

U.S. Naval Observatory VLBI Analysis Center

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Abstract This report summarizes the activities of the VLBI Analysis Center at the United States Naval Observatory for calendar year 2013. Over the course of the year, Analysis Center personnel continued analysis and timely submission of IVS-R4 databases for distribution to the IVS. During the 2013 calendar year, the USNO VLBI Analysis Center continued to use the VLBI global solution designated usn2012b. Earth orientation parameters (EOP) based on this solution and updated by the latest diurnal (IVS-R1 and IVS-R4) experiments, were routinely submitted to the IVS. Sinex files based upon the bi-weekly 24-hr experiments were also submitted to the IVS. During the 2013 calendar year, Analysis Center personnel continued a program to use the Very Long Baseline Array (VLBA) operated by the NRAO for the purpose of measuring UT1–UTC. Routine daily 1.5-hour duration Intensive observations continued using the VLBA antennas at Pie Town, NM and Mauna Kea, HI. High-speed network connections to these two antennas are now routinely used for electronic transfer of VLBI data over the Internet to a USNO point of presence. A total of 345 VLBA Intensive experiments were observed, electronically transferred to, and processed at USNO in 2013.

U.S. Naval Observatory

USNO Analysis Center

IVS 2013 Annual Report

1 Introduction

The USNO VLBI Analysis Center is supported and operated by the United States Naval Observatory (USNO) in Washington, DC. The primary services provided by the Analysis Center are the analysis of diurnal experiments, the production of periodic VLBI global solutions for estimation of the Terrestrial Reference Frame (TRF), the Celestial Reference Frame (CRF), and Earth Orientation Parameters (EOP). The Analysis Center continued the submission to the IVS of Intensive (EOP-I) and session-based (EOP-S) Earth orientation parameters based on USNO VLBI global solutions. Analysis Center personnel maintain the necessary software required to continue these services to the IVS including periodic updates of the GSFC CALC/SOLVE software package. In addition to operational VLBI analysis, Analysis Center personnel are actively engaged in research related to future reference frames, the electronic transfer of VLBI data, and software correlation.

2 Current Analysis Center Activities

2.1 IVS Experiment Analysis and Database Submission

During the 2013 calendar year, personnel at the USNO VLBI Analysis Center continued to be responsible for the timely analysis of the IVS-R4 experiments, with the resulting databases submitted within 24 hours of correlation for dissemination by the IVS. Analysis Center personnel continue to be responsible for the analysis and database submission for the periodic

IVS-CRF experiments. In 2013, USNO scheduled and analyzed 12 CRF related experiments including IVS-CRF73 through IVS-CRF79 and IVS-CRDS63 through IVS-CRDS68. The analyzed databases were submitted to the IVS. Analysis Center personnel also continued analyzing IVS Intensive experiments for use in the USN-EOPi time series and continued a new series of Intensive sessions using the VLBA antennas at Pie Town, NM and Mauna Kea, HI.

2.2 Global VLBI Solutions, EOP and Sinex Submission

USNO VLBI Analysis Center personnel continued to use the periodic global TRF/CRF/EOP solution usn2012b over the course of the 2013 calendar year. Analysis Center personnel continued to submit the USN-EOPS series, which is based upon the current global solution, and updated with new IVS-R1/R4 experiments. The updated EOPS series is submitted to the IVS twice weekly within 24 hours of experiment correlation and is included in the IERS Bulletin A. Analysis Center personnel also continued routine submission of Sinex format files based upon the 24-hr VLBI sessions. In addition to EOPS and Sinex series, USNO VLBI Analysis Center personnel continued to produce and submit an EOPi series based upon the IVS Intensive experiments.

2.3 Software Correlator

Over the course of the 2013 calendar year, Analysis Center personnel continued the implementation, testing and evaluation of the DiFX software correlator. Phase I of the software correlator has two management nodes, 33 compute nodes (with each node having a 2.9 GHz dual-core processor with eight cores per processor for a total of 528 processing cores) and has been operating since September 2012. Phase II of the software correlator is expected to be delivered in the second quarter of 2014 and will double the processing power of the Phase I correlator. Post-correlation calibration and analysis of software correlated data is now routinely performed using the standard geodetic data reduction path including the use of the Haystack

Observatory Post-processing System (HOPS) for data calibration and the GSFC CALC/SOLVE package for data analysis.

2.4 VLBA Intensive Experiments

During the 2013 calendar year, Analysis Center personnel continued a program to use the Very Long Baseline Array (VLBA) operated by the NRAO for the purpose of measuring UT1–UTC. Routine daily 1.5-hour duration Intensive observations continued using the VLBA antennas at Pie Town, NM and Mauna Kea, HI. High-speed network connections to these two antennas are now routinely used for electronic transfer of VLBI data over the Internet to a USNO point of presence.

A total of 345 VLBA Intensive experiments were observed, electronically transferred to and processed at USNO in 2013. Once fully operational, these VLBA Intensive sessions will be scheduled as IVS-INT4 and data will be released to the IVS for community-wide distribution.

3 Staff

The staff of the VLBI Analysis Center is drawn from individuals in both the Astrometry and Earth Orientation departments at the U.S. Naval Observatory. The staff and their responsibilities are as follows:

Name	Responsibilities
Alan Fey	Periodic global CRF/TRF/EOP solutions and comparisons; CRF densification research; software correlator implementation; VLBI data analysis.
Nicole Geiger	software correlator implementation; VLBI data analysis; EOP, database and Sinex submission.
Chris Dieck	software correlator implementation; VLBI data analysis; EOP, database and Sinex submission.

4 Future Activities

The following activities for 2014 are planned:

- Continue analysis and submission of IVS-R4 experiments for dissemination by the IVS.
- Continue the production of periodic global TRF/CRF/EOP solutions and the submission of EOP-S estimates to the IVS updated by the IVS-R1/R4 experiments.
- Continue submission of Sinex format files based on the 24-hr experiments, and begin production of a Sinex series based upon the Intensive experiments.
- Continue the analysis of IVS Intensive experiments and submission of EOP-I estimates to the IVS.
- Continue the scheduling, analysis and database submission for IVS-CRF, IVS-CRMS and IVS-CRDS experiments.
- Continue testing and evaluation of the USNO implementation of the DiFX software correlator. Streamline pre- and post-correlation processing.
- Continue routine electronic transfer, correlation, post-processing and analysis of VLBI Intensive data from the MK and PT VLBA stations.
- Continue graphical user interface (GUI) development for the USNO implementation of the DiFX software correlator.