



IGS MultiGNSS WG/PP Meeting 2024/02/23

Oliver Montenbruck



Agenda

- MGWG/PP Status
- Feedback from Combination Task Force
- ACC Transition
- BeiDou/QZSS calibration campaign
- MGWG/PP Future

MGEX / MGWG / MGPP Status

- IGS has decided to rename established working groups in accord with IAG terminology
 - Committees: continued services and tasks; continued evolution (Antenna, Clock, RINEX, Reference Frame, ACC)
 - Pilot Projects: pre-operational services (Monitoring, PPP-AR, Multi-GNSS)
 - Working Groups: time limited task, new developments
- Committee and Pilot Project chairs now have voting rights in the Governing Board
- Multi-GNSS Excellence is No.1 IGS goal
- Partial extension of IGS AC products to 3 GNSSs (GPS, GLO, GAL)

Combination Task Force

- Established next to MGWG in Sep. 2022 after Call for Participation
- Goals
 - Review of concepts, algorithms, and tools for multi-constellation product combination
 - Identification of harmonization needs for the various products to support combination
 - Requirements for a harmonized IGS product combination tool
 - Definition of roadmap and responsibilities for a consolidated combination tool chain
- Bi-monthly meetings
- Work and results last presented at Associate Member meeting in Dec. 2023

Feedback to MGEX ACs

Requirements for product combination

- 5 minute orbit products to enable accurate interpolation, particularly for Galileo satellites in eccentric orbits
- Incorporation of end-of-day midnight epoch (24:00) to enable orbit interpolation for 30s clock combination
- Provision of attitude quaternions for optimum clock/bias combination
- Provision of ERP and SINEX files for frame alignment (future extension)

All MGEX ACs are encouraged to adapt and expand their products

- to best support a future multi-GNSS product combination and
- to pave the way for integrating "all" constellations into standard IGS products

Discussion

- All MGEX ACS already deliver 5 min products (MGEX website needs update)
- CODE strongly supports midnight epoch, GFZ will add it in the next days, SHAO will check and is open to include it; ESA has midnight included
- Attitude quaternions: GFZ/CODE/GRG/WUM (at 30s with midnight epoch; except GRG); ESA now has capability and will add it to their multi-GNSS solutions; SHAO will check
- GRG and GFZ and CODE provided ERPs, JAXA ERPs plus SINEX, Wuhan ERPs; CODE does not presently see the need; OM: useful for monitoring of frame consistency; RD: reference frame coordinator would need to run SINEX combinations; MGEX situation is similar to ultras and rapids, where no SINEX is provided. SHAO can provide EOP an SINEX; ESA multiGNSS will soon add SINEX and become the official standard.
-> kept as optional for all ACs, no must

Transition of Analysis Center Coordinator

- End of joint ACC hosting by GA & MIT after two 4-year terms
- New ACC needs to take over by end of 2024 (with limited GA&MIT support until mid 2025)
- Call for Participation - IGS Analysis Center Coordinator Candidates [IGSMAIL-8431]
- Take over current GPS-only combinations and, preferably, generate multi-GNSS combinations
- Candidates for “ready-to-use” multi-GNSS combination include
 - GFZ orbit and clock combination software (SPOCC)
 - GA orbit combination s/w plus Wuhan University s/w (CKCOM) for clock/bias combination
- Good prospects for routine combination of 3++ GNSSs by new ACC
(but still a lot of work ahead)

BeiDou/QZSS Calibration Campaign

- PPP solutions from GNSS products with BDS show systematic offsets (frame distortions, scale offset) w.r.t. to GPS/GLO/GAL solutions
- Use of regional BDS-2 satellites and IGS20-incompatible manufacturer calibrations of BDS-3 in igs20.atx considered as primary cause
- Calibration campaign initiated by reference frame coordinator (P. Rebischung)
- Call among legacy and MGEX ACs; kickoff Jan. 2024
- Steps
 - Estimate BDS-3 phase variations using B1C/B2a signals
 - Adjust PCOs
- Enables incorporation of BDS-3 (and QZSS) into OPS products without causing harm

Towards a Multi-GNSS IGS

- Multi-GNSS capability is an integral part of the IGS network
- MGX orbit/clock/bias products now in standard repository, DCBs accepted as “OPS”
- Many entities (ANTEX, Bias, RINEX, PPP-AR, etc.) “think” multi-GNSS
- “Peaceful coexistence” of legacy/3G OPS products and 3-5G MGX products
- The gap is getting smaller
 - OPS extension to 3G
 - Multi-GNSS-capable orbit/clock/(bias) combination s/w becoming available for IGS use

Closing the Gap

- All MGEX ACs
 - Adapt multi-GNSS product portfolio to OPS standard (ERP, SINEX, etc.)
 - Adapt to agreed upon processing
- Joint legacy & multi-GNSS ACs
 - Complement OPS products with additional constellations once “no-harm” is demonstrated
 - Stop MGX product or retain as test platform (e.g. for GPS L5, NavIC, ...)
- MGX-only ACs
 - Consider application as an OPS AC (Note: no automatic upgrade, but subject to review long-term product quality and stability; typically a 2++-year process!)
 - Stop MGX product or retain as test platform

MGWG/PP Future

Is it time to finish MGEX / MGWG / MGPP and put the full responsibility for multi-GNSS support into the hands of all other committees?

- Continued need for MGWG/PP or time for a change?
- Continued support of group members?
- In case of a continuation
 - New lead required (retirement; 3rd four-year term of MGWG/PP chair completed)
 - Candidates?
- In case of a termination
 - When?
 - Phaseout process?
 - Temporary chair?

Discussion

- ZD,TS: Need MGEX as experimental platform for new constellations (NavIC, KPS, QZSS extension, Galileo-2...) and satellites (orbit models, signals, biases) (“new GNSS WG” for characterization and modeling of anything new)
- OM: What about LEO-PNT?
- ZD: lack of combi s/w was an obstacle for making OPS multi-GNSS capable
- GFZ would like to contribute to MGEX continuation
- RD: GB has discussed MGEX “end-of-life” in view of ongoing activities to make OPS multiGNSS capable; agrees to close MGPP once outstanding problems of MGNSS combination are closed. Can go back to (or retain) MG for work on new constellations. Can be dormant or temporarily closed in between.

Discussion

- OM: if MGEX is intended to stay alive, we need a new chair. Volunteers?
- RD,ZD,RL: suggests Peter Steigenberger as a natural successor
- PS: would be willing to take over (given that no other volunteers raised their voice)