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Copernicus Sentinel Orbit Validation – Investigations on systematic geographical differences

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The Copernicus POD (Precise Orbit Determination) Service delivers, as part of the PDGS of the Copernicus Sentinel-1, -2, and -3 missions, orbital products and auxiliary data files for their use in the corresponding PDGS processing chains. The precise orbit results from the three missions are validated based on orbit comparisons to independent orbit solutions from member of the Copernicus POD Quality Working Group (QWG). In the case of Sentinel-3 a validation based on satellite laser tracking (SLR) measurements is also possible. The orbit comparisons are done based on orbit time series. Typically, only daily RMS metrics are derived, and its time-series mean and standard deviation are provided. Another possibility is to analyse the dependence of orbit differences with geographical differences; this is already done for the altimeter satellites to guarantee long-term stability of the orbit solutions.

Geographical orbit differences may reveal systematics due to, e.g., different background models or different geocenter motion models used in the orbit determination process. The geographical orbit differences of all six satellites and from all POD QWG contributions are analysed and checked for model- or satellite-specific systematics to improve the orbit quality and long-term stability.

Additionally, it is proposed to analyse the orbit differences (with respect to other orbital solutions, either reduced-dynamic or kinematic) with Fourier transformation, in order to derive amplitude vs. frequency plots. This could provide light into the sub-daily differences. The Fourier analysis of the sub-daily differences will be assessed for all the six satellites.