3.2 Central Bureau

General activities

The IERS Central Bureau (CB), hosted and funded by Bundesamt für Kartographie und Geodäsie (BKG), organized and documented the IERS Directing Board (DB) Meetings No. 46, April 13, 2008, at Technical University Vienna, Austria, No. 47, October 28, 2008, at the US Naval Observatory in Washington, D.C., USA, No. 48, April 19, 2009, at Technical University Vienna, Austria, and No. 49, October 22–23, 2009, at the Space Research Centre of the Polish Academy of Sciences in Warsaw, Poland. Between the meetings the CB coordinated the work of the DB.

Together with the Global Geodetic Observing System (GGOS), the CB prepared a Follow-Up Meeting of the GGOS Unified Analysis Workshop, held April 15, 2008, at the Technical University Vienna, Austria, and the Second GGOS Unified Analysis Workshop, held December 11–12, 2009, in San Francisco, CA, USA. The programme and the presentations of these meetings were published at the IERS web site. For summaries see Section 4. The CB represented the IERS at several other meetings.

IERS components maintain individually about 20 separate web sites. The central IERS site <www.iers.org>, established by the CB, gives access to all other sites, offers information on the structure of the IERS, its products and publications and provides contact addresses as well as general facts on Earth rotation studies. It contains also electronic versions of IERS publications, a list of meetings related to the work of the IERS, and an extended link list for IERS, Earth rotation in general and related fields. Throughout 2008 and 2009 the web site was regularly enlarged and updated.

The IERS Annual Report 2006 appeared in online and in printed form. The IERS Annual Report 2007 was published in online form and was prepared for print. The CB started also to prepare the IERS Annual Report 2008 for publication. Along with the reports of the IERS components, the Annual Reports contain information on the IERS compiled by the CB.

The CB prepared reports about IERS' activities for Commission 19 (Rotation of the Earth) of the International Astronomical Union (for the period 2005 – 2008) and for the International Association of Geodesy (for the period 2007 – 2009).

During the years 2008 and 2009, 33 IERS Messages (Nos. 123 – 155) were edited and distributed. They include news from the IERS and of general type as well as announcements of conferences.

Address and subscription information has regularly been updated in the IERS user database. There were about 2500 users in 2008 and 2009 with valid addresses who subscribed to IERS publications for e-mail and regular mail distribution.

Several questions from IERS users concerning IERS publications and products as well as Earth rotation and reference frames in general were answered or forwarded to other specialists.

IERS Data and Information System (DIS)

The IERS Data and Information System (IERS DIS), which was developed by the Central Bureau between 2002 and 2005, is in the operational mode since 2006. The system is continuously being adapted and extended by new components in order to fulfill the requirements for a modern data management and for the access to the data by the users. In this context international and interdisciplinary projects like the Global Geodetic Observing System (GGOS) or the Global Earth Observation System of Systems (GEOSS) are demanding special requirements with respect to the standardization of the data and applications on the data.

Besides routine work like maintenance of the data bases of users, products and web pages, in 2008 and 2009 further developments of the IERS DIS concentrated on the following aspects:

- migration of the IERS web site to a new Content Management System ("Government Site Builder", the CMS used within the division of the German Federal Ministry of the Interior),
- improvement of the IERS Plot Tool,
- development of an interactive data analysis tool,
- enhancement of the IERS Data Management System collecting all IERS products and data from the Product Centres and extracting the metadata into the metadata database,
- extending the IERS metadata profile to be a fully compliant with ISO 19115, and adaption of the existing metadata to this profile,
- development of tools for the management of metadata,
- creating metadata for the so-called Global Geophysical Fluids

All developments are being made in close cooperation with two research projects at BKG, the projects ERIS and GGOS-D:

The aim of ERIS (Earth Rotation Information System) as a part of the research unit FOR 584 "Earth Rotation and Global Dynamic Processes" is the development of a virtual Earth rotation system for geodetic and geoscience applications. The central part of the electronic infrastructure of the research unit is the common Web portal <http://www.erdrotation.de>.

The joint project "GGOS-D: Integration of Space Geodetic Techniques as Basis for a Global Geodetic Observing System" is meant to develop the IT infrastructure and the required software for the operational service of a Global Geodetic Observing System.

Both projects are providing an information, communication, and database system as a central interface between the research partners and their applications and fields of interest.

Initial points of the data pool for ERIS are the data series pro-vided by the IERS. As an international service dedicated to Earth rotation and reference systems the IERS maintains the official data series concerning the Earth rotation parameters, the related reference frames, and a collection of relevant data concerning the geophysical fluids influencing the Earth rotation. In ERIS these data series are amended by data from other sources accessible via links to the original locations of publication. Because of the close cooperation between ERIS and the IERS Central Bureau ERIS has direct access to the data archive of the IERS and to applications developed for the IERS. In return, techniques and software developed in ERIS will be used after a phase of testing also by the IERS.

The joint project "GGOS-D: Integration of Space Geodetic Techniques as Basis for a Global Geodetic Observing System" is meant to develop the IT infrastructure and the required software for the operational service of a Global Geodetic Observing System.

One of the most important tasks in both projects deals with the data preparation and data networking. To ensure interoperability all data series are transformed into standardized data formats. Based on the XML versions developed for the IERS the XML schemata and the transformation routines are revised to harmonize the data structure and to enhance the machine readability.

