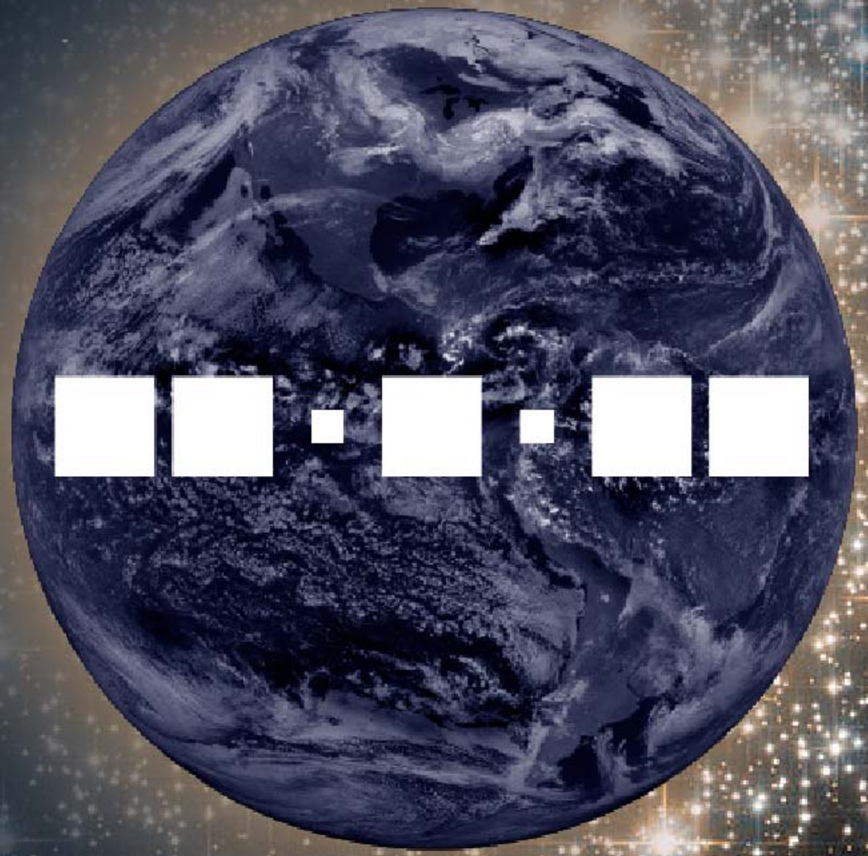
PPP-AR

Jianghui Geng



IGS INTERNATIONAL GNSS SERVICE

2022 Virtual Workshop
"Science from Earth to Space"

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Session Information

Rapporteur:

- Jianghui Geng

Participants:

- Sylvain Loyer (invited speaker)
- André Hauschild (invited speaker)
- Zhiguo Deng (invited speaker)
- Patrick Dumitraschkewitz (invited speaker)
- Oliver Montenbruck
- Sebastian Strasser
- Felix Perosanz
- and about 150 people in total

Discussion Highlights

- Clock/bias combination
  - An operational clock/bias combination process to cross-validate AC bias products
  - Statistics and PPP-AR results illustrated online
- Day boundary discontinuities
  - Reduce day boundary discontinuities of clocks using the integer clock properties
- BDS/QZSS and multi-frequency phase biases
  - Only GFZ and Wuhan provide BDS-2/3 phase biases at the moment
  - GPS L5 as well as all third frequencies for Galileo and BDS

Key Issues

- Progress of the PPP-AR WG since 2018 Wuhan workshop
- New conventions to be applied to the bias generation
  - Satellite attitude quaternions
  - Antenna PCOs applied to the DCB and Melbourne-Wübbena observable
- Bias products at representative ACs
- Promotion of bias combination
- Roadmap to multi-GNSS & multi-frequency phase bias products

Emerging Ideas

- A consensus is needed for the Keyword denoting whether antenna phase centers (APCs) have been applied or not
- Consistent standard and modeling of group-delay variation patterns
- Temporal resolution should be at least equal to the clocks temporal resolution to avoid interpolation problems

Major Accomplishments

- Promote the recognition of providing satellite attitude quaternions and correcting for PCOs by ACs
- Inspire more ACs to provide phase bias products, especially for BDS and QZSS
- A preliminary consensus on establishing routine combination process for validation and online promotion

Recommendations

- Encourage more ACs to provide quaternions whose temporal resolution should be at least equal to that of the clocks and number of decimal digits should be properly set
- Antenna PCO should be considered in DCB and Melbourne-Wübbena computations
- Routine clock/bias combination and visualization online to cross-validate AC products
- Consistent standard and modeling of group-delay variation patterns
- Study how to reduce and calculate day boundary discontinuities of integer clocks and their impact on time transfer
- Study how to produce high-quality BDS/QZSS phase bias products

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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.

- Coordinating multi-GNSS efforts across ACs and WGs.

GOAL 2 Strengthen Outreach and Engagement

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

- Promoting the international visibility of PPP-AR WG and relevant high-precision products.

GOAL 3 Build Sustainability and Resilience

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

- Indirectly contributing to this objective.

Major purpose in the IGS and in the greater geodesy community

- Support high-precision scientific applications requiring globally applicable point positioning technique and rapid access to the international terrestrial reference frame.

Possible Impediments

- Limited resources in some ACs to provide extra satellite products
- Insufficient software which requires great efforts and manpower to improve to multi-GNSS and multi-frequency capability