



GRACE induced mass changes over continental and marine areas and correlations with rain-gauge data and oscillation indexes

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GRACE mission provides time-variable gravity observations which enable the interpretation of dynamic effects related to hydrology, geodesy, oceanography and solid earth sciences. This work deals with the dynamic effect of water mass redistribution in the northern part of the Atlantic Ocean and over Europe, in order to examine water mass changes from GRACE observations. Firstly, the appropriate Release 4 GRACE models are selected as well as a static field which is essential for creating geoid height (Δ) differences with GRACE monthly models. These differences are necessary for the determination of the water mass redistribution over the land and the ocean. Unfiltered GRACE models from GFZ and CSR exhibit the known stripping patterns in the determined time-variable gravity fields. For this reason, filtered models are used, which allow the comparison between three decorrelation filters DDK1, DDK2 and DDK3. The filter DDK1 from GFZ was selected as the most rigorous one, since it provides high accuracy, low correlation and relatively high degree of expansion. With respect to the static field, the one which led to the smallest Δ differences was determined as the average of the geoid heights of all the available GRACE monthly models of Release 4, until April 2011. Moreover, the standard deviations and mean values of water mass redistribution calculated by GRACE over the 2002-2011 period are compared with the NAO, SOI and MOI oscillation indices to induce correlations between GRACE water mass variations and climatic phenomena such as El Niño and La Niña. Furthermore, hydrological models based on in situ rain-gauge data from the Global Precipitation Climatology Centre (GPCC) are used in order to calculate variations for continental water storage in the two areas under study. The results of the hydrological models are then compared with GRACE water mass redistribution, along with the calculation of the correlation coefficient. The correlation between satellite and rain-gauge data is relatively small due to a time-lag of GRACE data.