

**ILRS Governing Board Meeting,**

**14 November 2013,**

**Fujiyoshida, Japan**

**(Prepared by Cinzia Luceri and Mike Pearlman)**

Attendees: G. Appleby, E. Pavlis, J. Mueller, L. Langkaas, P. Opseth, S. Merkowitz, L. Thomas, R. Burris, H. Donovan, L. Grunwaldt, J. McGarry, H. Mueller, T. Otsubo, Z. Zhongping, G. Kirchner, M. Wilkinson, D. McCormick, G. Bianco, S. Wetzell, U. Schreiber, M. Pearlman, C. Luceri, J. Del Pino, J. Degnan, and H. Kunimori

**Opening Remarks (G. Appleby)**

- Welcome to the new members of the Governing Board.

**Status of the ILRS (G. Appleby)**

- Overview of the ILRS status: network distribution is improving with the addition of the stations in Russia and Korea, and upgrades underway at several stations. TIGO is moving to La Plata in June; the contract is signed and platform is in preparation. Data volume continues to increase with new satellites including five recent LEO additions. Four new missions are scheduled for the coming year. Efforts are underway to improve station data quality checks to reduce QC problems at the Operations and Analysis Centers.
- The GNSS tracking is substantially increasing; 13 stations are tracking much of the GLONASS constellation missions. The Russian are asking for tracking coverage on the full constellation of 24 satellites; a reasonable goal might be best effort by each station to provide two passes per day (1 day, 1 night), each pass with two NP, spaced widely apart in the orbit.
- CB items: new normal point (1000 FR) recipe has been tried with good success at several of the higher repetition rate stations. The new procedure for reporting station configuration changes has been approved and circulated to the stations; this is simpler than the previous version and will hopefully encourage more accurate reporting. Stations have been encouraged to: (1) submit updated log files commensurate with current system configuration, (2) submit FR data, (3) strengthen adherence to process for certification of new or upgraded stations, and (4) use the real-time web facility for tracking update information.

**Working Group Reports**

Analysis (E. Pavlis/C. Luceri)

- The AWG meeting held on November 9<sup>th</sup> focused primarily on estimation and resolution of systematic errors. The WG is routinely providing its operational data products; it participated in the ITRS/GGFC Pilot Project for testing atmospheric corrections at observation level using GGFC input data. After harmonization of models and procedures, the AC's will start re-analysis for ITRF2013, to be submitted in early 2014.

- Operational issues: new Russian stations have been validated, but data is currently sparse and delivered with considerable delays. Some stations that are undergoing repair/upgrade are not keeping us current on their status for quarantine purposes. Three stations have completed their quarantine period; ten others are still in quarantine.
- Publication and Meetings: IERS annual reports 2011 & 2012, ILRS special issue in the Journal of Geodesy is in process (3 abstract are pending finalization). The next meeting of the AWG will take place in Vienna, during the EGU 2014 week (most likely, the exact date to be determined after the meeting schedule is available).

#### Missions (G. Appleby/S. Wetzel)

- The MWG meeting was held on Tuesday November 12<sup>th</sup>, but most of the WG discussion is running electronically during the year.
- More care should to be taken with the Mission Support Request process to make sure all information is submitted; a completed sample might help the organizations not familiar with the process.
- Some missions are having difficulties with predictions and hence data yield is poor; an example is STSAT-2C, which is relying on TLE's for predictions. NERC SGF tried to provide predictions, but they were no better than those provided by KASI. In general several centers provide backup predictions for all of the satellites, but in this case the TLE's are not adequate. We need to take some remedial action.
- ELT/ISS will be launched in 2016 for an 18 months campaign. Ground station safety precautions will include selection of specific stations, pass selection, go/no-go scheduling, divergence calibration, and other station-specific conditions. Participating stations must be compliant and carefully calibrated. J. Degnan stated that due to the tight schedule, it will be important, in the U.S., to coordinate with aircraft traffic (i.e., the FAA) above and beyond normal SLR/FAA coordination.

#### Data Formats and Procedures (H. Mueller/R. Ricklefs)

- The DF&P WG met on November 12. The ILRS contacts and specifically the stations contact and e-mail information maintained by EDC and CDDIS needs to be updated; some contacts information appears to be stale.
- Three new sites have sent Site Logs. Some of the Station Site Logs are not current; stations, most urgently the core sites, need to be contacted to update their site logs and keep them current.
- Randy has issued the new configuration change instructions (including a better definition of the release flag) to the stations; a deadline might be helpful in stimulating compliance.
- Late data on Lageos and LARES is degrading the daily products, in particular on the last day of the product cycle; some stations delay delivery for local data review; we need to urge them to speed up the data flow.
- Some stations are using both upper and lower case in their data submission; Randy should add a requirement for "lower case only" to his CRD instruction and the data centers should add a case check to the processing stream.
- EDC is working on a process to check incoming data using predictions as a means of QC to avoid gross errors.
- Data biases are quite common and are limiting the quality of our data products; The AWG, N&EWG and the CB need to address this issue; we need to design better calibration and engineering tests at the station as a first line of defense. We must engage and motivate the stations with perhaps a clinic as a part of a coming workshop.

