Summary of the Third IVS Analysis Workshop

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Abstract

On February 8, 2002, the Third IVS Analysis Workshop was held at the Epochal Conference Center, Tsukuba, Japan. The one-day meeting was attended by about 40 participants. Here, a short summary of the discussion topics and the most important results is given.

1. Preliminary Results of the Second IVS Analysis Pilot Project

C. Steinforth showed the first preliminary plots of residuals. Combining the results of the Pilot Project submissions and comparing the combined series with the regular IVS series IVS01001 yielded an agreement at the level of 100 microarcseconds in all components. This preliminary result indicates that the EOP series are more consistent throughout the IVS Analysis Centers with ITRF2000 station coordinates and ICRF Ext. 1 source positions. It was questioned whether the rates in these comparisons were significant.

The Analysis Coordinator regretted that only seven solutions had been submitted by the IVS Analysis Centers for this Analysis Pilot Project limiting the input series to only three different software packages.

It was mentioned that in the future the term "Pilot Project" should only be used if the activity is carried out in preparation of a routine product. In this respect, the term "IVS Analysis Research Project" seems to be more appropriate.

2. Comparison of EOP Series Derived for the Second IVS Analysis Pilot Project

C. Bizouard and co-workers presented their results of initial comparisons. In the y pole component there appears to be a systematic disagreement between VLBI and GPS of 156 microarcseconds. Between VLBI and SLR it is even larger (331 microarcsec). At the x pole component there is no significant disagreement.

3. Discussion of the Second IVS Analysis Pilot Project - Troposphere

J. Boehm presented the first results of the comparisons of troposphere parameters estimated in the Second Analysis Pilot Project. The results are very satisfactory and a proposal was being announced to make troposphere parameters a regular product of the IVS. The IVS Directing Board had already discussed this proposal by the Vienna Institute for Geodesy and Geophysics and had decided to set up an IVS Pilot Project which will help to prepare making atmosphere parameters a routine IVS product. Analysis Centers will be asked for participation. The format of the submissions will be discussed in due course but will closely resemble the IGS SINEX format for

troposphere parameters. For more details see paper by Boehm et al. in the IVS GM Proceedings and the corresponding proposal text.

It was noted that packages using Kalman Filters may have difficulties to produce the atmosphere parameters for specific time intervals.

4. Extension of the SINEX Format for VLBI

On the basis of a proposal of the IVS Analysis Coordinator and of inputs from the other space geodetic techniques, the IERS Analysis Coordinator had compiled a proposal for SINEX Version 2.0 which now includes all current VLBI related parameters. The LOD parameter is inconsistent within the group of rate parameters due to its inverse sign. SINEX 2.0 also permits the submission of normal equations (or reduced normal equations) with their right hand side column for easy combination with other solutions, both VLBI and other space techniques.

Reduced normal equations for further combinations are ideally singular and are, thus, not solutions in a general sense. The pros and cons of reduced normal equations versus submission of solutions with covariance and constraint matrices were discussed extensively.

As a result it was decided by the partcipants that in the future there will be two types of SINEX submissions on the basis of SINEX 2.0:

a) solutions which are described in full by their covariance and constraint matrices and

b) reduced normal equations with their complete right hand side column for the sole purpose of further combination with other solutions.

In the context of solutions with covariance and constraint matrices, a proposal by L. Petrov to include a data block for singular constraints as well as an extension of the permitted nutation reference models was also accepted. Concerning atmosphere gradient parameters, it was emphasized that it has to be stated to which part of the atmosphere (hydrostatic or wet) the gradient is referred.

The IERS Analysis Coordinator who attended the workshop will use this information to extend the SINEX V2.0 proposal and bring it forward for further discussions with representatives of the other space techniques.

5. PIVEX: Platform Independent VLBI Exchange Format

Following the presentation of A.-M. Gontier during the IVS General Meeting, more details were discussed. Chopo Ma will follow as chairperson of the working group after Martine Feissel had carried out the initial phase of the project. A.M. Gontier is prepared to develop the programs for writing PIVEX files from Mark III/IV databases. She will put out the so-called LCODES (i.e. codes of the data fields) which will be transferred from the databases to the PIVEX files for a period of about 6 weeks for comments. After this, programming will be started.

S. Bolotin volunteered to develop special readers for PIVEX but colleagues who may be able to help are very welcome. Although the readers should be platform independent, it would be helpful to know which computers are currently in use for this type of work. All analysts are asked to send their requests for specific computers to the chairperson.

