

**ILRS Governing Board Meeting**  
November 04, 2018, 17:00-19:00  
Mt. Stromlo Observatory, Canberra Australia

**Notes**

**Attendees:**

GB Members:

James Bennett	Georg Kircher	Cinzia Luceri	Stephen Merkwowitz
Carey Noll	Toshi Otsubo	Erricos Pavlis	Mike Pearlman
Ulli Schreiber	Christian Schwatke	Andre Sokolov	Daniella Thaller
Matt Wilkinson	Zhang Zhongping		

Invited:

John Degnan	Evan Hoffman	Julie Horvath	Randy Ricklefs
Jean-Marie Torre	Vyacheslav Murashkin		

**Introduction (M. Pearlman)**

The meeting began with a brief introduction by M. Pearlman and a review of the agenda (see presentation package).

**Elections (C. Noll)**

C. Noll reviewed the results from the election of the 2019-2020 ILRS Governing Board and the process followed for the election (see presentation package). She recommends that the ILRS implement a more formal process for future elections beginning with the establishment of an Election Committee consisting of three members (ideally) to solicit nominations and supporting documentation, and conduct the elections for each post. There was general agreement and the Central Bureau will follow up with a recommendation for GB review.

ACTION: Finalize a recommendation for a GB election procedure. (Noll)

**ILRS Central Bureau Report (M. Pearlman)**

M. Pearlman reported on ILRS highlights (see presentation package).

We have Improved techniques for estimating and addressing station range biases using orbital solutions over long periods of time and improved modeling (including satellite center of mass corrections). This activity will continue to be a high priority item. The ILRS is implementing new CRD and CPF formats to Increase transfer of information, and support for future missions and applications (e.g., ELT and space debris). New site log format updates and site log procedures (in testing) will allow stations to submit and modify site logs online, and record more information on station configuration/status.

The ILRS Operations Centers are implementing more thorough data screening and QC to improve data inflow from the stations and to harmonized the process between the two OCs at EDC and NASA. In addition, the OCs have implemented a new procedure to permit dual path data submission for monitoring station transitions to the event timers or other data path

upgrades; this procedure was implemented for the new event timer at NASA stations, but is available for use by other stations.

All but seven stations are routinely submitting full-rate data.

In an attempt to preserve the full resolution of epoch-timing, stations have been requested to submit their epoch-timing data to the full resolution of their timing equipment. The CRD format has sufficient resolution to accommodate this.

Operations at Metsahovi will be delayed until late 2019 or 2020 due to new hardware implementation issues. Operation of the relocated/upgraded SLR stations in San Juan and La Plata have been delayed due to importation problems, but it looks like the La Plata situation has been resolved and operations should start by mid-2019.

In the 2020-time frame: Russian SLR systems are scheduled for Ensenada (Mexico), Java (Indonesia), and Grand Canaria (Spain); NASA core stations are scheduled for McDonald, Halekala (USA), and Ny Ålesund (NMA, Norway); ISRO SLR stations for Mt. Abu and Ponmudi (India); and a Spanish station at Yebes. These will certainly enhance the network, but geographic coverage gaps still exist in northern South America, Africa, and ocean areas.

Station productivity shows some improvement; but only 15 to 20 stations are producing sufficient data to have an impact on ILRS products. Only 15 stations are meeting the ILRS 3500 pass/year performance criteria.

We discussed the idea of categorizing stations by data yield. J.M. Torre pointed out that this could adversely impact local status and funding, and that the performance of some stations like Grasse, which were engaged primarily in lunar ranging, are not properly represented. He also suggested that since there are many stations in Europe, the ILRS should consider ways to more effectively perform tracking on a regional basis. G. Kirchner pointed out that since the list of targets continues to increase, it is probably the wrong approach to have all stations track all targets; stations run out of time and resources. We might give stations more freedom in selecting the satellites they track, or give different sets of satellites and/or priorities to selected stations. The NESC and MSC together should try to formulate a recommendation.

*ACTION:* The NESC and MSC together should try to formulate a recommendation for a tracking division of labor in station-plentiful areas like Europe (Wilkinson).

*ACTION:* Develop an ILRS recommendation for normal point formulation. (Wilkinson)

Users of the GNSS SLR data have different requirements; some want concentrated tracking on a few satellites at a time; others want sampling on all of the GNSS satellites. We are trying to settle on a formula to provide the best overall support. The ILRS conducted two 2018 LARGE campaigns to test different strategies for tracking the ever-increasing number of GNSS satellites. It looks like the best compromise will be a mix of a few higher priority GNSS satellites from each constellation (with more concentrated tracking) and a large pool of GNSS satellites (for low priority tracking with sparser tracking on an as-time-available basis). We are discussing this now with the IGS and the ICG.

In light of the large number of missions that we have on our roster, and the additions each year, we should be more selective on our acceptance of new missions, especially when the likelihood

of success is low. We also need to review user requirements for satellites currently on our priority list. Results from our previous user survey however, showed that some users required data from every satellite tracked by the ILRS.

