2019–2020 Analysis Coordinator Report

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Abstract I summarize some of the important issues related to IVS Analysis over the last two years.

1 Conclusion of the Transition to vgosDB

In the spring of 2018 a computer failure at the Bonn correlator precipitated the sudden transition to the vgosDB format. Because not all of the pieces were in place and fully tested, many things were initially done on an ad-hoc basis. For example, at the end of 2018 none of the IVS Data Centers was able to automatically process vgosDB and, because of this, the data was uploaded to CDDIS manually. Two years later I am happy to report that the transition to vgosDB is complete.

2 ITRF2020

Much of the focus the last two years was related to preparation for and participation in the IVS submission for ITRF2020. Eleven Analysis Centers using seven software packages submitted SINEX files (Table 1).

The IVS 2020 submission differed from the 2014 submisison in several key ways, mostly modeling changes:

1. ITRFF2014 used a model from 1996 for High-Frequency EOP. This model had begun to show its age, and the IERS recommended use of a new model due to Desai-Shailen-Egbert based on Topex data.
2. The IVS also adopted the new IERS pole-tide model.
3. This submission included the effects of galactic aberration using the model recommended by IVS Working 8 on Galactic Aberration. (See A&A Volume 630, A93, 2019, `https://www.aanda.org/articles/aa/abs/2019/10/aa35379-19/aa35379-19.html`).
4. This submission included models for the effects of gravitational deformation for six antennas: EFLSBERG, GILCREEK, MEDICINA, NOTO, ONSALA60, and YEBES40M. Unfortunately we were not able to include the model for NYALES20 which became available too late.
5. Unlike previous submissions, this submission included the effect of pressure loading. In order to be able to combine the results with other techniques that do not routinely apply pressure loading effects,

Table 1 Analysis Centers and software packages involved in the IVS contribution to ITRF2020.

Analysis Center	Software Package
ASI CGS	Calc/Solve
BGK	Calc/Solve
DGFI-TUM	DOGS-RI
GFZ Potsdam	PORT
IAA	Quasar
GSFC	Calc/Solve
NMA	Where
Paris Observatory	Calc/Solve
Onsala	ASCOT
TU Wien	VieVS
USNO	Calc/Solve

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the SINEX files were modified so that pressure loading could be backed up.
6. Source positions. The IVS contribution to ITRF2020 included source coordinates.

A fuller discussion of ITRF2020 can be found in the December 2020 issue of the IVS Newsletter (Issue #58), available at `https://ivscc.gsfc.nasa.gov/publications/newsletter/issue58.pdf`).

3 Automated Scheduling of VLBI Sessions

One of the most interesting recent developments is VieSched++, developed by Matthias Schartner as part of his PhD. VieSched++ can automatically generate hundreds or thousands of schedules for a given session and choose the session with the 'best' properties. Here 'best' is determined by the goals of the session. VieSched++ is widely used in Europe and Australia, although sked is still used by GSFC and USNO to schedule the R1 and R4 sessions, and by Haystack to schedule the VGOS sessions.

4 VGOS Moves from R&D to Operational

In January 2020, the VGOS network was officially declared operational (and vgosDB files were made available on the Data Centers for sessions from January 2019 onward). The goal was to schedule 24-hour VGOS sessions every two weeks. This goal was largely successful with 26 sessions scheduled and correlated in 2019. These sessions generally involved all of the VGOS antennas which were available at a given time. Although we continued to observe at roughly a bi-weekly cadence during 2020 there was a backup in correlating sessions due to COVID-19. The IVS is still working through the backlog.

One of the obstacles to making VGOS operational was that Haystack was the only correlator that had the expertise to correlate them. Recognizing this, there was a correlator workshop held at Haystack Observatory in conjunction with the 2019 Technical Operations Workshop. Following this, several correlators processed first an Intensive session and then a 24-hour session and compared their results with Haystack. Currently there are several correlators that can process VGOS sessions.

In the spring of 2019, the NASA VLBI group began a pilot project to schedule VGOS Intensives. Initially this was a proof-of-concept demonstration, and the stations used depended on what was available. In the fall of 2019, the IVS began regular VGOS Intensives using the Kokee–Wettzell baseline.

In addition, the European VGOS consortium scheduled a series of regular EU-VGOS sessions and EU-VGOS Intensives involving European stations and Ishioka. As we move into 2021 the number of VGOS sessions continues to increase. The major roadblocks are media/data storage and data transmission.

5 IVS Analysis Centers and Analysis Software

The number of IVS Analysis Centers continues to increase. There are currently over 30 IVS Analysis Centers with the most recent one being at ETH Zurich in Switzerland. The number of analysis packages also continues to increase. Friendly competition between Analysis Centers is the surest way to improve the VLBI technique.