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Global high-resolution crustal deformations from simulated terrestrial water storage estimates

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Deformations of the continental crust due to non-tidal loading caused by variations in atmospheric pressure, ocean bottom pressure and terrestrially stored water frequently reach several mm at subdaily to seasonal periods. Space-geodetic receivers attached to the crust therefore experience positional changes that are large enough to affect epoch-wise parameters obtained from the analysis of global geodetic networks.
In this contribution, we present predictions of loading deformations due to terrestrial water storage from the global hydrological model LSDM for the last two years. Load estimates are calculated daily in order to account together with the seasonal variations in terrestrial water storage also for rapid changes associated with major precipitation events. Additionally, we account for water mass anomalies stored within the river channels as they induce exceptionally high loading amplitudes at stations close to river banks, in many cases with distinct non-seasonal nature. We demonstrate the potential of using high spatial resolutions in particular at the GPS station in Manaus where loading calculations with lower resolutions fail so far to capture the observed amplitude of 0.5m in the vertical.
In addition to the hydrological loading, global-scale deformations are also calculated for non-tidal atmospheric and oceanic loads to obtain a complete set of model-based global deformation fields that might be compared to GPS time series at specific stations of interest. Those atmospheric and oceanic fields are based on ECMWF and OMCT simulations which are also the background for the GRACE AOD1B products. This might principally allow to further homogenize the processing strategies among the geometric and the gravimetric techniques in Global Geodesy.