

## ILRS Governing Board Meeting

Austria Center Vienna  
Splinter Meeting Room 4 Yellow Level

Friday, April 7, 2006  
12:00 – 15:00

Attendees:	M. Pearlman	J. McGarry
	P. Bianco	G. Appleby
	R. Noomen	W. Seemueller
	P. Shelus	C. Noll
	G. Kirchner	W. Gurtner
	H. Drewes	B. Greene

### Opening Remarks

The meeting began shortly after noon on April 7. Gurtner thanked everyone for coming to the meeting and noted a quorum was present.

### ILRS Status/Action Items

Noll and Pearlman reviewed current status of the ILRS and outstanding action items (see handout). Open action items and key discussions are given below; other action items are listed in GB materials handout.

1. CB will contact the IAG Outreach to suggest that the IAG make its participants aware of the issue of service recognition in publications, papers, reports, and presentations. *This item has been discussed in meetings with the other services but no action has yet been taken.*
2. Bianco should make sure Pavlis has looked at the MLRO two-color data. *Not a GB action.*
3. Appleby will provide station signal strength regimes to the CB for placement in the site logs with perhaps a separate table automatically updated/extracted and linked to the CoM pages on the ILRS Web site. The information is not in the site log now so the format will have to be modified. *Appleby will send an email about the new GLONASS pages.*
4. An ILRS orbit product committee should be formed and develop a plan for the new product (Noomen). *No longer a GB action.*
5. ALOS issues. *See discussion on ALOS under Mission WG report.*

### Reports from Working Groups

#### *Analysis Working Group*

Noomen reported on results from the ILRS AWG meeting on April 4 (see auxiliary materials for presentation). The re-analysis of older SLR data for the period 1983 through 1993 has been requested by the IERS. These older data are of weaker quality and quantity than current data and thus some special consideration must be given in the analysis. Instead of the current weekly solutions, these data may only support data products with longer time periods. A question remains on the interval for the EOP solution and weights of SLR measurements. A report on the progress of this re-analysis effort will be made during the Canberra workshop.

The IERS has acknowledged that the ILRS is the most important provider for the origin of the TRF as well as a critical contributor to scale (along with VLBI). Altamimi (IGN combination center) has noted that the time series of the ILRS derived origin from the current data differs from the ITRF2000 by a slow secular variation. This may be due to changes in the network configuration. Altamimi has asked which reference the ILRS would endorse for origin. Both the GB and AWG strongly recommended that IERS use the current time-series rather than the ITRF2000. The criteria for excluding stations from the ITRF solutions were discussed with general agreement that only “good stations” should be included for one reliable ITRF2005 (reference frame of the first order). Densification could then be enhanced through subsequent inclusion of “other” stations, including re-analysis of older data. It was also noted that the time history of scale as derived by SLR and VLBI were different, suggesting that this difference should be investigated and better understood.

**Action:** Noomen will inform the IERS that the ILRS strongly recommends using the current time-series of ILRS and IVS pos+eop solutions for the definition of the origin and scale of ITRF2005.

**Action:** Noomen will inform the IERS that noting the difference between the scales derived by the ILRS and IVS, the ILRS recommends that the IERS investigate the difference and decide how this difference should be handled.

The AWG reviewed the current status of analysis center categorization and recommended updates based upon contributions to the ILRS operational product. The GB recognizes that the analysis groups contributing to the ILRS operational product, having successfully passed the qualification process and are providing contributions to the ILRS product on an operational basis, now have the status of an ILRS AC.

**Action:** Pearlman will send a message to the newly acknowledged ACs and inform the previous ACs that do not qualify as such anymore about their loss of AC status.

**Action:** Noll will update the Web site, exploders, etc. to reflect the operational (and non-operational status) of ACs.

A special issue on the ILRS in the Journal of Geodesy has been proposed; the IDS and IVS are currently in the process of completing similar special issues in the same publication. This ILRS issue will focus primarily on science and analysis but should include a few papers on an ILRS overview, the network, and technology. A guest editorial board will need to be formed; it will include Noomen plus perhaps 3-4 others.

**Action:** Noomen will establish the ILRS Special Issue editorial board.

#### *Data Formats and Procedures Working Group*

Seemueller reported that the WG discussed format issues and the plans for implementation of the Consolidated Prediction Format (CPF). The need was identified for modifications to the ILRS full-rate and normal point formats to accommodate kHz ranging data and future transponder missions. The AWG and DFPWG will conduct email exchanges in the coming months to consider modifying the current format and coming up with a proposal.

Randy Ricklefs reported at the WG meeting on the current status of the CPF implementation at both prediction centers and the stations. Most centers are now providing predictions in CPF format; ESA and JAXA are testing; there is no response yet from MCC. Very few stations are currently using the format on an operational basis, but the ILRS is pressing for implementation by June 30, 2006. Tables of specific center and station status were provided in the handout materials. The WG also discussed the option of including velocities as part of the CPF.

