ILRS Governing Board Meeting
20th International Workshop on Laser Ranging

GFZ, Potsdam Germany
October 09, 2016

Opening Remarks (M. Pearlman on behalf of G. Bianco)

Bianco had an unforeseen commitment and went back to Rome for a day. Pearlman gave the welcome to the audience on his behalf.

The agenda for the meeting is given in Attachment 1; the attendees list is provided in Attachment 2.

Workshop Overview (L. Grunwaldt)

Grunwaldt gave a brief picture of the plans for the 20th International Workshop on Laser Ranging. The format consists of one or two invited science talks during each morning session, sessions with oral presentations, poster sessions, and the station clinics. The organizing committee and the program committee have done a great job and everything is ready.

ILRS Central Bureau Report (M. Pearlman)

The revised ILRS Terms of Reference have been approved by the IAG. The new ToR includes two more at-large Governing Board members to enhance geographic and/or science representation. Wording has been updated for clarification of procedures.

The network of tracking stationed continues to expand. During the last year, the SOS-W (BKG) at Wettzell (core site) and the KASI system at Sejong (core site) became operational, as did the upgraded systems in Boroweic and Riga. The Russian network has a new station underway in Hartebeesthoek, agreement for a new station in Ensenada, and discussions underway for a station in Tahiti (to be co-located with the other instruments at the new site). NASA SGP has work in process for new stations in Texas, Haleakala, and in Ny Alesund (in cooperation with the Norwegian National Mapping Agency). New stations are also in process in Metsahovi and India (2), and planning has begun for a new station in Yebes. The BKG AGGO core site is now being setup in La Plata. A number of other sites are undergoing upgrade and should be operational in 2017.

The list of target satellites continues to expand as new missions use SLR for orbit determination and other applications; the network is now tracking 90+ satellites (from LEO to GNSS and synchronous) which in some cases is placing a limitation on the per satellite data yield. Many new satellites were added last year. The ILRS pass performance standard has been increased to 3500 passes/year in recognition of the general improvement in system performance. Twelve to fourteen stations have already or are on course to meet this new standard this year.

Interest is increasing in the use of laser ranging techniques for time transfer and optical transponders for extended range.

The official orbital data product on the LAGEOS and Etalon satellites is now operational (ASC) and implementation of ITRF2014 (SLRF2014) in ILRS operational products (ASC) is in process. A new data Quality Control Board has been established to address laser ranging data quality issues, evaluation and diagnosis of systematic errors. A Systematic Error Monitoring Pilot Project is working toward developing diagnostic operational data products (ASC).

Over the past couple of years the network data level (number of passes) has leveled off, but we attribute much of this to the many stations that have been in the process of upgrade, replacement, and relocation. We expect that 2017 will be a bountiful year.

Issues and challenges for the ILRS continue to be:

- Filling the geographic gaps with new stations, in particular in Latin American, Africa, and the ocean regions;
- System upgrades and replacements to overcome the present mix of new and old technologies;
- More standardization in system hardware and operations;
- Improving data quality (reducing system biases) as the ILRS strives for mm accuracy;
- Supporting an ever increasing list of targets, including implement of more effective tracking strategies;
- Developing new retroreflector designs to increase range accuracy and signal link

Future Role of the ILRS (M. Pearlman)

We introduced the question of whether the ILRS needs to update its role to accommodate changes over the last 18 years. This might include questions like:

- Is the role of the ILRS articulated properly?
  - Are we fulfilling the role?
  - What are we not doing?
  - What else should we be doing?
- Should the role be updated?
- Does the organization structure of the ILRS effectively support that role?
  - Do we have the correct elements, standing committees?
  - Are the elements fulfilling the right role? Should there be more/different elements?
- Are we properly representing the ILRS community? Should we have more users "in the loop"? Do we need a better way to integrate the missions?
- Do we need a strategic plan? (I hope the answer is no)

Georg Kirchner said that he believed that the role as presently specified now is quite good. Other organizations (e.g. ESA) appreciate the ILRS job. Space Debris tracking should be stated somewhere in the ToR. Ulli Schreiber mentioned that we should also stress that SLR could be the key technology for time. We should discuss this further.

