Ocean Surface Topography Science Team Meeting (OSTST)

19-23 October, 2020
Virtual meeting

CNES POE-F precise orbit performances for the current altimeter missions

John Moyard, Alexandre Couhert, Flavien Mercier, Sabine Houry, Hanane Ait Lakbir, Eléonore Saquet, Vincent Debout

SOME NEWS

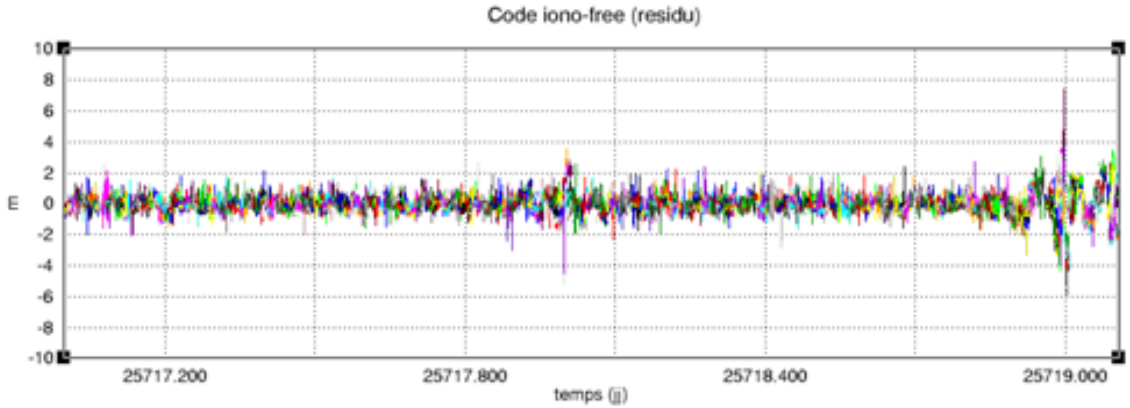
No change in the POE-F standards, on-going studies to prepare the next one

HY-2A POE delivery stopped at the orbit arc 467, in mid-September 2020

Two new missions :

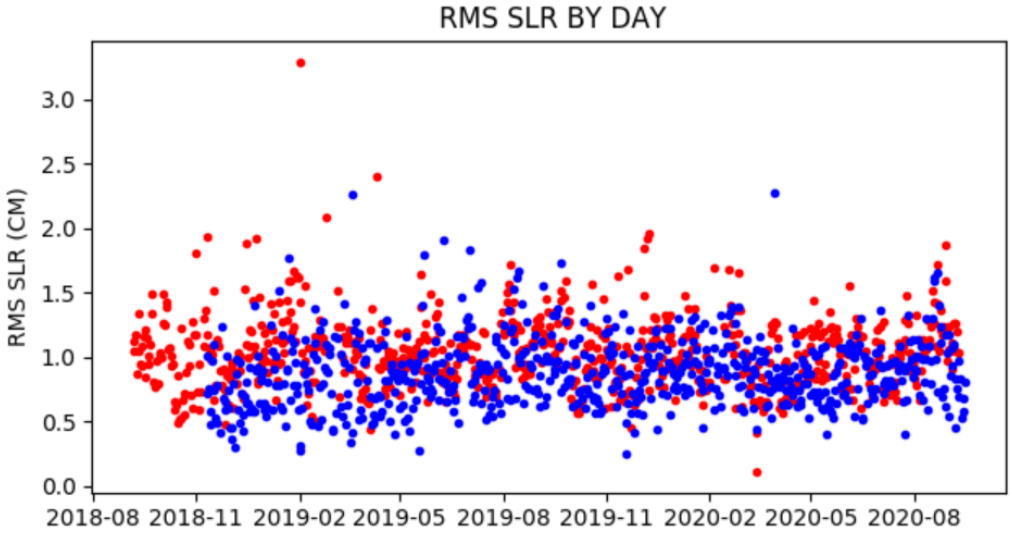
HY-2C: launched on September 21, 2020. On-going final preparation of the MOE and POE products (specific attitude law, operational processing under validations)