*ACTION:* Conduct another survey of user mission requirements. (CB)

The proceedings from the 2017 Technical Workshop in Riga are available through the ILRS website, with links to abstracts, presentations, posters, and papers. Unfortunately, we have received papers for only 40% of presentations. The proceedings for the 21<sup>st</sup> International Workshop on Laser Ranging in Canberra have already been set up on the web; material received to date has been posted. These web-based proceedings will include PDFs of abstracts, presentations, posters, and papers as received.

U. Schreiber suggested that we continue to stress autonomous operations to reduce our cost and that we articulate the benefit from twin SLR and VLBI systems at key stations.

### **Standing Committee/Study Group Reports**

Each of the ILRS Standing Committees and Study Groups reviewed recent accomplishments and plans for splinter meetings during the workshop (see presentation package). Some highlights are given below.

#### *Analysis Standing Committee (E. Pavlis)*

The ASC is working on a new operational approach to handle error sources in our current modeling standards progressing. The approach estimates systematic errors simultaneously with all other parameters to eliminate the biases in station positions and to correct identified serious shortcomings in the current models for the target signature (also known as “CoM correction”) for certain types of ground systems. Correction of such errors can affect the SLR-VLBI scale difference at the 0.25 ppb level. The new CoM model under development by Jose Rodriguez will be adopted and the data from 1983 will undergo complete reanalysis to provide ITRF2014-based “pos+eop” and orbital products for a seamless backwards-compatible set of operational products.

#### *Missions Standing Committee (T. Otsubo)*

The MSC is working on a new ILRS website layout for GNSS LRAs, a collaboration with the NESC to improve the on-line Forum, new mission approvals, and new scheme with the CB to improve discrimination on future mission approvals.

#### *Data Formats and Procedures Standing Committee (C. Schwatke)*

The DFPSC is implementing the new CRD and CPF formats; stations have been recruited to begin testing. The committee is also implementing the new on-line site logs and station history logs. M. Wilkinson’s standard normal points software is also ready for release.

#### *Networks and Engineering Standing Committee (M. Wilkinson)*

The NESC is reviewing the QC tests for submitting CRD data to the ILRS Data Centers and working on an update to the NESC online forum. The committee is using full-rate data to test the consistency of the station generated NP’s. The ILRS has a standard NP procedure, but there

are small deviations in the processes used at different stations and the question is whether stations be allowed to develop and implement alternative procedures and how should this be managed in some way. One complication in the process is that some stations are submitting raw data (no edits) while others are submitting fully screened data. We need to decide which methodology we want stations to use. M. Wilkinson will work with the ILRS Standing Committees to recommendation a standard full-rate data process.

**ACTION:** Develop recommendation for the content of the full-rate data submitted to the ILRS OCs. (Wilkinson)

*Transponder Standing Committee (U. Schreiber)*

U. Schreiber reported on ELT tracking and time transfer for ACES. An ACES workshop was held in October; ESA reports that ACES will launch on Space X in 2020. Procedures for SLR tracking have been accepted; documentation should be completed by the end of 2018. Experiments continue on time transfer on non-cooperative targets (e.g., space debris). Testing has been done with common view at several European stations (Graz, Wetzell, Zimmerwald). Here two stations transmit; each station receives own echo and that from other station. Analysis then determines ranges and time offsets between stations.

*Space Debris Study Group (G. Kirchner)*

Several SLR stations are actively tracking space debris under the organization of the Study Group. Several Chinese SLR stations are planning to install an additional new space debris laser. Additional stations in Europe have joined the bistatic ranging activities. The Graz debris data server is extensively used for all debris-related data exchange and storage. Stations are installing single-photon counters for light curve recording (simultaneously with SLR). Time transfer activities are being scheduled with laser ranging to space debris targets. Considerable effort is being made using light curves to study attitude motions on space debris objects.

## **Other Business**

Standing Committee chairs were asked if 1 to 1.5 hours allocated for their meetings at the workshop was sufficient. The consensus was that time was adequate since these were really business meetings and many of the pertinent topics were covered in the workshop sessions. The ASC will still use a full-day meeting schedule, unless otherwise agreed a priori.

U. Schreiber questioned the need to use valuable workshop time for clinics. We agreed that we would evaluate the clinic sessions after the workshop.

**ACTION:** Develop recommendation for inclusion of or format of clinics at future workshops. (All)

M. Wilkinson suggested modifications to the ILRS website including a “station biography” or a station information page, similar to the description available on mission pages. This information could include the purpose of the station, activities at the station, etc. The CB will discuss this and C. Noll will recommend ideas on possible solutions.

**ACTION:** Determine feasibility of including general station information in station pages on ILRS website. (Noll)

M. Pearlman reported that the ILRS has not issued an annual report for quite a while; compiling this document is difficult within current CB staff. Perhaps we could start the next report by using information compiled for the ILRS overview paper in the Journal of Geodesy Special Issue on Laser Ranging. We need to decide if we should include individual station and AC/AAC reports.

