



Improvements of GNSS solutions by applying environmental loading corrections at the observation level

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The water cycle driven environmental mass load (non-tidal atmospheric / ocean loading and continental water storage loading) induces elastic displacements on Earth surface and gravitational impact on satellite orbits. These non-linear displacements have an impact on the GNSS geodetic stations' locations and on other global geodetic parameters, e.g., Geocenter coordinates, Earth orientation parameters (EOP) and more. We reprocessed 15 years (2000-2014) of GNSS data and generated daily and weekly solutions (consistent with ITRF2014). The GFZ loading models have been applied at the observational level during the analysis. We found that the annual Geocenter signal (over 80% of the x and y components) can be explained by the environmental loading. Variations at the tens of micro-arc-second level of EOP is contributed from loading. The minor influences of the environmental loading displacements at the orbit height is validated and presented. More than 80% of the station coordinate time series benefit from correcting for the environmental loading and show reduced WRMS.