

EGU24-16188, updated on 18 Feb 2025
<https://doi.org/10.5194/egusphere-egu24-16188>
EGU General Assembly 2024
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Copernicus POD Service – Impact of ITRF2020 Modelling Changes on Orbit and Validation Results

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The new ITRF20 includes a geocenter motion (GCM) model and seasonal station corrections, both with annual and semi-annual periods. The GCM model is recommended to be applied when processing space-geodetic observation data and the seasonal station corrections should be applied if no non-tidal modelling is applied for the station coordinates. In the case of the Copernicus Precise Orbit Determination (CPOD) Service this applies to the processing of GNSS data of the Sentinel satellites for precise orbit determination (POD) and to the processing of Satellite Laser Ranging (SLR) tracking data for validation of the estimated Sentinel orbits.

The CPOD Service delivers, as part of the Ground Segment of the Copernicus Sentinel-1, -2, -3, and -6 missions, orbital products and auxiliary data files for their use in the corresponding Payload Data Ground Segment (PDGS) processing chains at ESA and EUMETSAT, and to external users through the newly available Copernicus Data Space Ecosystem (<https://dataspace.copernicus.eu/>). It generates routinely several types of orbital products for Sentinel-1, -2, -3 and -6: predictions, near-real time (< 10 min), short-time critical (< 1.5 days) and non-time critical (< 25 days).

The POD quality control within the service is based on comparing the CPOD orbit products to orbit solutions provided by members of the accompanying Copernicus POD Quality Working Group (QWG). A combined orbit generated by CPOD from all available orbit solutions serves as reference for the comparisons. The new ITRF20 modelling opens the door to different Centre-of-Network (CoN) or Centre-of-Mass (CoM) frame realisations, so in order to avoid inconsistencies between the solutions when doing the combination and comparisons, special care must be taken.

This study aims to analyse the impact of the new ITRF20 GCM model and the seasonal station corrections on the CPOD Service products. Sentinel orbit comparisons and the corresponding processing metrics are analysed when applying the GCM model or not, with a focus on the geocenter motion modelling used by the different CPOD QWG centres.

In the SLR validation, station range biases are routinely estimated as part of the residuals analysis. Preliminary results reveal that the estimates of these range biases show smaller seasonal

variations when applying the seasonal station corrections. Detailed analyses will be shown and discussed.