



Current topic for a Master's Thesis

Precise orbit determination based on xTRF20xx solutions

The International Terrestrial Reference System (ITRS) and its realization, the International Terrestrial Reference Frame (ITRF), serves numerous geoscientific disciplines as primary reference to locate space-based and terrestrial observations on Earth. The ITRF is also crucial for various societal needs and is required for the precise orbit determination (POD) of any near-Earth satellite. In 2022/2023, three ITRS realizations (xTRF2020), namely the ITRF2020 (by IGN, France), the DTRF2020 (by DGFI-TUM, Germany) and the JTRF2020 (by NASA JPL, USA) were published. These realizations were derived by three institutions using identical but different combination approaches. In the first two realizations, station positions and velocities at a reference epoch as well as consistent Earth orientation parameters and corrections to the station positions are provided. The corrections are provided as a post-seismic deformation (PSD) model, annual and semi-annual corrections and a geocenter motion model for ITRF2020. For DTRF2020, they are provided as discrete PSD correction time series and atmospheric, oceanic, and hydrological non-tidal loading (NTL) time series. In the third realization, a time series of station positions is provided. These realizations are the successors of the previous xTRF2014 solutions (cf. figure). IGN also published ITRF2008, ITRF2005 and ITRF2000 whereas DGFI-TUM published DTRF2008 in the past. Recently, all three institutions are working on updates of the xTRF2020 solutions.

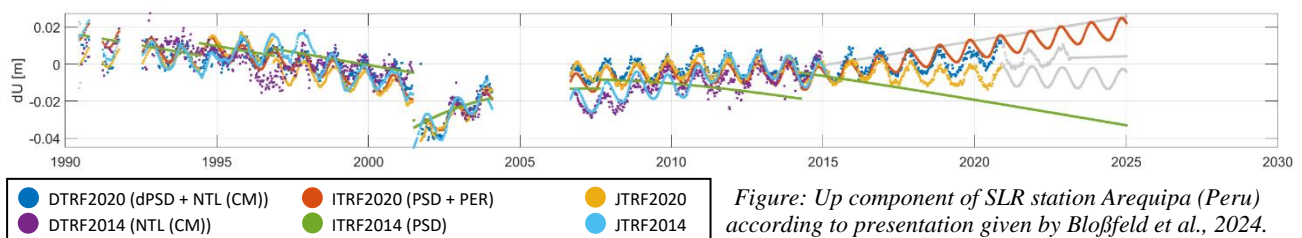


Figure: Up component of SLR station Arequipa (Peru) according to presentation given by Bloßfeld et al., 2024.

An analysis and comparison of the station position time series of any xTRF20xx solution shall be performed. Moreover, POD results for selected satellites based on the different xTRF20xx solutions shall be compared and systematics in the orbit differences shall be investigated.

Main tasks:

- Analysis and comparison of station position time series of any xTRF20xx solution for different space-geodetic techniques such as SLR (Satellite Laser Ranging) and DORIS (Doppler Orbitography and Radiopositioning Integrated by Satellite).
- POD for selected near-Earth satellites tracked by SLR and DORIS based on the different xTRF20xx solutions analyzed before.
- Quantification, investigation, and interpretation of the obtained orbit differences caused by the different xTRF20xx solutions.

References:

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