



INTERNATIONAL EARTH ROTATION SERVICE (IERS)
SERVICE INTERNATIONAL DE LA ROTATION TERRESTRE
WWW: <ftp://hplvlbi.obspm.fr/iers/ierscb.html>

REPORT ON THE IERS DIRECTING BOARD MEETING No 20

Wednesday 18 December 1996, 15:00 - 19:15
at San Francisco Moscone Center
in conjunction with the 1996 AGU Fall meeting

Attendance: C. Reigber (Chairman), M. Feissel, C. Ma, D. McCarthy, B. Melbourne, D. Salstein, B. Schutz, P. Shelus.

The Directing Board reviews the actions and studies started after the October 1996 meeting, be they a consequence of the 1996 Workshop recommendations or the result of the DB initiative.

Geocenter motion Campaign (J. Ray)

Analyses of satellite tracking data have provided persuasive evidence that the coordinate frame formed by the tracking stations attached to the Earth's crust moves detectably relative to the Earth's center of mass. This translational motion, when viewed from a crust-fixed frame, is known as "geocenter motion" and is caused by the mass movement of planetary fluids, primarily the atmosphere and oceans. It apparently has a total magnitude of up to a few centimeters and consists of two components. The tidal variations have mostly diurnal and semi-diurnal periods and are predominantly caused by oceanic motions; the non-tidal geocentric motions are thought to be due primarily to atmospheric mass motions, ocean circulation, and surface water storage.

The IERS is charged with maintaining a geocentric terrestrial reference frame, including the effect of the atmospheric and oceanic masses. Currently the International Terrestrial Reference Frame (ITRF) gives coordinates of stations relative to the position of the Earth's center of mass averaged over about 20 years of SLR observations. In order to provide improved accuracy for instantaneous geocentric coordinates, it has been proposed that the IERS collect and distribute tabulated results for geocenter motions, analogous to the Earth orientation service already provided by the IERS.

To better understand this phenomenon and the capabilities of the various satellite-tracking techniques, the IERS Working Group on the ITRF Datum is organizing an Analysis Campaign to collect appropriate products from interested space geodetic data analysis centers and geophysical data analysis centers, and to compare the results. While it is likely that the results of this Campaign will strongly influence any future IERS activity to monitor regularly geocenter motions, participation in this Campaign does not obligate a participant to contribute to any future operational activities. This Campaign does not request the collection of any new observational data not already being collected for other purposes.

J. Ray provided a draft Call for Participation in this campaign. After the IAG SSG 5.173, "Interactions of the atmosphere and oceans with the Earth's rotational dynamics" (Chair: C. Wilson) is consulted for the chapter on geophysical data, the Directing Board agrees that the Call be distributed shortly. The deadline for responses is 15 February 1997. Results could be discussed at the 1997 Fall AGU Meeting. All participants will be included in an e-mail exploder list at geoc@ray.grdl.noaa.gov. The guidelines document for the Analysis Campaign is available anonymously at <ftp://ray.grdl.noaa.gov/pub/gc-iers.guide>.

[The Call was later distributed to several mailing lists, see IERS Gazette No 10, 2 January 1997]

Study of the tie of EOP series to ITRF (C. Ma)

After a change in bias and slope is introduced on 1 January 1997 in the IERS EOP series, the latter will be in agreement with the ITRF and the ICRF. The accuracy of the agreement in rate ($\pm 0.1\text{-}2$ mas/year) is limited by the current understanding of the internal homogeneity and external consistency of the global analyses of the space geodetic data. In order to limit the rate of degradation of consistency of EOP results with IERS reference frames, a study is organized by C. Ma with selected analysis centres for the satellite geodesy techniques and VLBI.