Standing Committee/Study Group/Board Reports

The use of the term "Working Group" (WG) has been changed into "Standing Committee" (SC) in order to adhere to the IAG rules.

Analysis SC (ASC, E. Pavlis/C. Luceri)

The ASC met for a full day on the Saturday before the workshop (October 08, 2016). Overview of the activities:

- Daily and weekly products are routinely submitted by ASI (AC & CC), DGFI, ESA, GFZ, JCET (AC & CC), & NSGF; expect GRGS to participate soon;
- The four-satellite orbital product was finalized; eight ACs are already submitting SP3 files, anticipate BKG & GRGS participation;
- ITRF2014 should be adopted by January 2017 after a two-month test period on the standard product generation;
- The official data breaks at the SLR sites have been justified by engineering research and modeling have been adopted until further notice;
- The first phase of the Station Systematic Error Monitoring Pilot Project (SSPP) has been completed with results from five ACs agreeing to within the error of the estimates (few mm); expect submission from the three remaining ACs shortly for inclusion in the phase 2 reanalysis;

- Following completion of the SSPP, additional Pilot Projects should be underway in the spring, including (1) Low degree/low order gravity field terms (material is already in preparation) and (2) NT-Atmospheric loading applied at observation level;
- The submission process for the Special Issue of the Journal of Geodesy on Laser Ranging will be restarted immediately after the workshop.

Missions SC (MSC, T. Otsubo/S. Wetzel)

The MSC will meet on October 11, 2016. Planned topics for discussion at the meeting:

- The new MSRF has been adopted by the ILRS; it is easier to fill-in and read, and eliminates some ambiguities; it also allows incremental submissions for follow-on missions with engineering changes or updated objectives;
- Overview of future missions to need ILRS support;

Data Formats and Procedures SC (DFPSC, H. Mueller/R. Ricklefs)

The DFPSC met on October 09, 2016:

- The new "coffee break" leap second procedure have been adopted;
- Transponder clocks needs to have station time offset and drift in order to interpret their data; a provision should be made wither in the data record or a separate file to accommodate this information; a Study Group should be formed to make a proposal;
- EDC has proposed on-line facility for station and history site log entry with a login to the station account at EDC; there was great interest and Christian Schwatke will continue the development;
- Efforts are underway to harmonize the QC procedures at the OC's; this would make it possible for stations to submit their data through either or both Data Centers;
- There is an activity under Randy Ricklefs to develop a library of common use software that could be shared; lots of packages have been identified, but not much progress has been made in archiving much.

Networks and Engineering SC (NESC, M. Wilkinson/G. Kirchner)

Topics to be discussed at the NESC meeting on October 12, 2016:

- Beam divergence procedure has been established
  - The procedure was sent to the stations and some data has been gathered;
  - The delivered procedure was not followed by all of the stations, with some stations providing results from alternative methods;
  - The beam divergence procedure appears to work well at many stations, but not at all and it seems the procedure is unsuitable for some stations;
  - It was recommended that an entry "Measured Beam Divergence" section is added to the Site Log; this method can be used to help address Missions Standing Committee questions on energy densities at satellite heights.
- An NESC forum is online now and open to the ILRS community
  - Strengthen the connection, communication and collaboration between international colleagues, and exploit the wealth of experience and knowledge in the ILRS network to address problems that are common to multiple stations.
  - You can register as a member to post topics, post replies, get notifications, and see attachments

Transponder SC (TSC, U. Schreiber/J. McGarry, J. Degnan)

The TSC will meet on October 13, 2016; topics to be discussed:

- T2L2 is still acquiring full-rate laser ranging data (via EDC);