#### *Missions Working Group*

Shelus reported that the ILRS has approved support on four new missions: OICETS, ANDE, ALOS, and MicroSCOPE. Since the OICETS mission will end in September 2006, the window for support is very short. More information is needed on the MicroSCOPE reflector array. Because of its planned launch from the NASA Space Shuttle, ANDE will be delayed until late fall or later. With respect to restricted tracking on ALOS: eleven stations applied, nine (Mt. Stromlo, Riga, Koganei, Zimmerwald, Herstmonceux, Simosato, Monument Peak, Greenbelt, Greenbelt/TLRS-4) were successful in the test campaign on Ajjisai. However, since tracking on the ALOS mission will end in September, TLRS-4 will not yet be operational in Hawaii. ALOS tracking, in the form of short 1-2 week campaigns, will start at the end of April. The ILRS did not manage this mission support; JAXA dealt with the stations directly. In the future these processes must go through the CB to make sure that there is proper coordination. The MWG will work to keep mission information comprehensive and current on the ILRS Web site.

#### *Networks and Engineering Working Group*

Kirchner reported on recent (and planned) system improvements in the network. Graz sent their old laser to Metsahovi; providing the opportunity to increase repetition rate from 1 Hz to 2 kHz. The Korea

Astronomy and Space science Institute (KASI) has serious plans to build a fixed (one-meter telescope) and a mobile SLR station; a final decision on SLR in Korea is expected this fall. Georg Kirchner, John Degnan, and Ben Greene traveled to Korea in March to give some technical presentations.

Kirchner is trying to bring Chinese stations (Changchun in particular) into daylight tracking. Borowiec is implementing high-orbit capability (up to Galileo). Zimmerwald has two Riga event timers; Graz is trying to use the Riga event timer for kHz ranging. SLR groups have been urged to have more personnel exchange between laser stations; Graz is very active in this area and is planning to host a two-month visit to Graz by personnel from Borowiec.

Gurtner reported that China has made available 200M Euro for Galileo. Some of the funding will be used for upgrades to the Changchun station, construction of a new laser station in Urumqi with Galileo capability, and production of retroreflector arrays for the Galileo satellites. Yang Fu Min is awaiting information from the retroreflector studies now underway by Dave Arnold and the ILRS.

#### *Signal Processing Working Group*

Appleby and the SPWG are working on station-specific CoM values for LAGEOS; a table of range corrections for all stations has been produced which can be used for the re-analysis efforts. Appleby is talking with GIOVE-A contacts. Diagrams of the GIOVE-A array and its placement on the spacecraft are now available on the ILRS Web site, but there is still a question of the offset dimension between the cubes and the array. Updated GLONASS array information will be available soon.

#### *Transponder Working Group*

McGarry presented information provided by Schreiber. Gurtner requests that the WG prepare a one-page tutorial or a set of requirements that stations should fulfill in order to participate in transponder experiments and missions. McGarry said it is even more crucial that transponder groups talk to the ILRS to make sure that the ILRS is aware of activities underway and systems being designed. The ILRS should also set up a requirements list to help give guidance for transponders experiments to be compatible with ILRS present and projected capability.

**Action:** The Transponder Working Group will create requirements lists to give guidance to both transponder experiments and ground stations to promote compatibility with present and projected ILRS capability.

#### **New ILRS Orbit Product**

The AWG is considering an Orbit Product, but no new information was reported.

#### **Restricted Tracking**

See comments under MWG regarding ALOS.

#### **Galileo Support**

Gurtner reported that ESA is requesting tracking on GIOVE-A to commence on April 24. The request includes four tracking campaigns on GIOVE-A to be scheduled over the next year, three weeks in duration to start, then two weeks long after. In between these campaigns, no tracking by the ILRS is required. Prediction tests are underway; the full process must be completed before the upcoming tracking campaign. The launch of GIOVE-B is now scheduled for September 2006. The return signal strength from the GIOVE satellites is slightly greater than GPS. No discussions have yet taken place on the level of routine tracking that will be involved on the operational Galileo constellation. A comprehensive strategy will have to be developed to support the large number of GNSS satellites.

Discussion followed on the issues and conflicts that could arise if special funding were provided to selected stations by satellite providers. This action could be very divisive to our network. This topic needs further thought, especially since additional funding could help the network during these lean times.

