

# COPERNICUS POD SERVICE OPERATIONS – ORBITAL ACCURACY OF SENTINEL-1A AND SENTINEL-2A

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The **Copernicus POD (Precise Orbit Determination) Service** is part of the **Copernicus PDGS Ground Segment** of the Sentinel missions. A GMV-led consortium is operating the Copernicus POD Service (CPODS) 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 POD core of the CPODS is **NAPEOS** (Navigation Package for Earth Orbiting Satellites) the leading ESA/ESOC software for precise orbit determination, in whose development GMV has participated along the last 15 years. The careful selection of models and inputs is important to achieve the different but very demanding requirements in terms of **orbital accuracy** and **timeliness** for the Sentinel -1, -2 & -3 missions. The three missions require orbital products in Near Real Time (**NRT**), with latencies as low as 30 minutes, in Short Time Critical (**STC**), with latencies of 1.5 days and in Non-time Critical (**NTC**) with latencies of 20-30 days. The **accuracy** requirements are very challenging, targeting **5 cm** in 3D for Sentinel-1 and **2-3 cm** in radial direction for **Sentinel-3**.

The first Sentinel satellite, **Sentinel-1 A**, has been launched in April 2014. The CPOD Service is running since the first data got available from the satellite. After the end of the Commissioning Phase in September 2014, the CPOD Service turned into operational mode by first of October, providing routinely the required orbital products. In June 2015 **Sentinel-2A** will be launched and **Sentinel-3A** is expected to be launched in the last quarter of 2015, so by end of 2015, the Copernicus POD Service will be operating three Sentinel satellites simultaneously.

The Copernicus POD Service is supported by the **Copernicus POD Quality Working Group** (QWG), which consists of several LEO POD experts. Independent orbit solutions generated by this group using different POD software packages (Bernese GNSS Software, Ghost and NAPEOS) are used to validate the CPOD results. A combined orbit solution is generated to validate the CPOD solution as well as the other orbit solutions. Recommendations from the QWG guarantee that the Copernicus POD Service is updated following state-of-the-art algorithms, models and conventions.

**This paper describes the physical models and strategies used by the different POD SW packages used by CPODS and the Copernicus POD QWG members to compute the precise orbital products of Sentinel-1A and Sentinel-2A. It will also present the strategy used to prepare a combined orbital solution followed by an analysis of the differences found among the different orbital solutions;** in particular systematic biases and differences in the different orbit solutions. Finally the preparations and recommendations for the altimetry mission Sentinel-3A will be discussed.