The purpose of the study is to generate EOP series using ITRF positions and velocities (and ICRF95 source positions for VLBI) as fixed, a priori values. The resulting EOP and ITRF will thus be forced into consistency. The relationship between the EOP series from different techniques and centers and between these series and the current IERS series will be examined to suggest how the EOP and ITRF can be kept consistent in the future. The proper execution of the study involves several steps:

- 1) understanding the scope and purpose of the study,
- 2) convenient access to the ITRF (and ICRF95),
- 3) identification of software limitations,
- 4) agreement on the use of ITRF/ICRF information,
- 5) initial trials, and
- 6) a delivery date for EOP.

Detailed discussions were started with Analysis Centres and the Central Bureau to specify the exact conditions of the experiment. The study is likely to start in the first half of 1997.

Combination Centres

One of the strong recommendations of the IERS Workshop was that IERS further develops techniques to derive reference frame and Earth orientation results from the combination of observations from the various techniques.

Recall that the ITRF Section of the Central Bureau performs an all-techniques combination of terrestrial positions and velocities on the basis of variance-covariance matrices and that EOP series are currently combined by three IERS centres (Central Bureau, Sub-bureau for Rapid Service and Predictions, JPL). The EOP series of the three combination centres are intercompared in the Annual Reports.

In parallel, a Working Group has been set by the CSTG to study the combination of global reference frames + EOP solutions (Chair: T. Herring).

D. McCarthy presents a first attempt at defining what the IERS expects from combination centres. It is decided that the discussion should be continued by e-mail and finalized at the April 1997 meeting.

The Directing Board wishes to encourage competition on this aspect of data analysis. It is important that the Central Bureau be closely associated with these activities that it is already performing in part. Expressing results in the IERS System is the Central Bureau's responsibility.

The role of Coordinators

Many discussions took place about the role of Coordinators (or Coordinating Centres). There is a need to clarify the responsibilities and tasks of this major function in IERS. A list of facts and opinions expressed follows.

- B. Schutz distributed a task description for a Coordinator, based on the SLR experience. It lists responsibilities with respect to observations acquisition, distribution, quality assessment and analysis, and the validation of scientific products.
- Open and easy data circulation was organized at the time of the MERIT Campaign and works well for the three oldest IERS techniques (VLBI, LLR, SLR). It is indeed less normalized than for GPS and DORIS, which are driven by the need for rapid orbit production.
- The actual activity of the Coordinators should be given more visibility.

- More extended activities on global combinations should help in clarifying the share of tasks among analysis centres and coordinators, and between techniques.
- Coordination should be applied not only to observing techniques, but also to products, or objectives. This extension is starting (see below: Monitoring Global Geophysical Fluids, Tying celestial reference frames). Other objectives could be considered, e. g. Monitoring of local ties in the IERS sites.
- The Directing Board should keep overall responsibility for the final IERS products.

The discussion will be continued by e-mail, and should be concluded at the April 1997 meeting.

Conventional ITRF

The latest ITRF vintage goes back to 1995: ITRF94 is based on data up to the end of 1994. The Directing Board consider that in two years the quality of site velocities was significantly improved for the two youngest techniques, GPS and DORIS. Therefore the ITRF Section of the Central Bureau is requested to update the ITRF94 on the basis of data to be collected for 1996 Annual Report.

IERS Conventions

As IERS is analysing the most precise observation techniques, it needs to use the most accurate astronomical and geophysical constants and models. Conversely it is in a position to improve some of the models in use. The IERS Conventions represent, in general, the state of the art in the field concerned. In some cases they anticipate and support the evolution of the models and constants adopted at a later stage by the IAU and IUGG. In the case of the IAU and IUGG recommendations on Reference Systems, the question whether complying to them, as recommended by the 1996 Workshop, would be detrimental to the best analysis has to be clarified.

The Directing Board decided to set up an Editorial Board for the IERS Conventions. The question of tasks, membership and responsibilities of the Board requires further discussion.