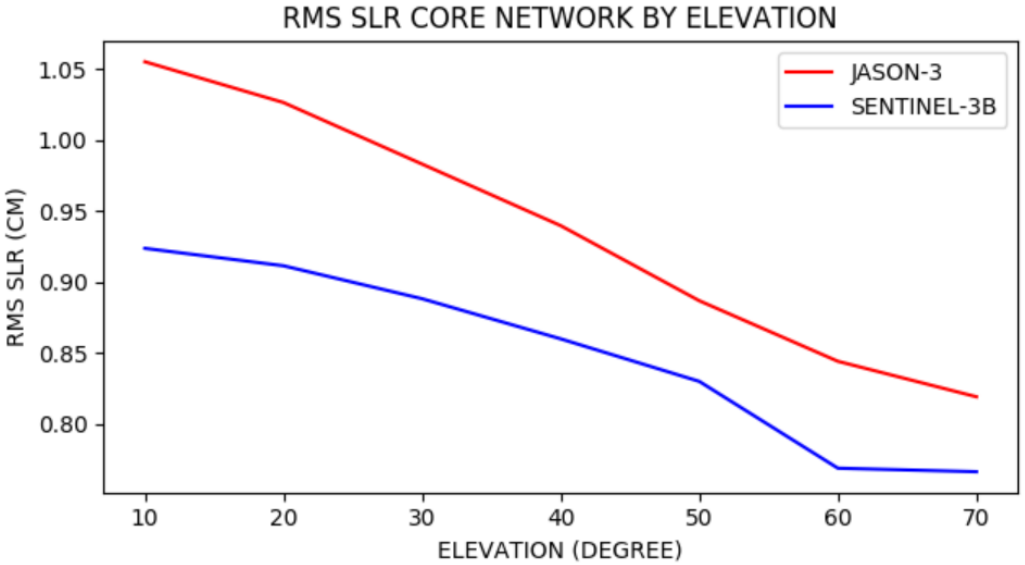
JASON-CS/SENTINEL-6: upcoming launch in November this year. Evaluation of the RINEX files produced by EUMETSAT, validation of the legacy GPS processing before Galileo, operational processing under final validations



CNES POE-F ORBITS

Reduced-dynamic DORIS+GPS (integer ambiguity) orbits / JASON-3 & SENTINEL-3B





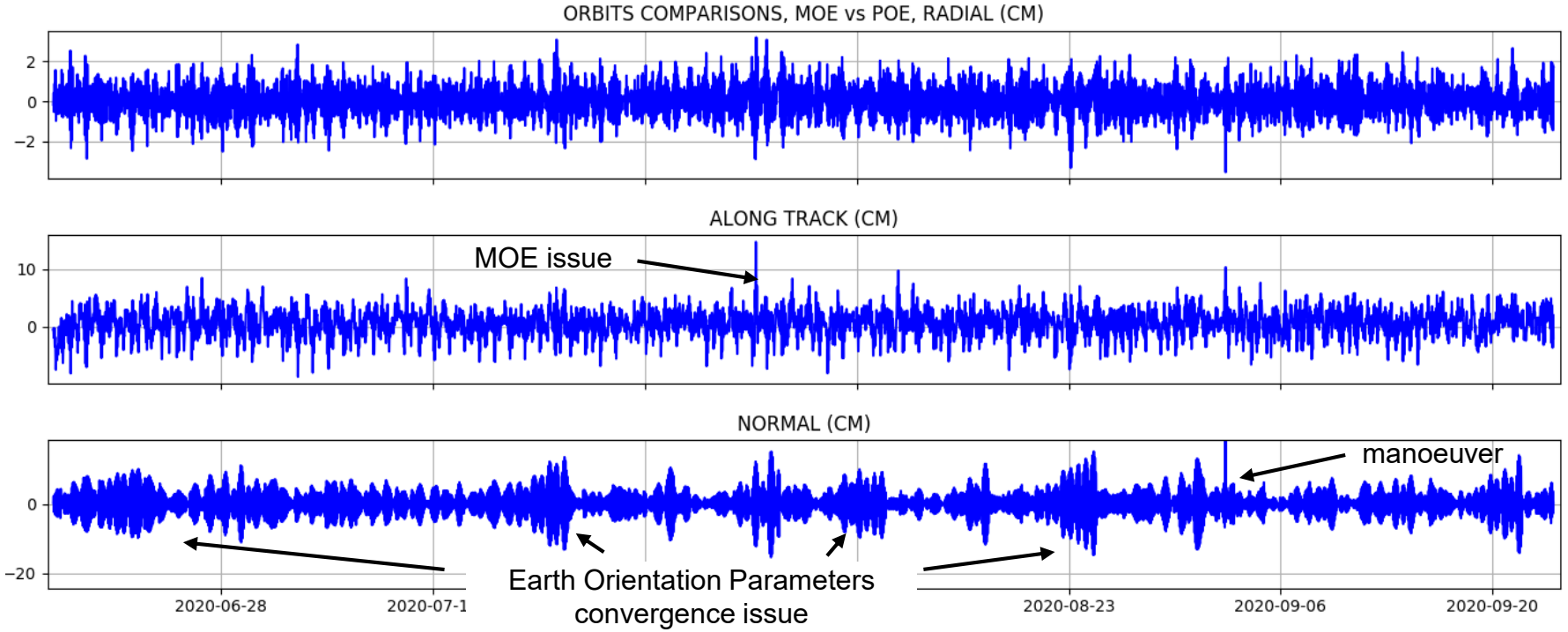
SLR Core Network of 8 stations (considered to have negligible biases)

