the solution level or, preferably, on the normal equation level).