#### **Laser Retroreflector Meeting Summary**

An activity is now underway to develop an “ILRS Specification” for retroreflectors on high satellites (GNSS and geosynchronous satellites). The array designs on these satellites to date have not been coordinated with the ILRS in advance and have placed considerable challenges to present network capability. The Laser Retroreflector Meeting held on April 6 focused on some initial work toward this objective and examined other retroreflector issues. Dave Arnold reported on his analyses on the required array effective cross sections that would be required to achieve specified levels of return signal strength for each satellite regime. He also examined options for achieving these effective cross sections for the GNSS and synchronous altitudes. Options included solid cubes, coated and uncoated and hollow cubes, each with some variation in size and vertex angle offset. Of particular interest was a large single open cube for geosynchronous altitudes. Luck reported on the Mt Stromlo experience with Opus-B satellite in synchronous altitude. McGarry reported that the engineering analysis continues at GSFC on the viability of the open cube configurations. Della Monache from INFN-LFN in Italy reported on their facility that is now ready for the testing of retroreflector arrays, including hollow cube options.

Some lower satellites were also discussed including LARES and the next version of the Luneberg sphere, which will be radiation-hardened to prolong lifetime in space. An agenda for the meeting as well as additional presentations are provided in the auxiliary information.

### **Laser Relativity Satellite (LARES) MOU**

Gurtner reported that the Russian Academy of Sciences, the INFN, JCET, and the ILRS are consummating an agreement to build, launch, and support the LARES and Radioastron Satellites.

LARES, under development by the INFN-LFN, is a spherical retroreflector satellite, with specially recessed cubes to minimize retroreflector overlap during ranging. Although this satellite is being launched for a relativity experiment, it will play a significant role in space geodesy providing a new, stable long-term geodetic reference in space.

Radioastron, to be built by the Russian Academy of Sciences, is a VLBI experiment satellite with a corner cube. The ILRS can use this satellite to test and further develop tracking capabilities to a target in a highly eccentric orbit, recalling that our experience with LRE was not very successful.

Both satellites would be launched by the Russian Academy of Sciences.

A joint MOI for these two missions has been developed by the sponsoring agencies and provided to the ILRS for signature. Erricos Pavlis has submitted mission information to the MWG for initial review. If an endorsement is forthcoming from the MWG and the GB, Gurtner will sign the MOI. Mission support requests will then be required.

### **GGOS Activities**

Pearlman reported on the meeting of the GGOS Working Group on Ground Networks and Communications that took place on April 6. Work continues on the SLR and VLBI simulation and modeling activity to scale the networks to satisfy long term projected requirements. Reports were given on the technology and system configuration projects for the next 10 years. Material on the gravity field that was provided by Rene Forsberg and Steve Kenyon was presented; the role of the gravity field as both a source of ground truth and as a sensitive indicator of height changes was discussed. Svetlana Jevrejeva (Proudman Oceanographic Laboratory) gave a nice presentation on tide gauges.

The GGOS Steering Committee met on April 5. The Committee is in the process of selecting its last few members. Pearlman has been elected to the six-person Executive Council. Drewes is the Chair of the Conventions, Analysis, and Modeling WG and seeks representation of ILRS on this WG; Drewes will write an email requesting the ILRS ACC join the WG. Noll is the co-chair of the Working Group on Data and Information Systems.

### **15<sup>th</sup> International Laser Ranging Workshop**

Greene reported that the workshop Web site ([www.ILRSCanberraWorkshop2006.com.au](http://www.ILRSCanberraWorkshop2006.com.au)) is now available. The theme for the workshop is “Extending the Range”; this theme is two-fold: longer range missions and different applications for laser ranging. Thus far, the local organizers have received \$45-60K AUS in sponsorship. The registration fee will be \$458AUS (~\$350 US). All foreign visitors to Australia will need a visa. Pearlman suggested that a day or session should be devoted to science/applications. Noomen requested that infrastructure be provided to hold an AWG meeting on the Saturday following the workshop. A meeting of the workshop committee will be held in Vienna to finalize session plans.

#### **New Business**

Gurtner reported on concerns voiced during the ILRS MWG about station support from specialized missions. Problems could arise for the ILRS network as a whole if outside organizations contact individual stations to fund their activities. This could seriously interfere with ILRS functions and the ability of the ILRS to respond to the full complex of tracking requirements. On the other hand, it is hard to turn away additional funding, particularly in this era of very tight budgets. This topic needs more discussion.

#### **Other Business**

Drewes reported on several upcoming meetings: related to IAG Commission 1, the VI Hotine-Marussi Symposium of Theoretical and Computational Geodesy asks for input on theoretical studies needed for all the commissions (e.g., reference frame). If anyone has a need for such a task, contact Drewes. The 36<sup>th</sup> COSPAR meeting will be held in Beijing in July. In October, the Geodetic Reference Frame Symposium with FIG will be held in Munich; 20K participants in total are expected. A GGOS Workshop will also be held during this time at DGFI.

The meeting ended at 15:30.