Yarragadee (7090), Greenbelt (7105), Haleakala (7119), Hartebeesthoek (7501), Zimmerwald (7810), Graz (7839), Herstmonceux (7840), Matera (7941)

Stable SLR RMS residuals

CNES POE vs MOE ORBITS

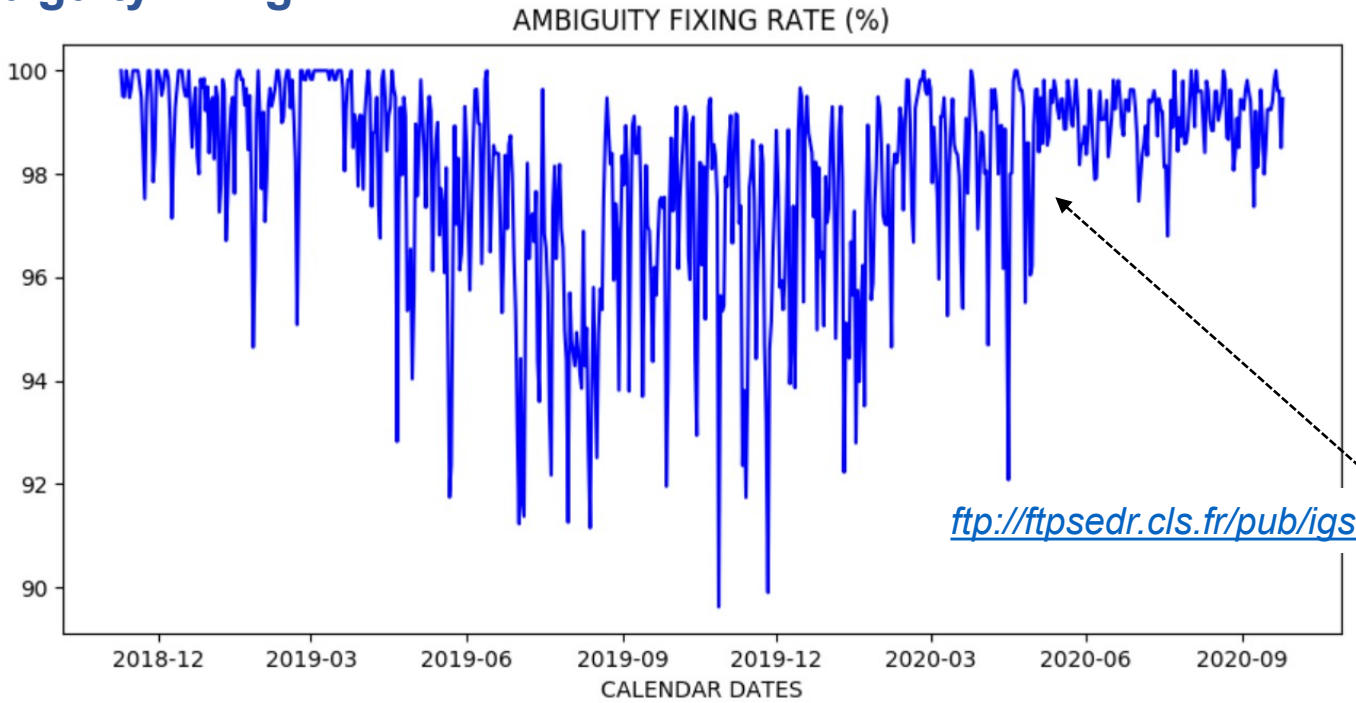
SENTINEL-3A POE-F orbits comparisons



Good agreement between CNES POE and MOE orbits, with differences 7mm RMS in radial direction

