

## ILRS Governing Board Meeting

Palais des Congres  
Grasse, France  
September 28, 2007

<b>Attendees:</b>	G. Appleby	C. Luceri
	P. Bianco	J. Mueller
	D. Carter	Z. Altamimi
	Y. Fumin	E. Pavlis
	W. Gurtner	M. Pearlman
	G. Kirchner	W. Seemueller
	H. Kunimori	J. McGarry

### Opening Remarks

Gurtner thanked everyone for coming to the meeting, reviewed the agenda, and noted a quorum was present. Pearlman gave a brief status review.

### Governing Board:

Zuheir Altamimi replaces Hermann Drewes on the ILRS Governing Board as the Ex-Officio Member, President of IAG Commission I;

### Network:

Data production through September 2007 has already surpassed that of any previous year. By far, the Yarragadee station continued to be the most productive station. Zimmerwald has been the most productive station in the northern hemisphere for the last two years. Noteworthy performance continued at San Juan and Riyadh; Concepcion has recovered remarkably well after the most recent upgrade. Eighteen stations met or very nearly met the Lageos pass criteria during the previous year; about half of them were able to range to the GNSS satellites. Four stations of the Western Pacific Laser Tracking Network were able to range to the synchronous ETS-8 Satellite;

We have not received any data of the Russian stations in Mendeleevo and Komsomolsk; the MCC in Moscow has sent data from Maidanak (Uzbekistan). It would be interesting to hear about the status of the new Russian stations discussed at the some of the most recent meetings (including the Canberra workshop last year).

**Action:** Pearlman will contact Victor Shargorodsky to ascertain the problem with the delivery of the Russian data.

Progress continues on the renewal of the NASA-CNES-UFP agreement for the operation of the Tahiti SLR station. Issues of personnel, hardware renovation, and training are under discussion.

### Task Forces to address concerns:

During the workshop serious concern was expressed about two issues

1. Inadequate two-way communication between the stations and the analysis centers to provide (a) unambiguous, timely reports to the stations regarding data quality and bias information, and (b) timely reports to the analysis centers on configuration changes and other events that could affect system biases.

A task force was set up with Mark Torrence (lead), Erricos Pavlis, Mike Pearlman, Georg Kirchner and Werner Gurtner to provide a plan for discussion by AGU (fall) 2007 in San Francisco on how to address the communications issue.

2. Large uncertainties in the spacecraft center of mass offsets, with particular concern on the geodynamic satellites.

A task force was set up with Graham Appleby (lead), Toshi Otsubo, Georg Kirchner Mike Pearlman, and Dave Arnold to provide a plan for discussion at the fall 2007 AGU on how we should improve the precise computation of the spacecraft CoM offsets for given station-s/c configurations.

### **Working Group Reports:**

#### **Analysis Working Group (Pavlis):**

GRGS has now qualified as a full Analysis Center. Operational products are delivered routinely by the Combination Centers at ASI and DGFI. The AWG is currently focused on site range biases (one prominent source being from the Stanford counters) and the re-analysis of the Lageos data from 1993 to present. Pilot projects in progress include development of orbital data products and daily solutions of 7-day arcs for length of day. New Potential projects include generation of a “geocenter to ITRF origin vector” series, use of Starlette and Ajisai initially for EOP and eventually for TRF products with improved modeling (e.g. atmospheric effects), and near real-time analysis of SLR data for “station health”/bias reports. All ACs and CCs have submitted online documentation (required by IAG/IERS) describing the models and standards used in their routine analysis. The AWG met three times so far in 2007 and is now preparing for the GGOS Unified Analysis Workshop of GGOS, Monterey, CA, 5-7 Dec., 2007.

#### **Missions Working Group (Appleby)**

Since April 2007, Jason-2 and LRO-LR have applied and been accepted for ILRS tracking support. The Missions WG met at the Grasse Laser Workshop and had presentations on the success of the QZS array for geosynchronous orbits, the SOHLA satellite, the new spherical reflector spacecraft, the GOES-R satellite and LARES geodynamic satellite.

#### **Data Formats and Procedures Working Group (Seemueller)**

Most of the stations have moved to the new CPF prediction format. The requirement for prediction centers to provide IRV predictions ceases at the end of this year. Work continues on the new CRD expanded data format.

