Recommendations

IGS

- Infrastructure
- Multi-GNSS Experiment
- Data Center
- RINEX
- Real-Time Service
- Reprocessing and Reference Frame
- Antenna
- Bias and Calibration
- Analysis Centers
- Space Vehicle Orbit Dynamics
- Clock Product
- Ionosphere
- Troposphere
- Tide Gauge
- Applications

Celebrating 20 Years of Service

IGS

Key Issues:

- Review presentations demonstrate the enormous success of the IGS in the last 20 years.
- There are major challenges ahead of the IGS, the most important being multi-GNSS.

Recommendations:

- All IGS entities (ACs,DCs, WGs, ...) should actively consider the multi-GNSS world and work towards its realization [2 to 3 years]

Infrastructure

Recommendations:

- To start the process to have an IGS NBS data service using the existing shared resources, to support the in-space GNSS radio occultation community.
- To adopt and promote the IGS SLM for station metadata management and to encourage the NC/CB that all existing GNSS metadata databases (GA, EPN, GFZ, etc) can talk to the IGS SLM to exchange and maintain the metadata correctly.
- To contribute to the development of the Rinex 3 transition plan with the MGEX, NC, DC WG, etc for approval in the Dec 14, 2014 GB meeting.

Multi-GNSS Experiment

Recommendations :

1. Adopt new SP3d format (for >85 satellites) within IGS
2. Adopt GPS-style s/c axes conventions for GAL/BDS/QZSS to achieve consistent handling of yaw steering mode across all constellations and satellites; orbit normal mode needs to be „translated“ consistently. ACs shall implement constellation-specific nominal attitude modes (yaw steering and orbit normal mode)
3. Populate IGS ANTEX file with transmit antenna PCOs for new constellations and anechoic chamber calibrations of receive antenna for new frequencies.

Data Center

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Recommendations :

1. Develop a transition plan that will integrate RINEX V3, including the V3 filename convention, into the operational IGS archives by the end of 2015. (IC, DCs, ACs, MGEX WG)
2. Provide software tools that DCs can use to continue to provide needed QC and metadata extraction enabling creation of data status information.
3. Provide software tools to support data conversion (e.g., RINEX V3 to RINEX V2. RINEX V3 filename creation) that both DCs and ACs can use.

RINEX

RINEX 3 Transition Plan, to cover:

- Acceptance of the Rinex 3.2 format
- Adopt the new naming convention limiting the rec and ant number to 00 for starters
- To continue to support 2.11 parallel files from MGEX stations for a period of time
- To confirm and support the tools to write Rx2.11 from Rx3 files to aid in the AC and user transitions
- To confirm and support a naming translator between Rx3 names to Rx2.11 and vice versa
- To define together with the DC WG the minimum QC of Rx3 files so that the repository daily metadata can continue to be generated

Real-Time Service

Recommendations:

1. The RTWG recommends that RTAC's who are not contributing GLONASS clocks to the real-time service be asked to confirm their intentions for future contributions.

   This can be done immediately in the form of a letter/email to these ACs.

2. The RTWG recommends that the IGS encourage and coordinate member organizations to establish protocols and develop a system for an Indo-Pacific moderate density GNSS network, real-time data sharing, analysis centers, and advisory bulletins to the responsible government agencies in accord with the IAG's Global Geodetic Observing System (GGOS) Theme #2 for natural hazards applications.
3. It is recommended that the RTWG implement a process to monitor BRD EPH streams that are used by RTACs and that rt-station operators be contacted and encouraged to deliver, when possible, a minimum of two streams to separate independent real-time data centers/casters.

Repro and Reference Frame

Recommendations :

1. Finalize the repro2 effort and the IGS contribution to ITRF2013.
    - Perform daily SINEX combinations using the two-step procedure recommended at the IGS 2012 Workshop.
    - Provide feedback to ACs.
    - Build modernized cumulative IGS solution based on a revised discontinuity list and an extended parameterization (seasonal signals, post-seismic relaxation).
    - Provide the AWG with reevaluated satellite phase center offsets.
    - Evaluate the intrinsic scale rate of the repro2 solutions and its potential contribution to the ITRF2013 scale rate.

    [8 months]

Repro and Reference Frame

Recommendations (cont.):

2. Involve station operators in the selection of the future IGS13 Reference Frame stations, and especially of the IGS13 core stations, in view of securing the long-term stability of the IGS13 Reference Frame. [1 year]
3. Start considering truly multi-GNSS IGS final products and the related issues (orbital arc lengths, impact of non-GPS constellations on station positions and EOPs…). [several years]

Antenna

Recommendations:

1. z-offsets of all GPS and GLONASS satellites will be reestimated from repro2 SINEX files in order to compensate for AC orbit modeling changes (albedo, antenna thrust) affecting the orbit scale. [several weeks to few months after the release of ITRF2013]

