

# U.S. Naval Observatory VLBI Analysis Center

Megan Johnson, Christopher Dieck, Nicole Geiger, Lucas Hunt, Phillip Cigan

**Abstract** This report summarizes the activities of the VLBI Analysis Center at the United States Naval Observatory for calendar years 2019–2020. Over the course of the two years, Analysis Center personnel continued analysis and timely submission of IVS-R4 databases for distribution to the IVS. During the calendar years 2019–2020, the USNO VLBI Analysis Center used the VLBI global solutions designated usn2018b, usn2019c, usn2020a, and usn2020b. Earth Orientation Parameters (EOP) based on the solutions and updated by the latest diurnal (IVS-R1 and IVS-R4) sessions, were routinely submitted to the IVS. Sinex format files based upon the semi-weekly 24-hour sessions were also submitted to the IVS. During the 2019–2020 calendar years, 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 1–1.5-hour duration Intensive observations continued using the VLBA antennas at Pie Town, NM and Mauna Kea, HI.

## 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 sessions, the production of periodic VLBI global solutions for

---

U.S. Naval Observatory

USNO Analysis Center

IVS 2019+2020 Biennial Report

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.

## 2 Current Analysis Center Activities

### 2.1 IVS Session Analysis and Database Submission

During the 2019–2020 calendar years, personnel at the USNO VLBI Analysis Center continued to be responsible for the timely analysis of the IVS-R4 sessions, with the resulting databases submitted within 24 hours of correlation for dissemination by the IVS. Analysis Center personnel also continued analyzing IVS Intensive sessions for use in the USN-EOPI time series and continued a series of Intensive sessions using the VLBA antennas at Pie Town, NM and Mauna Kea, HI. With the deployment of fiber to all ten VLBA antennas during the 2020 calendar year, USNO began including the St. Croix, VI antenna in the daily UT1–UTC Intensive series. The USNO Analysis Center continued the contributed analysis of the IVS-R1 sessions.

## 2.2 Global VLBI Solutions, EOP, and Sinex Submission

USNO VLBI Analysis Center personnel used the periodic global TRF/CRF/EOP solutions usn2018b, usn2019c, usn2020a, and usn2020b over the course of the 2019–2020 calendar years. 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 sessions. The updated EOPS series is submitted to the IVS twice weekly within 24 hours of session correlation and is included in the IERS Bulletin A. Analysis Center personnel also continued routine submission of Sinex format files based upon the 24-hour 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 sessions.

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

Name	Responsibilities
Alan Fey / Megan Johnson	Periodic global CRF/TRF/EOP solutions and comparisons; CRF densification research; VLBI data analysis.
Nicole Geiger	VLBI data analysis; EOP, database, and Sinex submission.
Christopher Dieck	VLBI data analysis; EOP, database, and Sinex submission.
Lucas Hunt	VLBI calibration and image analysis; CRF source structure research
Phillip Cigan	VLBI calibration and image analysis; CRF source structure research

## 2.3 ITRF2020 Submission

During calendar year 2020, the USNO VLBI Analysis Center generated and submitted Sinex files as part of a stand-alone global solution for contribution to the ITRF2020.

## 2.4 VLBA Intensive Sessions

During the 2019–2020 calendar years, 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 1–1.5-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. During calendar year 2020, the VLBA was outfitted with high-speed network connections to all ten stations, which USNO utilized by including the St. Croix, VI antenna in the Intensive series. Once fully operational, it is anticipated that these VLBA Intensive sessions will be scheduled as IVS-INT4 sessions and that the data will be released to the IVS for community-wide distribution.

## 4 Future Activities

The following activities for 2021 are planned:

- Continue analysis and submission of IVS-R4 sessions 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 sessions.
- Continue submission of Sinex format files based on the 24-hour sessions.
- Continue the analysis of IVS Intensive sessions and submission of EOP-I estimates to the IVS.
- Continue post-processing and analysis of VLBI Intensive data from the MK, PT, and SC VLBA stations.