SOME OBSERVATIONS

GPS ambiguity fixing



ftp://ftpsedr.cls.fr/pub/igsac/GRG_ELIMSAT_all.dat

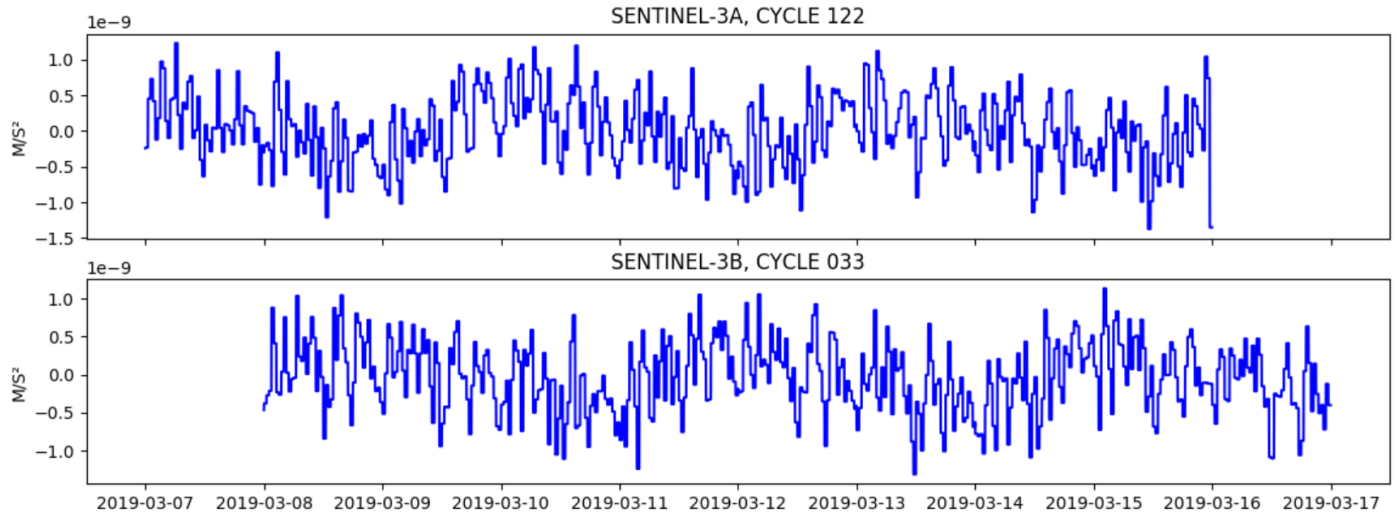
Zero-difference solutions with widelane combination step, based on GRG (CNES/CLS IGS solution) orbits/clocks

Need to take into account an implementation of GRG wrong GPS solutions rejected (GPS satellites not correctly fixed)

Improvement of the ambiguity fixing rate, no impact on the performance of the orbits though

SOME OBSERVATIONS

Empirical accelerations



Along-track constant accelerations estimated over 30-min periods

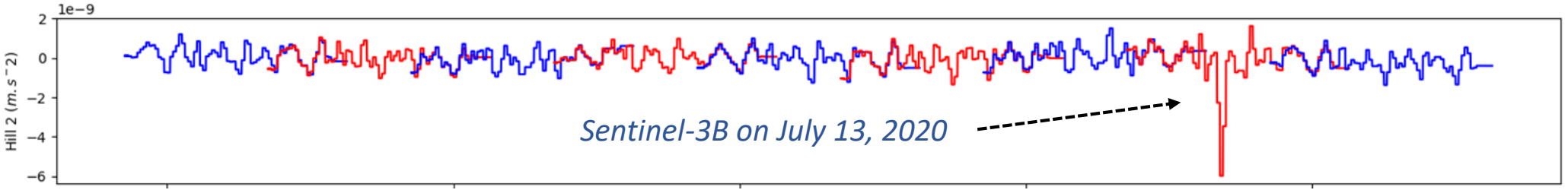
Periodically a 3.5-day signal occurs

The current integration step (60 s) and algorithm (Cowell) does not handle carefully the rapid variations of the accelerations at the beginning and end of eclipses (SRP model)