2. a) Conventional MGEX satellite antenna phase center offsets for the new GNSS will be added to the IGS antenna phase center model igs08.atx taking into account the IGS-conventional axis definition related to the yaw-steering attitude mode.
   b) igs08.atx robot calibrations for the legacy GPS/GLONASS frequencies are extended with chamber calibrations provided by the University of Bonn for the new GNSS in order to support MGEX activities. Systematic differences between chamber and robot have to be reasonably small for the affected antennas, but cannot be completely avoided. [several weeks]

Antenna

Recommendations (cont.):

3. antenna.gra will be extended with a definition for the so-called "north reference point". Station operators are asked NOT to touch active antennas immediately, in case the antenna orientation should not be according to the new IGS definition. [several weeks]

Bias and Calibration

Recommendations:

1. Define and adopt Bias SINEX Version 1.00 (including features, such as OBS1-only, handling time-varying biases, maybe extensions concerning phase-related biases) [until end of 2014]
2. Start to provide GPS DCB information in Bias SINEX 1.00 (in addition to Bernese DCB format). [until end of 2014]
3. cc2noncc, currently maintained by I. Romero (ESA/ESOC), will not to be extended to RINEX-3. Users are encouraged to handle this information in their analysis S/W.

Analysis Centers

IGS

Recommendations:

Orbit Modelling

Recommendations:

1. Marek and Tim to compile list of parameters needed to build SV surface force models for all MGEX satellites

   Pass this list to Zuheir

   Zuheir will make representations at ICG to attempt to obtain the data

2. Orbit Dynamics Working group must pool its resources to develop models for the MGEX satellites

   Marek will liaise with Oliver to keep him informed

   GLONASS/Beidou is where we will start – UCL already have substantial GLONASS information

3. It is time to start using better *a priori* SV models, but augmented by appropriate empirical parameters

   In the first step models must be made available – UCL has committed to this and others may be made available

   In a second step, we should revisit what empirical parameters are appropriate

Clock Product

Ionosphere

Recommendations:

1. Higher temporal resolution of IGS combined GIMs - the IAACs (UPC, JPL, ESA and CODE) agreed on providing their maps in IONEX format, with a resolution of 1 hour from October 1, 2014.
2. Starting a new potential official product – TEC fluctuation maps using ROTI over Northern Hemisphere to monitor the dynamic of oval irregularities (carried out by UWM(Krankowski), JPL (Pi) and UPC (Hernandez-Pajares) in next future to be started as official/routine product after performance evaluation period (end of 2014 or beginning 2015).
3. Close cooperation with National Central University from Taiwan regarding usage occultation measurements from Formosat/Cosmic mission for future validation IGS GIMs
4. Cooperation with IRI COSPAR group for improving IRI TEC

Ionosphere

Announcements:

1. Natural Resources Canada (NRCan) is resuming the activities on global VTEC modelling. After a performance evaluation period, NRCan can become again an IAAC (Reza Ghoddousi-Fard, beginning 2015)
2. The Institute of Geodesy and Geophysics (IGG), Chinese Academy of Sciences, Wuhan, China (Yunbin Yuan, beginning 2015) is computing on routinely basis global VTEC maps, and it can become a new IAAC after a performance evaluation period (Yunbin Yuan)
3. A new proposed format (SCINTEX) for slant ionospheric information (such as S4, sigmaPhi, ROT and STEC) has been recently proposed and it is under consideration in the IGS ionospheric community due to its significance for potential applications.

Troposphere

IGS

Recommendations:

1. General support was expressed for tropo_sinex standarization, so authors Pacione/Dousa plan to distribute a proposal for comment after further work on the draft.

2. Though several challenging ideas were put forward, the will of the people is to support providers of both real-time and post-processed troposphere estimates by comparing said estimates to the IGS Finals, and perhaps issuing regular comparison reports.
   This would particularly assist the providers of NRT estimates in understanding, e.g., how helpful their inputs are to forecasting models.
   Such comparisons will fortunately be made much easier with the completion of the troposphere-comparison database.
   It is therefore likely (recommended?) that establishing/re-establishing such comparisons will be the next big effort of the IGS Troposphere WG.

Troposphere

IGS

Recommendations (cont.):

3. Note: concern was expressed re the quality of the meteo sensor data recorded at IGS sites, e.g., are the instruments regularly calibrated? Bad P or T values can wreck ZTD-to-PWV conversion. Long-term, the group may need to work with the Infrastructure WG, perhaps creating a recommendation that IGS stations maintain/calibrate their meteo instruments, or even developing IGS site meteo-sensor standards.
4. Other potential long-term projects: addressing conversion of ZTD to IWV; INSAR support.

Tide Gauges

Recommendations

1. Encourage station operators to establish leveling to tide gauges
2. The inclusion of TIGA stations into the repro2 IGS combination as to be done with care as there are many stations with varying quality, monument stability and missing domes numbers.
3. Promote TIGA activities and results to non-geodetic and hydrographic communities

Applications

Recommendations

1. Taking into account temporal gravity variations in GNSS orbit determination.
2. Some applications benefit from long-term orbit arcs
3. Encourage more SLR observations to GNSS satellites

Note

Important role of GNSS for collocation ties

More applications will emerge with more accurate clocks onboard GNSS