

ILRS Governing Board Meeting

Austria Center Vienna
Splinter Meeting Room 5 Red Level

Monday, April 16, 2007
17:50 – 20:00

Attendees:	G. Appleby	C. Luceri
	P. Bianco	J. Mueller
	D. Carter	C. Noll
	Y. Fumin	E. Pavlis
	W. Gurtner	M. Pearlman
	G. Kirchner	W. Seemueller

Opening Remarks

The meeting began on April 16 shortly after 17:50. Gurtner thanked everyone for coming to the meeting, reviewed the agenda, and noted a quorum was present.

ILRS Status/Action Items

Gurtner sent a letter to the IERS Directing Board regarding the ILRS position on the ITRF2005 solution; no response has yet been received.

Gurtner received an update from J. Luck on the status of the proceedings from the workshop in Canberra last fall. Thus far, only three papers from the science session have been received. Gurtner believes we must express our serious concern about the status of the proceedings, particularly the lack of papers for this science session; we must have these papers for the document without delaying the production of the proceedings for much longer.

Action: The CB will contact S. Klosko about the status of papers for the Science session from the 15th International Workshop on Laser Ranging and/or send reminders directly to authors.

Pearlman gave a presentation on the current status of the ILRS. A review of the latest network map and report card statistics shows excellent performance from several stations, particularly San Juan and Riyadh; San Juan is second only to Yarragadee in data production and has realized this accomplishment with only nighttime operations. Nearly one half of the stations in the network exceeded the minimum ILRS requirement of 1500 passes for the reporting period. More than half of the network stations have also exceeded the 400-pass LAGEOS requirement; many stations are also above the 100-pass threshold for high satellite passes. Most stations are below the 2 cm RMS requirement with one third at the 1 cm level. The yearly pass total charts for 1995-2006 show a dip in data yield in 2004 primarily due to the loss of Maui, Arequipa, and NASA staff reductions. Statistics for later years show that operations and data yield continue to increase, however.

The Yarragadee, Mt. Stromlo, and Simosato stations successfully tracked ETS-8 (geosynchronous mission at the latitude of Japan); the Yarragadee data volume has been extremely impressive.

The U.S. government agencies responsible for the Block III GPS satellites have not yet agreed to the inclusion of retroreflector arrays on these future satellites; however, NASA and other agencies continue discussions with the responsible groups.

Pavlis reported on recent analysis activities. Geoscience Australia is now an official ILRS AC. GRGS is nearing completion of benchmark tests on orbital issues, which should result in a submission that will be compatible with the official ILRS products. The University of Newcastle has also submitted results for testing and could possibly be approved as an ILRS AC by the end of summer. The current ILRS ACs must once again re-analyze the data from 1993 to the present because of some modeling issues. T. Otsubo has moved from NICT to Hitotsubashi University and has applied for AAC status for this institution. The application was accepted by AWG. The remaining staff at NICT plans to continue its ILRS AAC activities. Pavlis attended the IERS Directing Board meeting on April 15. The IERS has adopted a new definitive series for EOP for which the ILRS is providing input. Tables and graphs that compared the input series to the new series did not include SLR in the write-up; Pavlis complained about this oversight especially because the historic SLR data provides continuity in the series. The IERS will correct the omission. The ILRS ACs will soon produce a daily EOP with a two-day delay. NEOS is very interested in this product. The ILRS AWG plans to analyze data including atmospheric modeling but the IERS Global Geophysical Fluids Center has not provided required inputs; the IERS will issue a new call to generate official products.

The official ITRF2005 solution continues to have an issue with the scale. There is still a need to understand why the differences in scale between VLBI and SLR exist in the IGN solution and not in the DGFI solution. The IGN solution will most likely be used only for another year or so when the next version of the ITRF should be issued. In the meantime, Z. Altamimi/IGN has generated an official rescaled ITRF solution for the ILRS. IGN and DGFI (IERS TRF combination centers) are meeting frequently to try to understand their differences. All IAG services are re-analyzing their data to be ready to supply inputs to the next ITRF solution. SLR will have the longest span of data to contribute to this new ITRF, and some ILRS ACs may add Starlette and Ajisai to make their solutions more robust.

Pavlis will work with H. Mueller/DGFI on issues related to the new ILRS orbit product. Pavlis has developed software for GEODYN to generate ILRS orbit results in SP3c format. All ILRS ACs will generate LAGEOS orbits, and Combination Centers will develop the final products in the same reference frame as the other ILRS official products.

Pearlman reported that SLR2000 is now known as the Next Generation SLR (NGSLR) system. Efforts continue on system development including support for the one-way

transponder activity on the Lunar Reconnaissance Orbiter (LRO) to be launched in mid-2008. A separate, more powerful laser, with a several nsec wide pulse, has been purchased for the LRO-Laser Ranging (LRO-LR). Eyesafe tracking with the NGSLR is planned for satellites at LAGEOS altitude and below; higher satellites will require more power. Staff members working on NGSLR are supporting several other projects (including LRO), which unfortunately have contributed to delays in NGSLR development. NGSLR and MLRS will support LRO-LR tracking and hopefully other ILRS stations will be able to participate with either 28 Hz. synchronous or asynchronous modes of tracking. Gurtner announced that Zimmerwald could provide 28Hz tracking.