Fortunately, no impact on the performance of the orbits but minimizes empirical accelerations. The integration step was updated to 10 s to remove this issue in the empirical accelerations

SOME OBSERVATIONS

Odd along-track accelerations



Odd along-track constant perturbations over about 1.5 hours

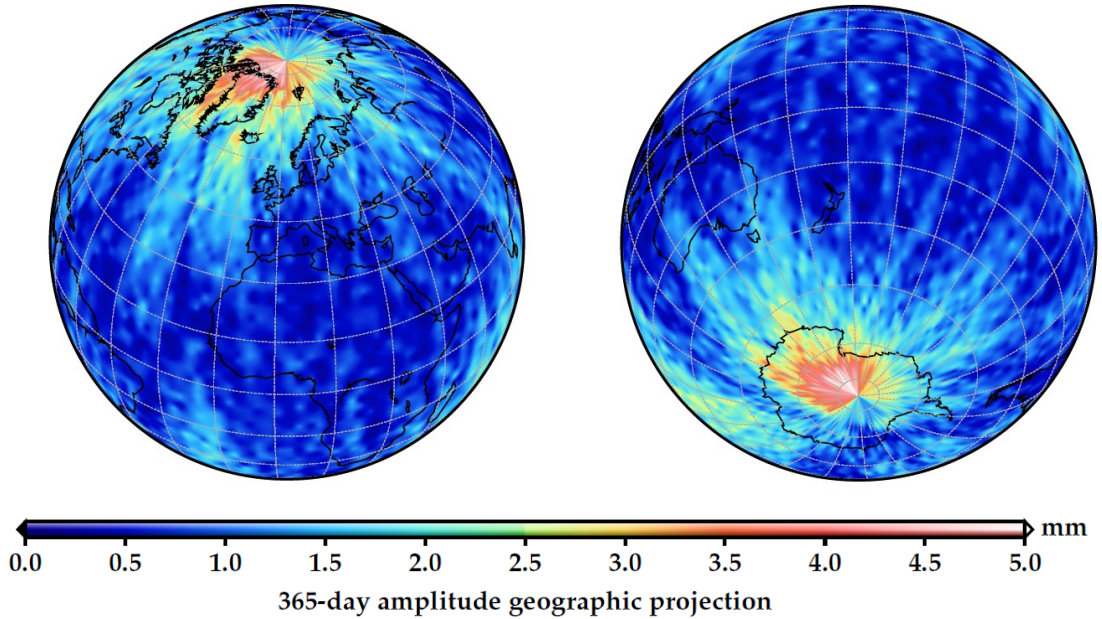
Also seen on Jason-3 (July 9, 2020) and HY-2A (July 1, 2020) both with DORIS and GPS measurements, but curiously not seen on Sentinel-3A

Nothing was observed in SCAO analyses for Jason 3 (canceled the debris hypothesis)

Thanks to EUMESAT, a possible explanation : an increased electron density in the radiation belts was measured from the MetOp satellites these days. The density of electrons is not a proxy of the standard atmosphere density models used for the drag modeling of the satellites

SOME OBSERVATIONS

GPS/DORIS orbit comparisons on Sentinel-3, on-going analysis



North/South pole patches in GPS/DORIS orbits comparisons, with patches in an opposite phase

Observed using JPL GPS orbits too, with a lower amplitude though

Not seen in Jason-3 GPS/DORIS comparisons (inclination/altitude of Sentinel-3 resp. greater/lower than Jason-3)

Two possible explanations : ionospheric pertubations (behavior of the GPS receiver) and/or geometry issue of the GPS constellation (low inclination)

CONCLUSION

POE-F orbit performances always stable for the current missions

Consequent work for HY-2C/JASON-CS to finalize the POE/MOE operational processing and their configuration

Some interesting observations are done thanks to the multi-technique and multi-mission approaches, with on-going analyses

Thanks for your attention !