While XML schemata describe the technical data structure of data series stored in XML, metadata are needed to describe the content of the series, how the data are produced, the authorship, the availability of the data, parameterization etc. To ensure in-teroperability of the metadata with respect to international and interdisciplinary metadata catalogues, the IERS specific metadata profile has been extended to an ISO 19115 "Geographic Informa-tion – Metadata" standard compliant profile. Furthermore, routines have been established for automatic generation of metadata as well as a metadata editor to support the creation of metadata.

A variety of interactive tools were set up. First some applications have been developed which realize interactive Web interfaces for some helpful geodetic and astronomic tools: transformations between Gregorian calendar and Julian and Besselian date / epoch, calculation of Greenwich Sidereal Time, calculation of the ephemeris of Earth, transformation between the reference systems GCRS and ITRS, and calculation of the time dependent precession and nutation matrices.

Second, if downloading data, often single data points, data of a short time period, or time series of isolated parameters are needed. The *EOP Reader* represents the first step in this direction in the context of ERIS. It allows the user to extract the EOP data of a single day from a data series of his choice by entering the date as

Gregorian date or as modified Julian date. The EOP Reader has access to data series stored in the IERS data archive. Currently, the series Bulletin A and B, the Finals Daily, the Finals Data, the Finals All, and the C04 series[1] are available.

Furthermore, a concept for an interactive tool for time series analysis has been developed and an industrial partner was engaged for the implementation. A graphical user interface allows the user to apply standard methods of time series analysis to data series of the ERIS and the IERS data archives as well as to own data. The analysis results will be presented as data and visualizations; the import of own data series is managed via an import wizard. The application flow runs via three main steps: Data – load data files, Procedure – run analysis operations, and Output – give results as data and visualizations. All intermediate results are stored. The following analysis procedures are incorporated into the initial version of the data analysis tool: extraction of statistical values (mean value, maximum, median, etc), polynomial, sinus, and spline approximations, FIR filters (high-pass / low-pass / band-pass, Moving-average, derivation), up / down sampling and shifting of the time axis, FFT, short-time FFT and power spectrum, correlation and autocorrelation, and time / frequency analysis with wavelets.

The conceptual framework for the visualization component was finished. This module will illustrate the interactions within the "system Earth" and their effects on Earth rotation. It contains parameterized model descriptions and a modular visualization engine that will allow an interactive use via the ERIS web portal.

Staff

Dr. Bernd Richter, *Director*

Dr. Wolfgang R. Dick, *scientist*

Carola Helbig, *secretarian*

Dr. Alfred Kranstedt, *scientist (until May 2008)*

Anja Niederhöfer (formerly Kreutzmann), *scientist (since May 2008)*

Alexander Lothhammer, *technician (until January 2011, on leave from November 2007 to October 2008)*

Peter von Rappard, *technician (from May 2009 to December 2010)*

Sandra Schneider, *technician (on leave from May 2009 to December 2010)*

Dr. Wolfgang Schwegmann, *scientist (until March 2010)*

---

[1] http://www.iers.org/EOP

Publications   Brzezinski A.; Ma, C.; Dehant, V.; Defraigne, P.; O. Dickey, J. O.; Huang, C.-L.; Souchay, J.; Vondrák, J.; Charlot, P.; Richter, B.; Schuh, H.: Commission 19: Rotation of the Earth. In: Proceedings of the International Astronomical Union, 4, Cambridge University Press, Cambridge, 2008, pp. 37–49, doi:10.1017/S1743921308025271

Dick, W. R.; Richter, B. (eds.): IERS Annual Report 2006. Verlag des Bundesamts für Kartographie und Geodäsie, Frankfurt am Main, 2008. 187 p.

Dick, W. R.; Richter, B. (eds.): IERS Annual Report 2007. Verlag des Bundesamts für Kartographie und Geodäsie, Frankfurt am Main, 2009. 220 p.

Neidhardt, A.; Kronschnabl, G.; Plötz, C.; Dassing, R.; Schwegmann, W.; Thorand, V.; Engelhardt, G.: Experiences with regular e-transfer of geodetic INTENSIVE data at Wettzell. In: Proceedings of the 8th International e-VLBI Workshop, 22–26 June 2009. Madrid, 2009. PoS (EXPReS09) 034, 5 p., http://pos.sissa.it/archive/conferences/082/034/EXPReS09_034.pdf

Nothnagel, A.; Rothacher, M.; Angermann, D.; Artz, T.; Böckmann, S.; Bosch, W.; Drewes, H.; Gerstl, M.; Kelm, R.; Krügel, M.; König, D.; König, R.; Meisel, B.; Müller, H.; Richter, B.; Panafidina, N.; Rudenko, S.; Schwegmann, W.; Steigenberger, P.; Tesmer, V.; Thaller, D.: GGOS-D: A German project on the integration of space geodetic technique. In: Capitaine, N. (ed.): The Celestial Reference Frame for the Future, Journées 2007, Systèmes de Référence Spatio-Temporels. Observatoire de Paris, Paris, 2008, pp. 167–168

Tsvetkova, K.; Tsvetkov, M.; Böhm, P.; Steinmetz, M.; Dick, W. R.: The Potsdam plates of the Carte du Ciel project: I. Present inventory and plate catalogue. Astronomische Nachrichten 330 (2009), pp. 878–884

Wolfgang R. Dick, Anja Niederhöfer, Bernd Richter