PIVEX files will be generated by the IVS Operation Centers when the conversion programs have been tested (in parallel to NGS card files). As soon as the readers are available there will be

a grace period for NGS card files for a maximum of six months. After this, NGS card files will not be produced any more.

6. Scheduling Considerations in High Data Rate VLBI

C. Klatt raised the question of how to optimize scheduling when high data rates, i.e. > 56 Mb/s, are used. Since so far no experience exists, it was decided that a call will be made soliciting participants for an Email discussion group.

7. Analysis of EOP Rate Results

Z. Malkin presented a comparison of the first BKG solution which also solved for pole rates as well as for UT1-UTC rates with IGS results. In the discussion it was stated that one series alone is not really conclusive but that the rate parameters weaken the VLBI solutions. Larger networks may improve the stability.

The Analysis Coordinator emphasized that users are very keen to use EOP rates from VLBI analyses for their investigations of geophysical excitations. More solutions with EOP rates are very valuable and should be submitted in parallel to the regular series.

8. Implementation of IAU2000 Resolutions

N. Capitaine gave an overview of the IAU2000 resolutions and their impact on VLBI data analysis. Since VLBI observations are not sensitive to the equinox but to the Geocentric Celestial Reference System (GCRS), the long term consistency of the EOP will improve. A special IERS workshop will be held on this topic in Paris on April 18 - 19, 2002.

9. Reference Temperatures used in VLBI Analyses

Z. Malkin presented a list of long term mean temperatures of regularly used VLBI telescopes for correction of thermal expansion effects. After extensive discussion it was decided that an official list of reference temperatures will be published on the Web on the basis of this list. One of the reasons for this list is that there cannot be a single reference temperature for all sites and that this list represents the mean temperatures on which the ITRF2000 is based.

Reference temperatures will be the open area air temperatures and will be rounded to the next full degree Celsius. For sites with radomes, stations will be asked to provide their long term average temperatures within the radome. For new sites, reference temperatures will be taken from meteorological history of the respective area.

The discussion of reference atmospheric pressure values for pressure loading effects was abandoned since more investigations are necessary.

10. The Use of the ICRF in EOP Determinations

Chopo Ma reminded the participants of the evolution of the ICRF now often serving as the basis for EOP determination. The CRF observed during EOP monitoring sessions is a small subset of the ICRF and has evolved, beginning with a small number of very strong sources, many

with significant structure, to a much larger number, some of which still have detectable positional variation. With the current and future levels of accuracy for the EOP, the instability of part of the CRF should be considered in EOP analysis, which could be derived from source position time series.

11. Abandoned Problems of Operative Data Analysis

L. Petrov presented a list of problem areas which need a closer look. A number of hardware induced error sources should be investigated and be reported to the stations for elimination. Some of these error sources can only be addressed if the data which is used to determine the delay observables is looked at in more detail.

The Analysis Coordinator stressed the importance of these investigations and asked all participants to contribute to these efforts. There are still a number of items which have to be solved for further improvements in the geodetic VLBI technique.

12. Differences in Results between Mark III and Mark IV Observations

D. Macmillan presented results of recent Mark IV observations which showed significant differences compared to Mark III style sampling rates. Since these differences are most dominant on baselines with Onsala, it was suggested to look at the effects of Onsala cable cal which had been found to compensate this type of error already in the early nineties.

13. Miscellaneous

- The IVS data structure will be prepared for baseline length results as a separate IVS product.

- On the basis of the discussion concerning the SINEX 2.0 extension, IVS Analysis Centers are asked to submit SINEX 2.0 files with reduced normal equations for all site coordinates and EOP including EOP rates for each session.

- Next IVS Analysis Research Project: EOP and EOP rates on the basis of fixed ITRF2000 station coordinates and fixed ICRF source positions for a period of 2 years, to be announced in late spring.

- Next meeting: The Fourth IVS Analysis Workshop has been invited to take place at Paris Observatory, France, in cooperation with the Institute Geographique National (IGN) in early 2003. Although February 2003 would keep the sequence of workshops at 12 month intervals, it may be advisable to shift the Fourth IVS Analysis Workshop to early April 2003, the week prior to the EGS/AGU General Assembly. More details will be announced on the IVS Analysis Coordinator's web page in the next few months.

14. Acknowledgements

The IVS Analysis Coordinator is very grateful to the members of the Geographical Survey Institute and the Communications Research Laboratory for hosting the Third IVS Analysis Workshop at the Tsukuba Epochal Conference Center.