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Comparison of ITRF2020 residual displacements with environmental loading models

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Abstract. All geodetic techniques have been reprocessed since the 1980s for SLR and VLBI and the 1990s for DORIS and GNSS in order to compute the latest realization of the International Terrestrial Reference Frame ITRF2020 (https://itrf.ign.fr/en/solutions/ITRF2020). Besides ocean tide loading, no environmental loading corrections have been applied, following the IERS conventions.

The IERS Global Geophysical Fluid Center has provided atmospheric, induced oceanic and hydrological loading estimates for all permanent stations based on the latest ECWMF reanalysis (ERA5) and the barotropic ocean model TUGO-m (http://loading.u-strasbg.fr/ITRF2020/).

In this paper, we present a comparison of the ITRF2020 residual displacements to environmental loading estimates, and in particular for GNSS because of their higher sampling rate (daily instead of weekly). In more details, we show that ERA5 is slightly better than MERRA2 (Modern-Era Retrospective Analysis for Research and Applications, Version 2) reanalysis. We also show that a dynamic ocean response to pressure and wind is more suitable to model high frequency ocean non-tidal loading effects than the classical inverted barometer (IB) approximation.