



## **The Copernicus POD Service and beyond: Scientific exploitation of the orbit-related data and products**

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The Copernicus POD (Precise Orbit Determination) Service is part of the Copernicus Processing Data Ground Segment (PDGS) of the Sentinel-1, -2 and -3 missions. A GMV-led consortium is operating the Copernicus POD Service being in charge of generating precise orbital products and auxiliary data files for their use as part of the processing chains of the respective Sentinel PDGS. The orbital products are available through the dedicated Copernicus data hub.

The Copernicus POD Service is supported by the Copernicus POD Quality Working Group (QWG) for the validation of the orbit product accuracy. The QWG is delivering independent orbit solutions for the satellites. The cross-comparison of all these orbit solutions is essential to monitor and to improve the orbit accuracy because for Sentinel-1 and -2 this is the only possibility to externally assess the quality of the orbits.

Each of the Sentinel-1, -2, and -3 satellites carries dual-frequency GPS receivers delivering the necessary measurements for the precise orbit determination of the satellites. The Sentinel-3 satellites are additionally equipped with a DORIS (Doppler Orbitography and Radiopositioning Integrated by Satellite) receiver and a Laser Retro Reflector for Satellite Laser Ranging. These two additional observation techniques allow for independent validation of the GPS-derived orbit determination results and for studying biases between the different techniques. The scientific exploitation of the orbit determination and the corresponding input data is manifold. Sophisticated satellite macro models improve the modelling of the non-gravitational forces acting on the satellite. On the other hand, comparisons to orbits based on pure empirical modelling of the non-gravitational forces help to sort out deficiencies in the satellite geometry information. The dual-frequency GPS data delivered by the satellites can give valuable input for ionospheric studies important for Space Weather research. So-called kinematic orbits, being a time series of discrete satellite positions derived from GPS, may be used for the modelling of the time-variable low degree harmonics of the Earth's gravity field. This is very important to support filling the possible gap between the dedicated gravity field missions GRACE and GRACE Follow-on. Many other important research topics could be mentioned here as well. Therefore a broad scientific community could benefit of an open access not only to the operational orbits (which is partially available today), but also to the GPS observations, satellite attitude and other ancillary information to perform POD.

This poster presents firstly the status of the Copernicus POD Service in terms of products generated, accuracy and timeliness of the operational orbital products and all potential inputs available. Then the main focus of the poster is to outline the possibilities for scientific exploitation of the orbit determination and the corresponding input data. The great scientific potential of these data is explained to confirm the need of making them publicly available for scientists.