CNES/CLS IGS Analysis Center 2024/2026 Activities

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IGS 2026 WORKSHOP
SANTIAGO DE CHILE
33°26' S 70°39' O

INTRODUCTION

We present in this contribution the main aspects of efforts done at the CNES/CLS Analysis Center in 2024-2026. We now deliver a full set of GNSS products (finals, rapid, ultra) that contribute daily to the combined IGS products. The quality and specificities of these products are presented. Involved in the MGEX Pilot project since the beginning, we provide also Multi-GNSS products (three constellations) of the same quality. Recent improvements concern the attitude modelling and the extension of the Observable Specific Biases (OSB) available. First results of our global ionospheric map (TEC) are also presented.

PRODUCTS

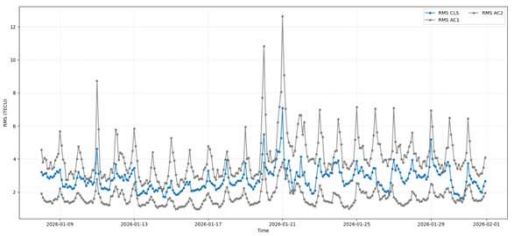
Our group delivers a complete set of IGS products with the different latencies for ultra/rapid and finals. The products include orbits, clocks, attitude, biases, earth rotation parameters and sinex solutions. Our network contains roughly 120 stations distributed worldwide (100 for rapids/ultras) chosen to maximize the receivers that:

- are part of the IGS reference network
- register multi-gnss signals
- are collocated with other geodetic technics

Products	Constellation(s)	Names
Finals	GRE	GRGOPSFIN
Rapids	GEC	GRGOPSRAP
Ultra	GEC	GRGOPSULT
MGEX	GEC	GRGMGXFIN

GRG IONOSPHERIC MAPS

CNES/CLS team is currently working on the development of global ionospheric maps (GIM). The processing includes the estimation of Differential Code Biases (DCB) that contribute to the OSB (see left). We use a spherical harmonics model adjusted each 2-hours on the 30-seconds data of a global network of ~200 GNSS stations (CDDIS network). Our objective is to participate to the IGS ionosphere finals ionospheric combination.

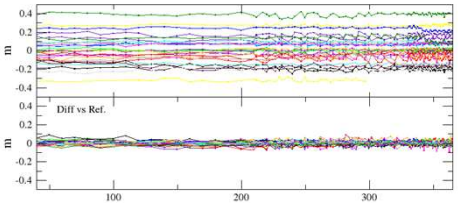


Internal RMS of GRG TEC maps (blue) relative to IGS finals over the month of January 2026 (1 value/2h). Two ACs participating to the final IGS combi. are also displayed (in grey).

BIASES

Computing and delivering Observable Specific Biases (OSB) compatible with the products is an essential task of our analysis center. In 2025/2026 we developed an ensemble of tools dedicated to compute/follow new biases that are added progressively in our OSB files to the historical GRG biases corresponding to the measurements used by our AC to compute GNSS orbits and clocks.

Const.	Primary OSB	Secondary OSB (Finals/MGX only) (*) new (2025-2026)
GPS	C1C/C1W C2W L1C=L1W L2C/L2W	C2L(*)
GAL	C1C/C1X C5Q/C5X L1C/L1X L5Q/L5X	C7Q/C7X(*) (E5b)
BDS-3	C1P/C1X C5P/C5X L1P/L1X L5P/L5X	-



Example of the tri-frequency combination used to constrain the C7-GAL OSB ((C7X./C1X/C5X iono. and geom. free, one curve per satellite). As daily determination is noisier than observed variations, these biases are modelled with constant segments between possible events/jumps.

Involved in the BAR(*) Pilot Project, our group focuses on the following objectives :

- Include additional biases useful for users (e.g. GPS freq. 5 or Galileo freq. 6)
- Improve the continuity of our biases
- Improve the resolution/quality

On the same subject, see also presentations:

- C. Gazzino et al. *"GNSS satellite hardware biases stability over time: long term analysis of the products from several analysis centers and impact from flex power."*, Session 2 (Tuesday morning)
- G. Katsigianni et al. *"IDEFIX : An algorithm for the comparison and validation of fixed ambiguities."*, Session 2 (Monday afternoon)

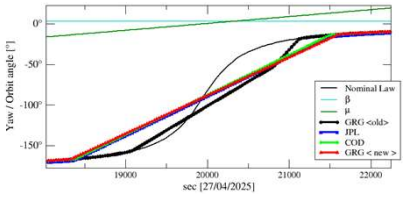
(*) Biases & Ambiguity Resolution PP

RECENT STUDIES & IMPROVMENTS

USING THE PRODUCTS

ATTITUDE LAWS

Over the past year, several corrections and improvements have been implemented in the processing of our GNSS attitude laws (delivered with our products in ORBEX files. These efforts contribute to the initiative of the SVOD/WG on the IGS common attitude models.



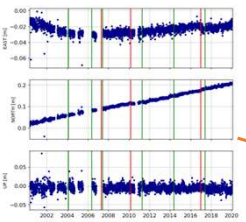
Example of the comparison of yaw angles of the satellite GPS PRN 26 (block IIF) showing the corrected GRG model

The non-exhaustive list of improvements includes :

- Correction of GPS/IIF attitude model
- Improved detection of the exact start of an eclipse maneuver to be insensitive to the step of computation (e.g. 300s/30s give same results) – applied to Galileo FOC & BDS
- Correct handling of eclipse attitude when the arc/computation starts during an ongoing eclipse

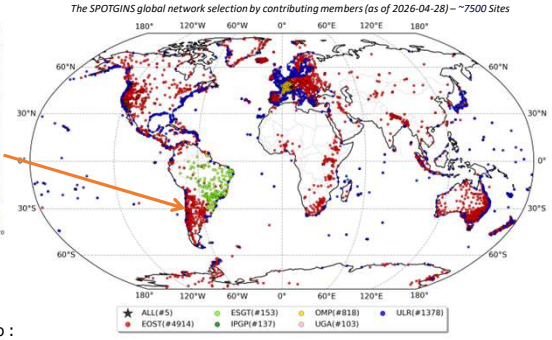
SPOTGINS

is a distributed analysis center where multiple research groups cooperate by using the same software, the same processing strategy, the same metadata and the orbits/clocks of the CNES-CLS IGS Analysis Center (GPS & Galileo) to produce a common set of GNSS time series. Daily PPP position time series and hourly zenith tropospheric delay time series are processed from globally accessible GNSS observations with the GINS software(CNES) All series are homogeneous and available for scientific studies.
(Please visit https://ac-gnss.pagelab.univ-lr.fr/spotgins)



Example of COYQ00CHL station serie in Cohaique/Patagonia (green resp. red lines indicate equipment changes resp. potential earthquake displacements).

The SPOTGINS global network selection by contributing members (as of 2026-04-28) – ~7500 Sites



Related to this subject see also :

- M. Gravelle et al. : *"Comparison of GPS-only and Galileo-only ambiguity-fixed PPP solutions: insights from the SPOTGINS analysis center."* , Session 2 (Monday Afternoon).

ABSTRACT ID 6939

ORGANIZING INSTITUTIONS

SANTIAGO – CHILE

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