The IAG will sponsor a “unified” analysis workshop just prior to the fall AGU in San Francisco. Analysts from the IGS, ILRS, IVS, IDS, and perhaps the IGFS will attend and explore synergies among the services.

Noll reported that a majority of inputs have been received for the 2005-2006 ILRS report. She hopes to complete the document for distribution this summer.

Working Group Reports

Signal Processing (now part of Networks and Engineering)

Appleby reported for Otsubo that the SPWG is working on a precise model to make fuller use of the kHz SLR data. The SPWG has done considerable work on quantifying signal strength dependence of the LAGEOS CoM. However we still do not make any corrections for signal strength variations, and hence this dependence continues to limit Lageos ranging accuracy to a few mm. Since we will be using the Lageos satellites as our standard for the foreseeable future, the AWG considers this to be a serious issue and points out the need to develop a strategy to reach sub-mm accuracies.

Analysis

The AWG met on April 14 at the Technical University of Vienna. The WG is planning a two-day workshop in Perugia around the IUGG meeting as well as a one-day workshop in Grasse to prepare for unified AC workshop at the AGU. Detection and processing of station biases is a serious issue that is degrading ILRS results. This topic will be included at the AWG meeting in Perugia, and ACs will start to look at biases on a weekly basis. The Networks and Engineering WG should continue to look into the sources of these biases and seek engineering solutions where possible. We must be careful however, to keep station configurations stable and avoid modifications to “fix” things unless they are very well understood and documented.

Missions

The ILRS GB approved the PROBA-2 tracking request. The ILRS would like to be involved in comparison of SLR orbits with those generated from the two new GPS receiver on-board the satellite. The CB has requested access to these GPS data but the mission has not yet responded to this request.

Pavlis noted that several missions will launch in the next three+ years that expect SLR tracking support: NASA/CNES Jason-2 (with SLR, DORIS, and GPS, June 2008),

CryoSat-2 (2008), ISRO/CNES SARAL (with SLR, the AltiKA instrument, and DORIS, 2009), CNES/China HY2A (with SLR, DORIS, and GPS, 2009), Jason-3 (2012). Pearlman believes the missions should come to the ILRS and request support, however, they may not realize what needs to be done.

Action: Pavlis will provide contacts to Appleby for known future missions requiring ILRS tracking support; Appleby will contact these missions and inform them of ILRS requirements for support requests.

Data Formats and Procedures

Seemueller reported that a majority of the ILRS network stations are now using CPF instead of TIRVs; therefore he has proposed that ILRS prediction providers stop TIRV generation by the end of 2007. HTSI plans to have all NASA stations converted to use CPF by June 2007 (currently Yarragadee and Greenbelt use CPFs but the remaining MOBLAS and TLRs systems need additional software). Work on the Consolidated laser Ranging Data Format (CRDF) continues.

Action: The CB will send an official message to satellite prediction providers that TIRV production should end on 12/31/2007.

Networks and Engineering

Kirchner reported that Graz tracking of the ANDE satellites using the 2 kHz laser has helped NRL solve some problems in determining spin rate. One of the ANDE satellites has small lasers of optical detection; the Graz station is participating in an experiment to detect flashes from these lasers.

Metsahovi is preparing for the biggest jump in SLR history: installation of a laser to move the system from 1 Hz to 2 kHz; the laser should be delivered in April or May of 2007. A former Graz colleague has moved to Metsahovi and is in a scientist position to oversee SLR, GPS, and gravity science at the observatory. The station is considering upgrades and possible replacement of their mount. Their goal is to be operational with the 2 kHz laser within 1.5 to 2 years. Graz will continue to help the staff with hardware and software. University students will perform system operations.

Galileo Support

Gurtner discussed tracking of GIOVE-A, which is more difficult to track than GLONASS. ESA has requested short high-priority campaigns, four times per year. These campaigns are related to the relative position of the sun to the satellite or orbital plan of the satellite. There was some questions whether we will see a substantial difference between campaign and “normal” tracking modes since some of the highly successful stations were already pushing their systems to the limit on these satellites. It was pointed out that data volume did pick up in the high satellites during the CONT05 campaign in September 2005. The GB approved the ESA request for these future campaigns.

Action: The CB will send a message to the stations notifying them of the upcoming GIOVE-A tracking campaigns. The CB will also send reminder messages in the week prior to the start of each campaign.

Gurtner reported that despite some damage during satellite testing, GIOVE-B is still scheduled for launch by the end of 2007. With a slightly smaller array, this satellite will most likely be a little more difficult to track than GIOVE-A. A third test bed satellite, GIOVE-A2 (also to be built by Surrey Satellite Technology Ltd) is under development with a planned launch in 2008; if this satellite configuration differs from GIOVE-A, the ILRS will require a new Mission Support Request form submission. ESA reported yesterday in an EGU presentation that the microwave data from GIOVE-A are now publicly available.

