Analysis Coordinator Report

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Abstract

IVS analysis coordination issues in 2009 are reported here. Routine EOP combinations on the basis of datum-free normal equations have been continued. The input of the IVS to ITRF2008 was generated at the IVS Analysis Coordinator's office carrying out the combination in a similar way as the routine EOP combinations. However, the number of input series has been increased to nine, permitting a rigorous quality assessment.

1. General Issues

The "Tenth IVS Analysis Workshop" was hosted by the Laboratoire d'Astrophysique de Bordeaux, France, in the building of the Cap Sciences, on March 26, 2009, in connection with the Nineteenth Meeting of the European VLBI Group for Geodesy and Astrometry. As in previous meetings, the coordination of IVS routine data analysis was discussed, as well as developments for improving geodetic and astrometric data analysis in general.

An important item for the years to come will certainly be how to maintain and improve the storage and handling of auxiliary data. Today, the only auxiliary data registered routinely is meteorological and cable calibration data. At most observatories, readings of these data types are triggered by the Field System and storing is done in session-wise log files. For past applications, this procedure has certainly been sufficient but the requirements are growing. A simple example is that ambient temperatures of about two hours before a VLBI session starts are needed for modeling of thermal expansion at the start of the session due to a time lag of about two hours for standard steel constructions. In addition to weather and cable cal data, further information can be used for a better modeling of environmental effects such as invar rod readings of the telescope tower height, ground water table heights and so on.

For this purpose, it is best to start setting up a seamless or continuous data storage scheme which is not limited by VLBI session boundaries and stores the data in separate files. A group of specialists has been gathered to develop a suitable scheme including the other space-geodetic techniques as well.

Concluding the workshop, Alessandra Bertarini and Brian Corey contributed a valuable tutorial on correlator operations. They presented a description of the data path from the correlation process to analysis including a description of Fourfit (fringe fitting) plots.

2. IVS Operational Data Analysis and Combination

The combination process for the two IVS EOP series (rapid and quarterly solutions) has been continued exclusively on the basis of datum-free normal equations in SINEX format. In 2009, six IVS Analysis Centers (BKG, DGFI, GSFC, IAA, OPA, and USNO) contributed to the IVS combined products by providing input in the correct format. The combination strategy is described in detail in [2].

The rapid solutions contain only R1 and R4 sessions, and new data points are added twice a week as soon as the SINEX files of at least five IVS Analysis Centers are available. The SINEX file submissions should not be later than 48 hours after the correlation is completed. A Web page

(http://vlbi.geod.uni-bonn.de/IVS-AC/data/timeliness_2.html) which states the timeliness of the latest submissions of the R1 and R4 sessions is automatically updated. As can be seen on this Web page, the timeliness requirement is still exceeded too often for various reasons in logistics and personnel.

For the quarterly solution, updated every three months, almost all available data of 24-hour sessions from 1984 onwards are used. Since this series is designed for EOP determinations, those sessions which are observed with networks of limited extension or which are scheduled for a different purpose such as radio source monitoring are excluded.

From October 1, 2009, the operational combination has been taken over by the IVS Combination Center at the German Bundesamt für Kartographie und Geodäsie (BKG) in Frankfurt a.M.. The transition has been smooth, and no further complications have been reported.

3. Generation of Input to ITRF2008

In late 2008, the IERS ITRF Product Center issued a call for contributions to the next realization of the ITRS, ITRF2008. The official contribution of the IVS to ITRF2008 was generated at the IVS Analysis Coordinator's office. It consists of session-wise datum-free normal equations which are the result of a combination of individual series of session-wise datum-free normal equations provided by seven IVS ACs (BKG, DGFI, GSFC, IGGB, OPA, SHA, and USNO). All these individual series are completely reprocessed following homogeneous analysis options according to the IERS Conventions 2003 [4] and IVS Analysis Conventions [5].

Altogether, nine IVS ACs analyzed the full history of VLBI observations with four different software packages. Unfortunately, the contributions of two ACs, IAA and GA, had to be excluded from the combination process. In the case of the IAA contribution, a scale offset of 1.5 ppb was detected. Most probably, this offset can be related to the relativistic model used in the QUASAR software which did not comply with the model recommended in the IERS Conventions 2003. The GA solution showed large inconsistencies with respect to all other contributions when looking at the station position time series, the TRF solution, and the long term EOP series. However, the direct results from the OCCAM(LSC) software are quite reasonable. Thus, most likely, errors in the analysis chain—i.e., in the generation of the normal equations written into SINEX—occurred.

Based on the experience gathered since the combination efforts for ITRF2005, the consistency of the individual VLBI solutions has improved considerably. The agreement in terms of the WRMS of the terrestrial reference frame (TRF) horizontal components is 1 mm and of the height component is 2 mm. Comparisons between ITRF2005 and the combined TRF solution for ITRF2008 yielded systematic height differences of up to 5 mm with a zonal signature. These differences can be related to a pole tide correction referenced to a zero mean pole used by four of five IVS ACs in the ITRF2005 contribution instead of a linear mean pole path as recommended in the IERS Conventions. Periodic annual variations in scale are reduced considerably from 2.7 mm to 1.7 mm due to the correction for thermal expansion of the radio telescopes. A detailed description of the IVS input to ITRF2005 can be found in [1] and [3].

4. Thermal Expansion of Radio Telescopes

Further details of radio telecopes have been collected in the antenna-info file under http://vlbi.geod.uni-bonn.de/IVS-AC/Conventions.

5. Personnel

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

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References

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