T. Otsubo reported on the GGOS Days 2018 meeting held in Tsukuba, Japan last month. GGOS and the WDS International Program Office located at NICT had a splinter meeting to discuss the assignment of DOIs to data and derived products; these DOIs could then be referenced in scientific publications, giving credit to data producers and services like the ILRS. CDDIS does implement DOIs to data and derived product “collections” in its archive, e.g., SLR daily normal point data. The ILRS will discuss this further; such a DOI activity will probably start with GGOS.

U. Schreiber reported on recent discussions he has had with Tom Murphy. Murphy believes that global LLR is a “broken community”. The lunar community is small; there are presently few LLR stations and few ACs analyzing lunar data. Resulting papers may acknowledge the ACs, but not data producers. Murphy has found that no ACs incorporate/acknowledge him or his station outright. This lack of cooperation means he doesn’t have access to the latest models, etc. Furthermore, insufficient acknowledgment of APOLLO data could result in a funding problem for the station. There seems to be a reluctance for providing co-authorship to those providing key component to the research. We agreed that there should be proper recognition for the data suppliers. We also agreed that there could be a “lunar group” (including the lunar stations and the ACs) within the ILRS, but the lunar community would have to take the initiative. At a subsequent small meeting, U. Schreiber agreed to meet with J. Mueller to see if they could sell this approach to the lunar community.

**ACTION:** Develop recommendation for formulating a “Lunar Group” (working group, study group, standing committee) within the ILRS. (Schreiber, Torre, Mueller)

The meeting closed by 19:00

**ILRS Governing Board Meeting**  
November 08, 2018, 17:00-19:00  
John Curtin School of Medical Research, Canberra Australia

**Notes**

**Attendees:**

GB Members:

James Bennett	Georg Kircher	Cinzia Luceri	Stephen Merkowitz
Carey Noll	Toshi Otsubo	Erricos Pavlis	Mike Pearlman
Christian Schwatke	Daniella Thaller	Jean-Marie Torre	Matt Wilkinson
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John Degnan	Evan Hoffman	Randy Ricklefs	Ulli Schreiber
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**Governing Board Membership**

C. Noll reviewed the ballot for the election of the chair of the ILRS Governing Board for the 2019-2020 term. Ballots were cast and counted, including three absentee ballots for GB members not attending the meeting (a ballot from one GB member not present was not submitted prior to the meeting). After tallying the votes, Toshi Otsubo was elected chair of the ILRS Governing Board for the 2019-2020 term.

GB members were requested to submit nominations for the two appointed members to the Board. Names should be sent to C. Noll in the next few weeks so elections can be held in a timely fashion.

***ACTION:*** Solicit nominations and manage election of the two appointed members to the ILRS GB by early December. (Noll)

**Appointment of Standing Committee Chairs**

Since the next term for the GB membership starts on January 01, 2019, the Board needs to review the chairs for all standing committees and study groups. E. Pavlis and C. Luceri will continue as chair and co-chair of the ASC. C. Schwatke and R. Ricklefs also agreed to carry on as chair and co-chair of the DFPSC. M. Wilkinson will remain in his position as chair of the NESC with Kirchner serving as co-chair. With the election of T. Otsubo as chair of the GB, he will step down as chair of the MSC; he also stated that S. Wetzel will no longer be able to serve as the MSC co-chair. He will start the search for candidates for these MSC positions. U. Schreiber will continue to be involved with the TSC; chair and co-chair(s) will be confirmed later. G. Kirchner agreed to continue to chair the SDSG.

**Next Workshops**

The 22<sup>nd</sup> International Workshop on Laser Ranging is planned for Kunming China in 2020; dates are still under consideration. M. Pearlman asked if we should hold an ILRS technical workshop in 2019 and many felt that this suggestion was a good idea. Possible locations are in Stuttgart

Germany (with Daniel Hampf's group at DLR) or in Arequipa Peru. The CB, with the GB, will further explore these possibilities and discuss any proposals with the GB.

*ACTION:* Reach out to possible hosts concerning the 2019 ILRS Technical Workshop. (Pearlman/Noll)

*ACTION:* Confirm dates for 22<sup>nd</sup> International Laser Ranging Workshop in Kunming in 2020 and forward schedule to other organizations. (Pearlman/Noll)

### **ILRS Outreach**

S. Merkwitz suggested that the ILRS institute educational sessions or schools similar to that used by the IVS and the IGS. This sounds like a good idea; the first step is to talk with the IVS and the IGS to see what they are doing and how the concept might be applied to the ILRS. We will form a small committee to look into this and formulate some ideas.

*ACTION:* Create committee to explore ideas for creating ILRS education sessions or dedicated workshop. (ILRS GB/CB)

The meeting was closed by 19:00