Analysis Coordinator Report

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Abstract

IVS analysis coordination issues in 2006 are reported here.

1. General Issues

The "Seventh IVS Analysis Workshop" was held at the Universidad de Concepción in Concepción, Chile, on January 12, 2006, in connection with the IVS 2006 General Meeting. Detailed information on presentations and discussions can be found in [2].

The institute hosting the office of the IVS Analysis Coordinator has been reorganized and was named Institute for Geodesy and Geoinformation of the University of Bonn (IGGB) on October 1, 2006. The relationship between the institute and the IVS is not affected.

2. IVS Operational Data Analysis and Combination

2.1. Terrestrial Reference Frame

A large portion of the work in the year 2006 was devoted to the generation of the IVS input to ITRF2005. For the ITRF2005, the International Earth Rotation and Reference Systems Service (IERS) invited the services of the International Association for Geodesy (IAG), i.e. the International VLBI Service for Geodesy and Astrometry (IVS), the International GNSS Service (IGS), the International Laser Ranging Service (ILRS), and the International DORIS Service (IDS), to submit one consolidated set of input data for their technique. The official contribution of the IVS has been computed by the IVS Analysis Coordinator's office.

In the case of IVS, the IERS asked for individual data sets for each VLBI observing session of 24 hours duration in *Solution INdependent EXchange* (SINEX) format. SINEX files permit the transmission of the full variance/covariance information to interpret the quality of the solution to its full extent or to further combine the results with other solutions. This can be realized through reporting either the full variance/covariance matrix or the normal equation matrix of a solution setup (see latest definition under http://www.iers.org/documents/ac/sinex/sinex_v202.pdf. The latter option is mainly meant for further combinations but, if required, variance/covariance information can easily be extracted through an inversion procedure which may have to include a datum definition if necessary. In order to facilitate combination steps through a procedure which may be completely free of any datum definition, the IVS had decided that IVS Analysis Centers report datum-free normal equation matrices in their SINEX files to the IVS Analysis Coordinator. Consequently, the IVS input to ITRF2005 was also based on datum-free normal equations.

Quite a lot of effort had to be spent on eliminating problems originating from peculiarities of certain sessions which inhibited a combination in a straight forward way. Noteworthy is the fact that the Japanese regional network is linked to the global network of ITRF sites only insufficiently. This situation should be addressed by our Japanese colleagues in future session plannings. Several sites with only very few observing days of the past (1980ies) were eliminated from the station list for ITRF2005.

The final IVS data set was combined from data of Deutsches Geodätisches Forschungsinstitut (DGFI), of Bundesamt für Kartographie und Geodäsie (BKG), of NASA Goddard Space Flight Center (GSFC), of Shanghai Astronomical Observatory (SHAO), and of U.S. Naval Observatory (USNO). Unfortunately, the data of Geoscience Australia (GA) and of Kiev Main Astronomical Observatory (MAO) could not be used due to incompatibility of the data sets. For the next realization of the ITRS, however, we are confident that these difficulties will be overcome. For more details of the generation of the IVS input files to ITRF2005 see [3].

Within the inter-technique combination (VLBI, SLR, GPS and DORIS) extensive discussions on the definition of the scale of ITRF2005 were necessary and are still going on. Owing to its high quality and its long-term stability, only the VLBI input series has finally been used for the determination of the global scale of ITRF2005. ITRF2005 files are available under http://itrf.ensg.ign.fr/ITRF_solutions/2005/ITRF2005.php.

2.2. IVS EOP Series

In parallel to the ITRF2005 investigations, a new combination strategy for the two IVS EOP series (rapid and quarterly solutions) has also been developed. Preparations were made for a change from a combination of EOP on the basis of results to a combination on the basis of datum-free normal equations in SINEX format. The advantage of the new combination strategy is that one common terrestrial reference frame (ITRF2005) is applied after the combined datum-free normal matrix is generated. This helps to avoid that systematic differences caused by different TRF used in the individual contributions enter the combination. Due to the complicated dependency on several observatories participating in the sessions in a variety of configurations, the TRF effect is almost impossible to eliminate from EOP-only solutions afterwards. For testing purposes, the application of an identical TRF to all contributions also allows a better investigation in remaining systematics. The weighted RMS differences between the individual IVS Analysis Centers and the combined products have been reduced from roughly 80 – 100 μas to 50 – 60 μas in all components.

Since January 1st 2007, the new procedure is used for the generation of the official combined IVS EOP series. However, until March 1st 2007, the old IVS EOP series based on EOP time series combinations will be maintained. As for the present IVS combined EOP series based on EOP results, a rapid solution (ivs07r1e.eops) and a quarterly solution (ivs07q1e.eops) is generated also for the new IVS EOP series. SINEX files of five IVS Analysis Centers (BKG, DGFI, GSFC, SHAO and USNO) are used as input data. The rapid solution contains only R1- and R4-sessions and new data points are added twice a week as soon as the SINEX files of the five IVS Analysis Centers are available. The SINEX file submissions should not be later than 36 hours after the correlation is completed. A web page is automatically updated which states the timeliness of the latest submissions of the R1- and R4-sessions. For the quarterly solution, updated every three months, all available data from 1984 onwards are used.

On the IVS Analysis Coordinator's web page additional information about the series, the residuals of the individual contributions w.r.t. the combined solution as well as comparisons with IGS and IERS EOP results are provided.

3. IVS Pilot Project "Baseline Lengths"

In late 2006, the VLBI group of Agenzia Spaziale Italiana at Matera, Italy, joined the project and has contributed data to the series since then. In September 2006 at its 16th board meeting, the IVS Directing Board decided to turn the Pilot Project into a full product line. Baseline length results are now often used for public relations activities. Especially astronomers and telescope operators like to use the graphs for explaining what else can be done with radio telescopes. For more details see [1].

4. Personnel

Table 1. Personnel at the IVS Analysis Coordinator's office

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References

[1] IGGB, Bonn (2006): IVS Product "Baseline Lengths",
Results available online at http://vlbi.geod.uni-bonn.de/baseline-project/index.php

[2] Nothnagel A. (2006) *Summary of the 7th IVS Analysis Workshop*; International VLBI Service for Geodesy and Astrometry; General Meeting Proceedings 2006, D. Behrend and K.D. Baver (eds.), NASA/CP-2006-214140, Greenbelt MD, p. 373 - 376

[3] Vennebusch, M.; Böckmann, S.; Nothnagel, A. (2006) *The contribution of Very Long Baseline Interferometry to ITRF2005*; J. of Geodesy, DOI:10.1007/s00190-006-0117-x