*Action:* The CB will send out a reminder on the discontinuation of the IRV format.

*Action:* Randy Ricklefs and the Data Formats and Procedures WG will draft an implementation plan for the CRD format for review at the EGU meeting in Vienna in April 2008.

#### **Networks and Engineering Working Group (Kirchner)**

The main activities were active support of SLR stations engaged in kHz upgrades including Metsahovi, Potsdam, and Herstmonceux and 100 Hz in Zimmerwald. The network had to contend with very poor predictions on the low orbiting ANDE satellite, severely limiting data yield; it is agreed that we should discontinue daylight ranging (see below). The Graz station is also testing “TLE” based predictions with some hope of improving predictions on very low satellites. They have been used successfully to track the Reflector satellite to measure spin / motions / orientations.

### **Transponder Working Group (McGarry)**

The LRO is planned for launch in October 2008 with lunar encounter shortly thereafter. The ground system laser has been installed in the SLR2000 at GSFC; the rest of the hardware and software is in the process of being installed and tested. The data flow path from SLR2000 and MLRS has been automated and successfully tested. Predictions are in testing. Meetings were held in Canberra and Grasse with network station representatives, several stations have agreed to participate. Several others have expressed interest. Notes from the most recent meeting at the Grasse Workshop are attached.

### **ANDE Satellite:**

The predictions for the ANDE satellites continue to be poor. Daylight tracking will be cancelled to avoid great labor with little or no payoff.

*Action:* The CB will inform the stations and the ANDE project that daylight tracking on ANDEE will be cancelled.

*Action:* The CB will circulate a 1 page synopsis of Mark Davis's paper on ANDE atmospheric modeling and will add a link to the full paper.

### **Galileo:**

The network is producing about 20 passes on GIOVE-A per week. Gurtner reported that ESTEC is "quite happy with the SLR data" which is also being routinely processed at ESOC in Darmstadt. GIOVE-A operations will probably be extended at least until GIOVE-B is available. The Missions Support Request Form for GIOVE-B SLR tracking should be submitted shortly. Tracking will be requested to start in April 2008. The schedule for the GIOVE-A2 has not yet been defined.

*Question:* What do they really need?

The North China Institute has been contracted to provide the retroreflector arrays for the Galileo satellites using specifications provided by Galileo. It would be most unfortunate if future Galileo satellites used the old specifications rather than a design based on the uncoated or perhaps hollow cube technology which would provide considerably enhanced effective cross-section. It was suggested to Yang Fu Min that he make the experience on COMPASS known to the Galileo planners. The ILRS should make additional contact (perhaps through Werner Gurtner) with Galileo to reinforce the message.

### **COMPASS Satellites:**

The first COMPASS satellite was launched into a GNSS altitude orbit in April by the Chinese. The satellites complex will include a mix of GNSS and geosynchronous altitude satellites in the 2008 – 2010 timeframe. Ranging from the Chinese stations has been very successful with signal strength several times stronger than from GPS. The COMPASS satellites are using solid uncoated cubes, with a vertex angle offset to compensate for velocity aberration. The ILRS will be asked to commence tracking.

### **Retroreflector Arrays**

The IAG and GGOS have endorsed the placement of retroreflectors on all of the GNSS satellites to support POD and reference frame requirements.

At the GB meeting in April 2007, we agreed to an ILRS "standard" for GNSS "effective cross-section" of 100 million sq. meters (5 times that of GPS-35 and -36) to strengthen network performance. It was later pointed out that the Galileo satellites were about 4000 km higher than the GPS, Glonass, and COMPASS satellites and therefore the effective area on Galileo would

have to be about a factor of two larger. The GB agreed to the following changes to the GNSS standard”

Revised Standard (September 28, 2007)

- Retroreflector payloads for GPS, GLONASS, and COMPASS satellites should have an “effective cross-section” of 100 million sq. meters (5 times that of GPS-35 and -36) for GNSS satellites;
- Retroreflector payloads for satellites such as Galileo in higher orbits should scale the “effective cross-section” to compensate for the  $R^4$  reduction in signal strength;
- The parameters necessary for the precise definition of the vectors between the effective reflection plane, the radiometric antenna phase center and the center of mass of the spacecraft be specified and maintained with an accuracy sufficient to support GGOS objectives;

It was also recommended that we develop a specification for both synchronous and low orbiting satellites.

