

# Copernicus POD Service – overview and status

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Jaime Fernández (1)  
Marc Fernández (1)  
Heike Peter (2)  
Pierre Féménias (3)

(1) GMV AD., Tres Cantos, Spain  
(2) PosiTim UG, Seeheim-Jugenheim, Germany  
(3) ESA/ESRIN, Frascati, Italy

## Abstract

The Copernicus Precise Orbit Determination (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 ESA Copernicus Open Access Hub.

In this poster focus is given to the altimeter satellites Sentinel-3A, -3B, and Sentinel-6A Michael Freilich for which the CPOD Service is responsible for near real-time orbit products, on which contrary to Jason family of satellites, the GNSS POD NRT orbits (ROE) computed by the CPOD service are used and DORIS DIODE aboard is the backup. For the Sentinel-3 satellites also a short-time critical and non-time critical orbit product is delivered as backup to the CNES (Centre National d'Etudes Spatiales) orbit products.

The CPOD Service is supported by the CPOD Quality Working Group (QWG), composed by leading experts on GNSS and Low Earth Orbit (LEO) POD. Independent orbit solutions are provided from these members to support quarterly and yearly Regular Service Reviews. These reviews guarantee a continuous and independent quality control of the orbital products generated operationally by the CPOD Service. In addition, the CPOD QWG regularly meets to discuss recent developments and enhancements in the field of LEO POD and the applicability to the service operations.

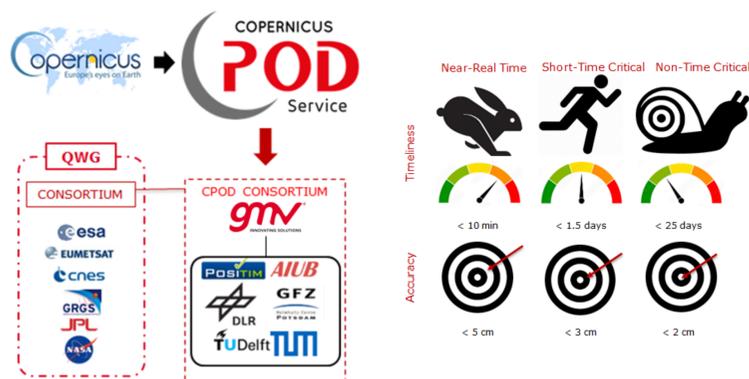
In the frame of the Regular Service Reviews non-time critical orbits from the three altimeter satellites are compared to CNES and other orbit solutions from members of the Copernicus POD Quality Working Group (QWG). Satellite Laser Ranging measurements are used to independently validate the orbits.

Overview and status of the Copernicus POD Service is presented in terms of organisation, design, operations and performance in particular related to Sentinel-3 and Sentinel-6 satellites.

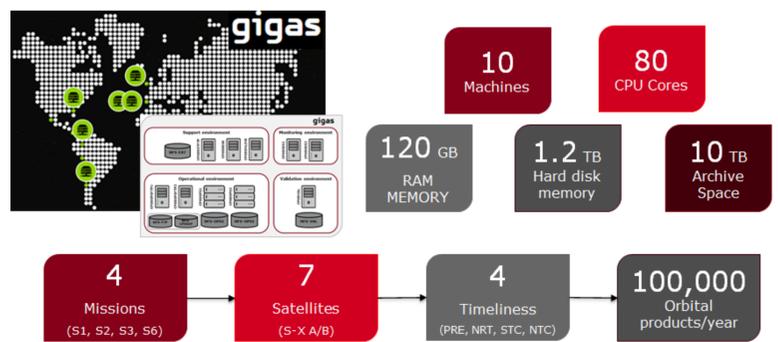
## Introduction

CPOD Service is composed by a consortium of seven companies and institutions lead by GMV. The Quality Working Group (QWG) is key to monitor the quality and propose evolutions.

The CPOD Service generates products in three timeliness and different accuracy requirements.



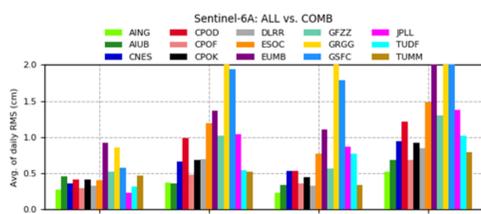
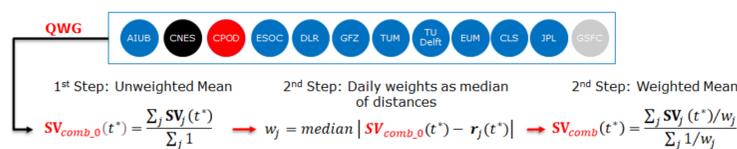
## CPOD physical design–cloud based



## POD parametrization

Model	Value	NRT	STC	NTC
EOPs	IERS rapid / finals			
Reference System	IERS standards			
Gravity field	Current: EIGEN.GRGS.RL04 TVG			
Solid tides	IERS 2010			
Ocean tides	FES 2014			
Atmospheric gravity	GFZ AOD LIB RL06			
Earth / Ocean pole tides	IERS 2010			
Radiation pressure model	Box-wing			
Earth radiation	Albedo and infra-red applied			
Atmospheric density model	msise00			
Arc length		24 h	5+24+3 h (32h)	
Drag coefficient		10 (estimated)	1 (estimated)	
Solar pressure coeff.		1 (estimated)	1 (fixed)	
1/rev empiricals (estimated)		2 sets per arc in: along sin+cos cross sin+cos	16 sets per arc in: along cnt+sin+cos cross cnt+sin+cos	
GNSS sampling		30 sec	10 sec	
GNSS products	magicGNSS	magicGNSS	CODE Finals	
Receiver ambiguities		Float	Float	Fixed
Manoeuvres		Calibrated		

## QWG – combined orbit solution



Process to compute the weighted combined orbit solution from up to 15 different solutions and example of comparisons of each independent solution vs. the combined solution.

## Sentinel-3 & 6 CPOD operational performance



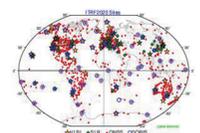
## CPOD next steps

### ITRF 20

What: Change of Reference Frame; affects GNSS products, and location of IGS, IDS and ILRS station's coordinates.

When: 27/11/2022.

Impact: Need of reprocessing.



### focusPOD

What: substitution of NAPOS SW with **focusPOD**, a new GMV's POD SW written from scratch in C++/Python. Validation in on-going.

When: 01/01/2023.

Impact: Transparent to final users; Better performance; Future new capabilities.

### COST-G

What: Combination Service for Time-variable Gravity Fields; to substitute current gravity field (EIGEN.GRGS.RL04 TVG).

When: mid-2023 (pending agreement by CPOD QWG).

Impact: Better accuracy. Need of reprocessing?



### IAR in STC/NRT

What: Application of Integer Ambiguity Resolution in STC/NRT.

When: Mid / End – 2023.

Impact: Better accuracy and stability of orbital products.

## Acknowledgements

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