- CRD is the current ILRS data format standard; data in the previous format will be reformatted into CRD format and verified by DGFI. Incoming data in the old format will no longer be stored.
- To avoid operational data loss due to local outages, EDC and CDDIS will propose a method to allow incoming NP data to flow to both Data Centers.

#### Networks and Engineering (G. Kirchner/M. Wilkinson)

- The NEWG met on Thursday 14th November and discussed a series of current topics and those emerging from the ILRS Workshop. The new system change tracking procedure designed by Randy Ricklefs was discussed and it was agreed that it was simpler and that more, if not all, stations should be expected to follow these requirements. Georg suggested a 6-month period for stations to get up to speed before they are contacted directly.
- Envisat tracking since its demise has proved to be a good target to demonstrate the capability of the SLR technique for monitoring such debris objects and satellite dynamics, and it might be useful to help with collision avoidance; tracking should continue.
- Ray Burris has outlined a method for measuring output beam divergence; his method appears to be straightforward simple and most stations should be able to test it. It is also very timely due to the interest in laser energy density at satellite heights. Ray will detail the procedure for the stations to follow.
- The ADS-B systems on aircraft should be explored as a tool for aircraft avoidance by the stations;
- Spacecraft vulnerability to laser beams continues to be an issue for SLR. In particular the ELT experiment on the ISS will come with specific requirements for stations and the network. The Transponder WG will soon publish its suggestions.
- Station range bias was a recurring theme at the Workshop; NEWG must work with the AWG and the CB to help communicate the issue with stations and to develop calibration and QC procedures with the stations.
- Dave McCormick will organize a task to share information on station safety

#### Transponder (U. Schreiber/J. Degnan/J. McGarry)

- The WG met on November 12; it was agreed that the WG charter is a bit aging and an update is necessary.
- LRO is doing great; new challenging missions are coming up that will demonstrate the SLR benefit, interplanetary missions are being proposed: ILRS can give POD support.
- Laser Time Transfer has been demonstrated between a number of stations using the T2L2 experiment on Jason-2, and a team from OCA, Grasse is visiting those stations to measure local time-offsets in order to calibrate the results to date. Time-transfer at ps-level of accuracy is potentially achievable.[]

#### **EUROLAS report (G. Bianco)**

EUROLAS meeting was held on November 12<sup>th</sup>. The ToR is obsolete and must be updated, in particular in the definition of the members: Appleby, Bianco, Kirchner and H. Mueller will prepare a draft of an updated ToR by the end of the year. The European network still makes sense to try access EU funds and plans interesting applications that can be carried out in an area with high density of SLR stations. A EUROLAS associate list will be revised and maintained by EDC.

#### **GPS III (L. Thomas)**

The GPS III constellation satellites with retroreflectors are on track beginning with launches in 2019.

#### **Laser Safety Issues (D. McCormick)**

- Information on new safety goggles, interlock systems and other safety features are available and should be distributed.
- SAE International released a document AS6029A Performance Criteria for Laser Control Measures Used for Aviation Safety in May 2013. This document would be a good safety reference for anyone involved in outdoor laser ranging.
- A sub-working group on safety should be organized: Jorge Del Pino and Dave McCormick will outline ideas on how to proceed. Documentation and reports must be produced to demonstrate how serious the topic is within ILRS. Sharing information is a top priority.

#### **GGOS Activities/Role of the ILRS (M. Pearlman)**

- The GGOS site requirement document is on the GGOS website;
- Eighteen responses covering 38 sites plus the DORIS network have been submitted in response to the GGOS Call for Participation.
- A performance model projecting station capability has been developed to be used with the simulations to project network performance. Reaching the ideal network will require a lot of time and resources; we expect a mix of new technology and legacy sites will be essential for a long time and perhaps indefinitely.
- NASA has embarked on a Space Geodesy Program to develop and implement core sites to help fill some of the critical gaps in our global site coverage.
- Major issues limiting data product quality in our current ILRS network are unstable system performance, data biases, engineering problems and poor local ties. Some of the station contacts are stale as evidenced by lack of responses to our performance inquiries. We need to attack this on a broad front, including: update/verify station mailing list, reiterate the data quality issues to the stations, identify senior level contact for each regional network, identify minimum QC procedure at the station, consider a workshop/clinic for stations, analysts, engineers to help educate the station and improve procedures, and in general increase motivation of station personnel.
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#### **Election of GB Chair and WG Chairs (M. Pearlman)**

- Graham Appleby has completed his second two-year term as GB Chair. The GB warmly thanks Graham Appleby for service.
- Giuseppe Bianco was unanimously elected as GB Chair. The past chairs are invited to participate in the GB meetings.
- The chair of the mission WG is now Toshi Otsubo; Graham Appleby will continue to give his help.