**Action:** Pearlman will draft material for review by the GB.

#### **ITRF:**

Zuheir Altamimi is planning (hoping) that the next ITRF formulation for an ITRF2008, which should include all past data up to the end of 2008, will be realized in 2009. The ILRS is aggressively reprocessing the older data with newer models and the most recent station bias information. The pacing item appears to be the reprocessing of the GPS data.

#### **Special Issue in Journal of Geodesy:**

The IDS and the IVS already have a Special Issue published in the *Journal of Geodesy*. See

<http://www.springerlink.com/content/x064n7136046/?p=14abea21e2f4495b8fd5e667f5299768&pi=8>  
<http://www.springerlink.com/content/v760312v657v/?p=2eb0ea41429e480f9acac4b08d1b8d55&pi=1>

It was agreed at the GB meeting in Vienna 2006 that an ILRS-dedicated special issue of the *Journal of Geodesy* to be compiled for better and wider documentation of ILRS (ground segment, space segment, data analysis and interpretation). Little progress has been made to date so a reconstituted editorial board with Erricos Pavlis, Werner Gurtner, and Mike Pearlman as members. Ron Noomen will also be asked to join. The Board will set up criteria for content, mix, set schedule and develop a list of suggested solicited papers.

**Action:** Pavlis will ask Ron Noomen to participate in the reconstituted Editorial Board.

**Action:** Pavlis will contact the Editor and Chief of the journal to start the activity.

#### **Site Survey:**

Geoscience Australia and Instituto di Radioastronomia (Italy) have compared survey results using common data from Mt Stromlo and Medicina using their own software with excellent results. HTSI is now performing tests on the same data with its software. ASI is also exchanging data with Geoscience Australia to benchmark their software. IGN could do the same.

IGN is in a position to do 1 – 2 surveys per year. An IGN survey is scheduled this year for Herstmonceux. Presently the locations surveyed are decided on an informal basis with the IGN. We may want to seek a more formal arrangement, perhaps asking the AWG to make

recommendations to the GB based on the multi-technique values of the sites. Stations in China may be good choices.

Altamimi reported that he still has cm issues with the coordinates at Zimmerwald and Herstmonceux.

**Other Business:**

The point was raised that there are a few closed SLR stations around the world that nonetheless have good instrumentation that is not being used. There are also operational sites that are in need of major upgrade, including better telescopes, etc. The ILRS might consider some forum to get these groups talking to each other to their mutual benefit and to the benefit of the Service.

**Next Meeting:**

The next GB Meeting will be held in Vienna at EGU in April 2008. A splinter meeting will also be held at the fall AGU 2007 to discuss the Task Force results.

Notes from the LRO-LR Splinter Meeting  
Grasse, France  
September 27, 2007

We met to brief the interested stations and to discuss issues of participations.

Stations preparing to participate: Texas, Zimmerwald (using laser installed in late 2007 in synchronous or asynchronous mode), and Matera

Stations giving serious consideration: Herstmonceux (using present system at 10 – 13 Hz), Stromlo (at submultiples of 60 Hz.), Grasse, Wettzell

Stations thinking about it: S. Africa (if a proper timer can be provided), and Koganei.

Points and issues that were made during the meeting:

1. The project will formally request station participation;
2. Stations must be vetted and approved by the project prior to participation; payload safety is of primary concern;
3. Approval will come with a letter of acceptance that addresses the liability/damage issue;
4. The project will schedule station operations; some program for scheduling needs to be implemented allowing stations to “sign up”. Stations must not range to LRO during any period that they weren’t scheduled;
5. Although operations could support multiple stations operations, initially only one station at a time will be scheduled with a “backup” station;
6. Stations should track a full transit (about one hour) at a time and should commit for several transits a month. Ranging to LRO is most important the first 3 to 4 months of the mission;
7. Interference (and risk) from Lunar Ranging must be recognized, reviewed and addressed if necessary through ILRS;
8. The one way transmit-side calibration technique must be defined ;
9. The stations would like active feedback rather than just web based reports.
10. Some regularly scheduled interaction between the participating stations and LRO should take place during the next year.

It was suggested that some cooperation with the T2L2 experiment might be beneficial.