Analysis Coordinator Report

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Abstract

IVS analysis coordination issues in 2007 are reported here. Routine EOP combinations have been changed to solely using datum-free normal equations as input improving the overall agreement between analysis centers to $50 - 60$ μas in all components.

1. General Issues

The "Eighth IVS Analysis Workshop" was held at the Vienna University of Technology, Vienna, Austria, on April 14, 2007, in connection with the 18th European VLBI for Geodesy and Astrometry (EVGA) Working Meeting. The workshop was attended by about 40 participants who enjoyed the hospitality of the Vienna VLBI group.

In his introductory remarks the IVS Analysis Coordinator emphasized that the combination process of VLBI results with other geometric space geodetic techniques (GNSS, DORIS, and SLR) is the most important challenge of IVS analysis activities in the current time frame. Without an improved attitude of the IVS Analysis Centers towards combination requirements and timeliness issues, the IVS will run into the danger of losing its well earned reputation for state-of-the-art products.

Further presentations and discussions included topics like cable calibration, master analysis documentation, pole tide model, 256 Mb/s vs. 1 Gb/s recording, reference temperatures and pressure, current status of the OCCAM software, combination of Intensives, atmospheric refraction issues, implementation of P03 precession, singular value decomposition and cluster analysis, post VLBI solution tools, as well as an introduction to the Working Group on ICRF2. A number of these topics do require more efforts on an international level and all IVS Analysis Centers are asked to volunteer for a more active role in specific aspects of the analysis chain. The large number of individual problem areas cannot be handled efficiently by a few individuals alone. This is the reason why many topics are still on the "To do" list and progress lags behind expectations.

2. IVS Operational Data Analysis and Combination

On January 1, 2007, a new combination process for the two IVS EOP series (rapid and quarterly solutions) has been made operational. Routine combinations of IVS are now being made exclusively on the basis of datum-free normal equations in SINEX format. In 2007, five IVS Analysis Centers (BKG, DGFI, GSFC, IAA, and USNO) contributed to the IVS combined products by providing input in the correct format. 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 the 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 is automatically updated which states the timeliness of the latest submissions of the R1 and R4 sessions. As can be seen on this Web page, the timeliness requirement is 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 are excluded which are observed with networks of limited extension or which are scheduled for a different purpose like radio source monitoring.

The advantage of the new combination strategy is that one common terrestrial reference frame (e.g. ITRF2005) is applied after the combined datum-free normal matrix is generated. Thus, it is guaranteed that an identical datum is used in the combination process for all input series. After datum definition the combined system of normal equations is solved (inverted) and the full set of EOP (pole components, UT1–UTC, and their time derivatives as well as two nutation offsets in $d\psi$, $d\varepsilon$ w.r.t. the IAU2000A model) are extracted. These results are added to the two EOP time series in the IVS EOP Exchange format, the rapid solution file (e.g., ivs07r1e.eops) and the quarterly solution file (e.g., ivs07q4e.eops). Companion files containing the nutation offsets in the X, Y paradigm are routinely generated through a standard transformation process (e.g., ivs07r1X.eops, ivs07q4X.eops). 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. 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 routinely.

At the same time the combined SINEX files (datum-free normal equations) are also available on the Web for further combination with other techniques. At present, this is done on an experimental basis only, but the IERS Analysis Coordinator is strongly pushing towards such a routine process.

3. Comparisons of Long-term Station Position Time Series

As part of the quality assessment for the IVS combined products, long-term time series of station positions of each individual IVS Analysis Center, derived from the submitted normal equations, have been compared with each other. Through this, systematic offsets in the height component of up to 1 cm have been detected between solutions analysed with the VLBI analysis software packages OCCAM and CALC/SOLVE. In order to find the reason for these discrepancies several models used in both software packages have been compared in close cooperation with the VLBI group at DGFI (Deutsches Geodätisches Forschungsinstitut, München). It turned out that the systematic offsets were mainly caused by differences in the pole tide model. In the CALC/SOLVE solutions, a model for the annual mean pole was used, which was not in agreement with the IERS Conventions 2003. Therefore, all analysis centers using CALC/SOLVE reprocessed their solutions with the conventional pole tide model according to the IERS Conventions 2003 and most of the discrepancies disappeared. Since the IVS input to ITRF2005 was affected by the same inconsistency, the ITRF2005 may be affected by this oversight, though not to the full extent.

4. Personnel

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

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