Coordinating Centre for Monitoring Global Geophysical Fluids

In response to the IERS Workshop Recommendations, the Directing Board considers creating a Coordinating Center that would help relate properties of the various global geophysical fluids to motions of the Earth, including those of its three-dimensional rotation vector. The major Earth system fluid components, namely the atmosphere, ocean, and the core are known to participate in forcing motions of the Earth, including Earth rotation and polar motion, and to modify the gravitational fields and the motions of the Geocenter. Also, ancillary aspects of the properties of fluids such as the atmosphere, must be considered to interpret properly signals derived from the techniques of space geodesy relevant to the IERS mission. Moreover, effects of the ocean tides comprise a special type of forcing by the oceans.

The Coordinating Center for Monitoring Geophysical Fluids is an extension of the Sub-bureau for Atmospheric Angular Momentum, in existence since 1989. Though a great deal of research has been performed on atmospheric forcing of Earth rotation/polar motion during this period, the role of the other geophysical fluids have become evident too in recent years, and this role will be formalized within the IERS. Also, the Coordinating Center will deal with torques and gravity field changes due to the fluid mass transports, in addition to angular momentum, and that all will be an integral part of computation and data management.

A description of tasks for the various activities was provided by the IERS Workshop Topic 6 team (V. Dehant, D. Salstein, C. Wilson *et al.*).

The Directing Board decide to send out a Call for Participations on the basis of this description. This should be done in February 1997; a paper commenting on this initiative will be submitted for publication in EOS by the Topic 6 team.

Coordinating Centre for tying the Solar System dynamical reference frame to the ICRF

The concept is still at the exploration stage. It would be a response to the IERS Workshop Topic 2 recommendations (see IERS Technical Note No 22) that IERS monitor the motion of the equinox and ecliptic in the IERS System and that they assist in the collection and distribution of observations of milliseconds pulsars. One major technique for this aim is Lunar Laser Ranging, already an IERS technique. The acting LLR Coordinator, P. Shelus, has started discussions with the LLR observers and analysts. He will coordinate the thinking on other aspects in a second step.

Other matters

Support to AER for continued role in SBAAM: NOAA support was settled for 1997. Further activity and support for after 1997 will be defined in relationship to the new Coordinating Center for Monitoring Geophysical Fluids.

IERS and NASA plans. The implementation of the CORE program (Continuous Observation of the Rotation of the Earth) proposed to NASA by the GSFC VLBI group would be of utmost benefit to IERS in its service to the international scientific community. A letter expressing the importance of CORE to IERS will be sent to NASA. NASA is also studying its future laser ranging activity. Another letter, stating the usefulness of both SLR and LLR to IERS, will be sent to NASA.

The report on the 1996 IERS Workshop will be published as IERS Technical Note No 22 in January 1997. Extra copies will be available for distribution at meetings (e. g. EGS, IAU, IAG) or elsewhere.

Bulletin A. The semiweekly computation and distribution (Tuesday, Friday) will start in January 1997. Only 15 subscribers confirmed their request of a printed version. The distribution is electronic (e-mail, ftp, WWW).

Guidelines for EOP interpolation. The guidelines, including restoration of diurnal variations, will be distributed through an IERS Gazette, by ftp and WWW, and referred to in Bulletins A and B and in the Annual Report. [IERS Gazette No 13, 30 January 1997]

EOP step on 1 January 1997. The change was announced (IERS Gazette No 8, 29 October 1996). The sub-bureau for Rapid Service and Predictions and the Earth Rotation Section of the Central Bureau are ready to implement the change and to distribute revised EOP series for the past.

1996 IERS Annual Report. The contents of the Annual Report will be re-organized in order to emphasize the role of Coordinating Centres.

Polling IERS users. A draft questionnaire was circulated by M. Feissel. After final comments from the Directing Board, it will be sent out in January 1997. [Done on 20 January 1997]

Next meeting

In conjunction with the EGS meeting in Vienna, in the week 21-25 April 1997. [Tentative: 24 April, 16:00-20:00].