#### **Future Workshop Proposals (M. Pearlman)**

- The GB endorsed the NASA/GSFC offer to hold the 19th Workshop “Celebrating 50 years of SLR: remembering the past planning the future” at the end of October 2014. Jan McGarry presented possible topics including the SLR role within GGOS, network distribution, local ties, RFI issues mitigation, interactions between techniques to maximize effectiveness, and data biases including a station “clinic”. The participants of the Workshop approved this offer at the General Assembly the next day.
- The GB endorsed a GFZ proposal to hold the 20<sup>th</sup> Workshop in Potsdam in 2016.
- ASI/CGS in Matera is a candidate for the 2015 technical workshop.

#### **Other Business (M. Pearlman)**

- The UN Committee of Experts on Global Geospatial Information Management established a working group with the responsibility to write a resolution on global geodetic reference frame. Opseth (Norwegian Mapping Authority), Altamimi (IAG) and Johnston (GIAC) are leading the WG and are preparing a draft. Details are in Appendix 1 below.
- The Norwegian Mapping Authority is working toward a new core site at Ny Alesund, about 1.5 km away from the current site. They have two proposals for the VLBI telescope; they expect a contract to be signed by the end of the year. The VLBI system will be operating in 2017. They are still investigating options for the SLR system to be operating in the 2020 timeframe.

**Resolutions of the 18th workshop:**

The GB worked with Russian delegation to develop a resolution that the ILRS implement a GNSS tracking strategy that included tracking of the full constellation of GNSS satellites. The final wording is in Appendix 2.

## Appendix 1

The UN Committee of Experts on Global Geospatial Information Management (UN-GGIM) is paying growing attention to geodetic Earth observation. The work in this committee can now lead to a UN resolution on global geodetic collaboration "to work with all stakeholders to improve a sustained operational global geodetic reference frame (..) " (From the Doha Declaration UN-GGIM). A UN mandate could encourage a number of countries to make a commitment to global geodetic cooperation, and help achieve a sustained improvement in the reference frame and infrastructure for global Earth observations – in the same way that Norway and the Norwegian Mapping Authority are now doing at Ny-Ålesund.

The decision on **Global Geodetic Reference Frame** at the UN-GGIM 3. Meeting in Cambridge, July 2013:

- *The UN Committee of Experts on Global Geospatial Information Management has recognised the growing demand for more precise positioning services and the economic importance of a global geodetic reference frame; the need to improve global cooperation within geodesy, including to openly share data to contribute to regional and global reference frames, building on regional networks; and the need for appropriate commitment to national contributions to improve national geodetic infrastructure as a means to improve the global geodetic reference framework.*
- *The committee agreed that actions be taken to facilitate the submission of a resolution to be tabled at the 2013-14 Session of the UN General Assembly to seek support and commitment at the highest level, and requested the Secretariat to establish a Working Group to develop the conceptual note and draft text of a UN General Assembly resolution.*

The Working Group is led by a smaller group with representatives from GIAC, IAG and the Geodetic Reference Framework for Sustainable Development Working Group of UN-GGIM-AP (among others: Opseth, Johnston, Altamimi). This group will lead the process of developing a concept note, develop a draft text of a UN General Assembly Resolution and tabling of a resolution at the 2013-14 Session of the UN General Assembly.

Here you find more information about the UN-GGIM: <http://ggim.un.org>

## Appendix 2

### Resolution from the Eighteenth International Workshop on Laser Ranging

- Recognizing:
  - The increasing importance of SLR to the improvement of GNSS performance;
  - The necessity of the SLR technique to the improvement of time, frequency, and ephemeris data products from GNSS;
  - The significant contribution of GGOS to the development of GNSS measurement accuracy through co-location with SLR and other measurement techniques; and
  - The enhancement in station performance that we expect from the next generation SLR systems
  - The availability of full satellite characteristics
- The Participants of the 18<sup>th</sup> International Workshop on Laser Ranging recommend that:
  - With the example of the fully loaded GLONASS system; the ILRS develop a GNSS tracking strategy and on the basis of it, implement a mission (program) to track GNSS satellites with retroreflectors;
  - Multi-constellation GNSS receivers (GLONASS, GPS, Compass, etc) be co-located at all ILRS stations to improve measurement performance of GNSS and to support GGOS development;
  - All SLR stations should be members of ILRS and participate in the GGOS project.

#### Requested for GLONASS Satellites

Each participating station should make its best effort to provide two passes per day on each satellite in the GLONASS constellation, one pass in day-time and one pass in night-time, with each pass having 2 NP (i.e. 2 x NP, each consisting of 1000 full-rate measurements or of duration 5 minutes), spaced widely apart in the orbit.

Multi-constellation GNSS receivers could be offered by

Precision Systems and Instruments JSC for all interested ILRS stations; the data from the receivers would also be submitted to the IGS data center for use by the international community.