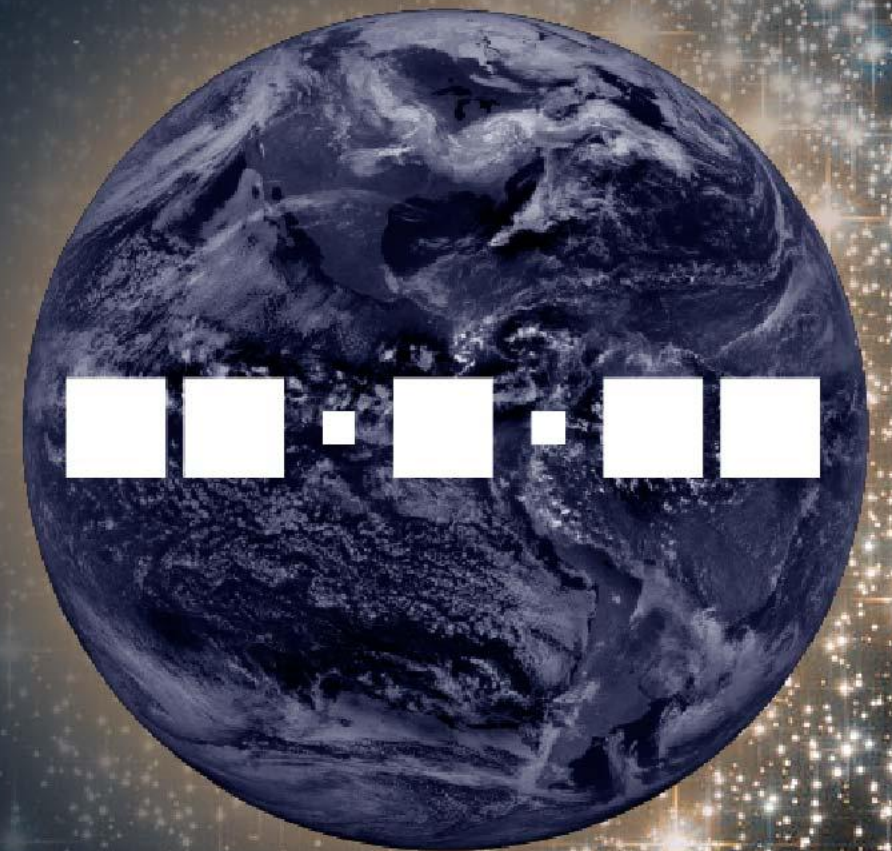




Satellite Vehicle Orbital Dynamics

Satellite Vehicle Orbital Dynamics (SVOD)

Tim Springer, Rolf Dach, Florian Dilssner



2022 Virtual Workshop
“Science from Earth to Space”

Session Information

Rapporteur: Tim Springer, Rolf Dach, Florian Dilssner

Participants:

- A Look at the Repro-3 Orbits, Tim Springer
- Repro-3 Orbit misclosures and ERP, Rolf Dach
- GPS III radiation force modeling, Florian Dilssner

Discussion Highlights

- The Repro-3 results show significant orbit model improvements compared to the Repro-2 results thanks to the efforts of all the participating ACs
 - Direct orbit comparisons clearly improved
 - Significant reduction of systematic orbit differences
 - Much improved behavior of the Z-Geocenter and ERPs
- New satellites pose new challenges (GPS III, Galileo FOC)
- Presentations of the session will be made available
 - Are available on the WS google docs page

Key Issues

- Reduction, and ideally, removal of orbital periods in the GNSS time series by improving the satellite orbit models
- Handling of ERP rates to be revised in order to establish a more stable quasi inertial frame (GCRF) for orbit modeling
 - See Beutler et.al. 2016 (IGS Workshop, Sydney)
- Modeling of GPS Block III and Galileo FOC can and needs to be improved

Emerging Ideas

- GNSS SVOD Capacity Development
 - Share and compare orbit models
 - At least make a central depository of relevant publications and models
 - Activities at DLR, ESA, JAXA, JPL, UCL, any others?
- ERP file format harmonization and enhancement of number of digits
- Attitude output (ORBEX format) from all ACs

Major Accomplishments

- See highlights slide earlier

Changes to Charter/Goals and Objectives

- To be reviewed

Recommendations

- Improve orbit modeling of the GNSS satellites in the operational products, in particular
 - the GPS Block IIIA satellites
 - the GALILEO FOC satellites (If possible also the two eccentric satellites)
- Improve orbit quality of the remaining GNSS satellites to bring them to a similar level as the operational products so that they can be included (in particular BDS)
- For next reprocessing the downweighting of known poorly behaving satellites should be considered
 - the GPS satellites with attitude thruster firings (loss of momentum wheels)
 - but also some GLONASS and other satellites
- Develop, share and compare GNSS Orbit Models
 - At least make a central depository of relevant publications and models
 - Activities at DLR, ESA, JAXA, JPL, UCL, any others?
- Harmonize the attitude models used amongst ACs

IGS 2021+ Strategic Plan Goals and Objectives



GOAL 1 Achieve Multi-GNSS Technical Excellence

Increase organizational capability by identifying barriers to multi-GNSS success throughout the IGS, supporting solutions to key challenges, and reinforcing the importance of continuous technical evolution.

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GOAL 2 Strengthen Outreach and Engagement

Advocate for open access geodetic and GNSS data and products that facilitate collaborations, standardization, and inclusivity.

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GOAL 3 Build Sustainability and Resilience

Foster a resilient, sustainable, and effective organization to support an expanding and evolving IGS community.

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Major purpose in the IGS and in the greater geodesy community

GNSS orbit modeling is the fundamental base for the successful application of GNSS for all science, engineering and society

Possible Impediments

Detailed knowledge of the metadata of the GNSS satellite is essential (elements like dimensions, materials, properties, attitude, antenna locations, center of mass, etc. etc.)

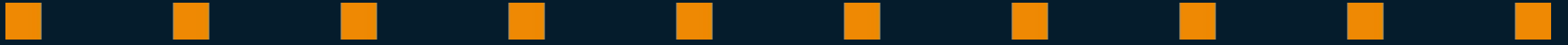
What the public should know about the IGS

Space is hard!

IGS has a lot to do with space!

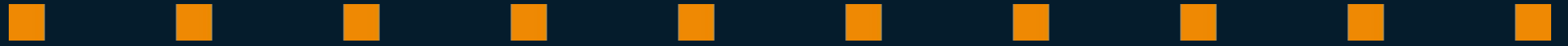
IGS is not routine, it may be operational but it requires a lot of research!

Friendly competition!



Additional Templates

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Timeline



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