    - There is an opportunity for SLR stations from Russia to participate in time transfer activities and station time bias estimation;
    - A time transfer campaign is currently underway between Herstmonceux/Grasse and Changchun/Shanghai; the goal is to compare the ground-to-ground calibrated links provided by GPS and T2L2 (in non common view).
    - There are a number of synergies coming from T2L2 including better understanding of the frequency response of the USO (radiations) on Jason-2, recovery of station time bias for ILRS analyses; estimation of laser received energy aboard the satellite and atmospheric transmission through the atmosphere, fundamental physics, and optical data transmission.
    - A proposal to extend the T2L2 mission through 2017 has been rejected by CNES; a Resolution asking to extend the T2L2 lifetime will be offered by the Laser Workshop;
- ELT laser safety: Wettzell is test case for ISS ranging. Once approved, the process will be easier for other stations. ILRS tracking request has been prepared and waits for safety approval.
- A lunar laser occultation test to study lunar dust and exosphere using LRO and the 1.2m telescope facility at GSFC is being planned;

Space Debris Study Group (SDSG, G. Kirchner)

The SDSG will meet on the final day of the workshop, October 14, 2016. Recent activities of the SG:

- The number of stations making space debris tracking is increasing, The TOPEX campaign had excellent results and the data collected were sufficient for interesting analyses (e.g. solar radiation studies). Observations are underway on the spinning of defunct GLONASS satellites;
- Under the "Stare and chase" project a sector of the sky is under watch and CPF's were computed on moving satellites within the sector; these satellites could then be tracked with SLR within one pass of the satellite. The test was done with space debris targets. With this technique, SLR can track without a CPF or TLE already available;
- This technique is powerful, but the question is "what can we do that is not already being done using microwaves"? The accuracy is better; the cost of a campaign for a specific target is lower. However, care must be taken with this technique to follow the proper ILRS policy and not range to active targets for which we do not have permission to track;
- This is a feasibility test only to check what could be done with powerful laser; there is no intention to turn this into an ILRS operation.

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

- GGOS Days meeting will be held at CfA on October 24 – 27; major issues will be:
    - The definition of the gravity field products and how they can be integrated into the reference frame along the data products from the Geometric Services;
    - Path forward on metadata;
    - Update on the focus areas including the Natural Hazard topic of Tsumani warning using GNSS perturbations in ionosphere;
    - Updating the GGOS Implementation Plan for 2017 – 2018.
- GGOS Bureau of Networks and Observations will meet during EGU; we are trying to get a location for Tuesday morning at 9 – 12.

Future Workshops (C. Noll)

- Next workshop (21st International Workshop in Laser Ranging) will be in Canberra, Australia, The theme of the workshop has not been decided yet. James Bennett (SERC) gave a short overview of the organization of the workshop. A more detailed presentation will be made during the workshop in Potsdam.

- It is possible to schedule a technical workshop in 2017, but we need to ensure that the format, subject, etc. are different from the full workshop. Riga has offered to host this workshop in October

Attachment 1

ILRS Governing Board Meeting
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GFZ, Potsdam Germany
October 09, 2016; 15:00-19:00 UTC

Agenda

• Opening Remarks	G. Bianco	10 min
• Workshop Overview	L. Grunwaldt	10 min
• ILRS CB Report/ILRS Status	M. Pearlman	10 min
• ILRS Future Planning (initial discussion)	M. Pearlman	20 min
• Standing Committee/Study Group/Board Reports (focus on what's new)		
– Analysis SC	E. Pavlis/C. Luceri	10 min
– Missions SC	T. Otsubo/S. Wetzel	10 min
– Data Formats and Procedures SC	H. Mueller/R. Ricklefs	10 min
– Networks and Engineering SC	M. Wilkinson/G. Kirchner	10 min
– Transponder SC	U. Schreiber/J. McGarry, J. Degnan	10 min
– Space Debris Study Group	G. Kirchner	10 min
– Quality Control Board	M. Pearlman	5 min
• GGOS Activities/Role of the ILRS	M. Pearlman	10 min
• Future Workshops	C. Noll	5 min
• Other Business and Discussion	G. Bianco/M. Pearlman	

Attachment 2

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October 09, 2016; 15:00-19:00 UTC

Attendees

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