



On the computation of trends from GRACE monthly gravity solutions

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In the past years it was shown in numerous publications that it is possible to compute physically rather plausible trends from the series of GRACE monthly gravity solutions at least for some regions of the Earth. However, some of the results found in the literature are divergent and the question, how to perform this computations properly was not investigated in much detail. In order to obtain physically interpretable results from GRACE data, several aspects influence the results. One is the required preprocessing of the GRACE-based gravity functionals respectively surface mass data in order to counteract spurious gravity signals showing up as striping features in spatial grids of the functionals. To this end isotropic and anisotropic filtering techniques are applied, causing a dampening of signal amplitudes and possibly introducing additionally phase shifts through leakage effects from signals outside the region of interest, which both affect the estimate of the trend. Another is the recovery and removal of periodic terms to get access to the trend signals. Usually some periods (like annual and semi-annual related to the astronomical year) are postulated, and only the amplitudes and phases are estimated simultaneously with the trend. However, such prescribed periods may not allow for an adequate representation of the to be removed processes, which in most cases are climatologically driven (like e.g. hydrology) and reveal significant spatial variability of the process amplitudes, phases and periods. Therefore a better alternative may be to determine also the periods of seasonal signals along with their amplitudes and phases simultaneously with the trends to get more reliable estimates of the latter. This contribution sheds some light onto these problems on the basis of results obtained using current GRACE-RL04 model data, which clearly demonstrate

the impact on estimated trends from distinct selections of a priori periods, and it also presents an enhanced methodology for a consistent determination of trend signals from GRACE-based data.