Gurtner reported that Russian control center recently set GLONASS-89 to an unhealthy status; therefore the ILRS should stop tracking this satellite. The ILRS has agreed to track three GLONASS satellites. C. Urschl/AIUB has contacted MCC to inquire about a replacement. Unfortunately, the MCC did not inform the ILRS of the GLONASS-89 failure and the network continued to track GLONASS-89 for three months after microwave data transmission stopped.

Action: The CB will notify stations to stop tracking GLONASS-89 immediately.

Site Ties Study Group

Bianco reported that he has received few responses to his request for membership to the Site Ties Study Group (STSG). People from IGN and GA should be involved. Pavlis talked to G. Johnson/GA and Z. Altamimi/IGN; there may have been a misunderstanding that this ILRS study group is trying to perform some of the activities of the IERS Site Survey and Co-Location Working Group. The STSG will focus on SLR-specific survey issues such as eccentricities and site ties. D. Angermann/DGFI can provide inputs to this activity by generating backwards solutions showing what ties may have had problems.

Laser Retroreflector Recommendation

Pearlman reported on the study that has been underway to develop criteria for more adequate retroreflector arrays on the GNSS satellites. The current arrays on the GPS-35 and -36 and GIOVE-A, with retroreflectors made by IPIE/Russia, do not have sufficient effective cross-section to provide adequate return signal. The GLONASS are adequate. There is a need to increase the effective cross sections of future arrays, and yet it is important not to make them too large for both weight and range accuracy considerations. GLONASS The study included rationale for including arrays on future GNSS satellites and several options for increased effective cross section. A report on the study was sent to the GB members.

GPS-35 and -36, GIOVE, and ETS-8 have similar calculated return strength strengths; GLONASS is a factor of five greater. Examination of return data quantity, the occurrence of daylight ranging, and anecdotal information provided by the stations

indicates that we should set a standard comparable to GLONASS. At GPS altitude this amounts to an effective cross section of 100 million sq. meters.

In addition, a data comparison of the ETS-8 array (uncoated cubes) with GPS arrays (coated cubes) indicates the arrays on GPS-35 and -36 may not be performing as anticipated. The study showed that options for the GNSS satellites using hollow cubes or uncoated cubes could provide the factor of five increase in effective cross section for the same size array.

Tests on the hollow cube options are underway at GSFC and will be tested with other array options at the INFN climatic chamber in Frascati.

We agreed that the ILRS should endorse a standard of 100 million sq. meters for the GNSS satellites. (It was later pointed out that the return signal strength from the Galileo satellites will be reduced by a factor of two because of its 4000 km higher altitude and that we should scale the standard by altitude)

Action: Pearlman will draft an ILRS standard for GB action.

Stanford Counter Issue

Appleby reported that work has been done in characterizing Stanford counters at Herstmonceux using what is considered a “perfect” event timer. This study was presented at the ILRS AWG where an issue as to the sign of the proposed corrections was identified. Herstmonceux has offered to perform similar tests on other Stanford counters used in the ILRS network; the counter from Potsdam is currently at Herstmonceux for testing. Appleby would like the NEWG to endorse this procedure and encourage stations to send their Stanford counters to Herstmonceux for testing. P. Gibbs is prepared to perform these tests, which should not cost much in time (only a few hours plus ~one week for shipping) and money. It may also be possible to sequentially replace counters after calibration at Herstmonceux unit to participating stations, but this exchange may, however, complicate record keeping for the analysts. The San Juan station may shortly install a new event timer sent from Shanghai; if this occurs, their old Stanford should then be sent to Herstmonceux for testing.

Simosato Letter of Support

H. Kunimori has informed us that 2008 funding for Simosato is in jeopardy and a letter of support from the ILRS may be helpful.

Action: Gurtner/CB will send an ILRS letter of support to Simosato.

Fall ILRS Workshop

Pearlman reported that the fall ILRS workshop will be held in Grasse in September 2007. Thus far, a proposed program outline has not been received. We propose that each ILRS Working Group generate one or two topics (e.g., Stanford counters) for sessions at the fall ILRS workshop. Each WG will be responsible for identifying a session lead, conducting the session, and soliciting papers. These workshops, held in the year between

the International Workshops on Laser Ranging, should be considered working meetings, rather than symposiums.

Action: Pearlman will contact F. Pierron for a more formal message about the workshop program.

Other Business

Mueller gave an update on the LLR network. The OCA lunar station in Grasse should be operational once again in 2008. McDonald lunar activities have been reduced resulting in a lower priority for LLR. The APOLLO system team has analyzed its first set of lunar normal points from last year. The system performance is similar to that from Grasse; they expected 1 mm accuracy but are not there yet (calibration, models may have not been applied correctly). The analysts will require more data in order to investigate if the 1 mm goal is achievable. Mueller is not sure if APOLLO will provide routine tracking data to the ILRS; other priorities (e.g., research in the equivalence principle) may intervene. Bianco reported that the Matera system has had problems with the photomultiplier low end receiving chain; he believes they should have lunar data any time now.

Gurtner proposed to hold the next ILRS Governing Board meeting in Grasse during the fall workshop; no GB meeting will be held at the IUGG meeting in Perugia.

The meeting ended at 20:00.