Analysis Coordinator Report

A. Nothnagel

Abstract

We present the IVS analysis coordination issues of 2012. The IVS Analysis Coordinator is responsible for generating and disseminating the official IVS products. This requires consistency of the input data by strict adherence to models and conventions. The term of the current IVS Analysis Coordinator will end on February 28, 2013.

1. General Issues

The "Thirteenth IVS Analysis Workshop" was held at the Royal Observatory of Madrid, Spain, on March 8, 2012, in connection with the 7th IVS General Meeting. In this workshop, the coordination of IVS routine data analysis was discussed as well as a number of individual items concerning geodetic and astrometric data analysis in the framework of the IVS. Due to personnel limitations at some of the analysis centers, the progress in improving the analysis software packages was slow. This is important for the necessary changes following the IERS Conventions 2010 in particular.

Concerning atmospheric gradient modeling, a decision was made by the attendees that the Chen and Herring model [1] should be the conventional model of the IVS, using the constant C = 0.0031 for estimating the hydrostatic gradient. Since the hydrostatic contribution is the biggest one and the coefficient for the total gradient contribution is only slightly different (C = 0.0032), no noticeable effect on the estimates is expected. The MacMillan model [2] produces essentially the same results, but for consistency with the analyses of the IGS, the Chen and Herring model [1] was adopted.

An unsolved problem is the issue of the sidelobe ambiguities resulting from loss of channels, e.g., due to radio frequency interference (RFI). For certain stations and sessions, this causes a loss of many observations. The only way to overcome this problem is by re-fringing the correlator output with a narrow search window (±10 ns). The author offers a little program which creates fourfit run commands with suitable search windows for a refringe. As input, it needs the listing of the post-fit residuals of the Solve program and the alist file of the aedit program. Because this requires that an analyst taking care of these observations has to extract the post-fit residuals from his solution, has to have access to the raw correlator output, and has to have some knowledge of running fourfit, the number of possible candidates for taking care of this job singlehandedly is small. It is, therefore, necessary that a suitable data flow is organized between the submitting Analysis Center and the respective correlator group.

2. IVS Operational Data Analysis and Combination

Since October 1, 2009, the operational combination has been carried out by the IVS Combination Center at the German Bundesamt für Kartographie und Geodäsie (BKG) in Frankfurt a.M. (see separate report by BKG/DGFI). The input to these combinations is datum-free (constraint-free) normal equation systems in SINEX format (Solution INdependent EXchange format) containing elements for radio source positions, Earth orientation parameters, and radio telescope coordinates.

3. Epilog

In September 2012, I gave notice to the IVS Directing Board that I will terminate my mandate as IVS Analysis Coordinator on February 28, 2013. At that time I will have served as Analysis Coordinator for more than 13 years. Thanks to the help and efforts of many individuals, it was a period of constant progress in the field of analysis and also in the field of combination products. Of course, expectations of how much progress should have been made have always been higher than could be realized. In the field of VLBI data analysis, there have been too many improvements to discuss or even mention. Concerning the combinations of the analysis results for the final IVS products, I made the first proposal to use datum-free normal equations in 2002. Although there are serious problems with filter-based solutions, I still defend my decision to go for normal equations. In the process of generating combinations for the International Terrestrial Reference Frame (e.g., ITRF2005 or ITRF2008), the IVS has always been the service that could prove and guarantee that the solutions were unconstrained. In the near future, the source positions will be handled in a consistent way together with the terrestrial reference frame and the Earth orientation parameters. Combination on the basis of datum-free normal equations containing the elements of all the parameters of the VLBI solutions will be a straightforward method without awkward constructions of the functional model between the parameters and the setting up of additional Helmert parameters as will be necessary for the solutions reported to the IERS with covariance matrices.

At the time of writing, the new IVS Analysis Coordinator, John Gipson (who works for NVI, Inc. at NASA GSFC), had already been elected by the IVS Directing Board. I am sure that John will be a capable and diligent leader of the analysis community within the IVS. I wish him good luck with all his new ideas and a good portion of persistence to motivate the IVS analysis groups to produce even better solutions in a timely fashion.

References

[1] G. Chen, and T.A. Herring (1997) Effects of atmospheric azimuthal asymmetry on the analysis of space geodetic data. J Geophys Res, Vol. 102, No. B9, pp. 20489-20502, doi: 10.1029/ 97JB01739.

[2] D. S. MacMillan (1995) Atmospheric gradients from very long baseline interferometry observations. Geoph Res Letters, Vol. 22, No. 9, pp. 1041-1044, doi: 10.1029/95GL00887.