

IVS Chair's Report

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While the year 2019 seems to have ended in the same fashion as it started—with no serious impact on all kinds of human activities including those of the IVS—the year 2020 was extraordinary in so many aspects of our lives that we may easily have lost track of the developments within the IVS. The preparations of the IVS Biennial Report (BR) 2019–2020 may have forced some of us to contemplate the developments in a broader perspective. When published, this BR will again help the IVS community to find references of the IVS activities and the changes they have brought about, in a positive sense but, unfortunately, also in a few negative developments.

In this Chair's Report, I would like to emphasize a few items of general importance to the IVS community in the last two years. You may often also find more details in this BR. Of course everybody has on their mind the fatal COVID-19 pandemic, which caught us by surprise. I hope and wish that all of you and your families stayed (and will stay) healthy and have been affected only in a moderate way by these adverse circumstances. From an IVS Chair's point of view, I am very glad that all of you helped to bring the many operational procedures to the hygienic standards requested by the authorities. Fortunately, we were able to keep up operational readiness for most of the IVS components for the delivery of our products as our customers expect them. Sometimes this even required official letters by the IVS Chair. In any case, this situation has forced a severe re-consideration of the importance of critical

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infrastructure and the need for the respective documentation with the authorities in each country.

When the discussions started in 2019 about what preparations had to be taken for CONT20, the IVS Observing Program Committee (OPC) together with the IVS Coordinating Center at NASA Goddard Space Flight Center went one step back and once again debated the pros and cons of uninterrupted 15-day observing sessions. It is unchallenged that they served their purpose in the past. However, in the discussions it turned out that extended IVS legacy observing networks are now in a state in which their results may well be able to stand up against the quality of polar motion results from GNSS observations. However, this needed to be proven and extending the current IVS-R1 network in a selected set of R1 sessions by a few more telescopes, i.e., from 8–10 to at least 14 telescopes, seemed to be the right approach. As a working acronym, this project was called R1-2020 and it was approved by the Directing Board (DB) to replace CONT20.

Prepared by the OPC, the second important decision of the DB in 2020 was to make two of the regular IVS-T2 sessions very special ones called T2Plus. Here, as many telescopes as possible should participate, but all should be able to observe the 512 Mbit/s recording mode with 720/140 MHz spanned bandwidth for high sensitivity. So far, up to 28 IVS telescopes are able to observe in this mode and we will see in 2021 what the quality of the results will be.

In the last two years, considerable progress was made in achieving operational readiness of the next-generation VLBI system, the VLBI Global Observing System (VGOS). Series of 24-hour VGOS test and operational as well as *Intensive* sessions were observed in regular intervals. Finally, the correlation and Level-1 data analysis has been developed and tested

by the Haystack Observatory colleagues to a stage where cookbook procedures could be disseminated to the other correlators. In parallel to this, the EU-VGOS cooperation has developed a competing polarization combination procedure and it will be interesting to see how the two approaches compare. By now, a network of 7–8 stations has matured enough to make the observations available on the IVS Data Centers and the analyses of these are in full swing.

The volume of correlation still needs to be ramped up for meeting the expected projection. The same applies to the capabilities of data transmission via the Internet which is needed for regular VGOS operations. However, I am convinced that the many individual activities of colleagues at their ends of the pipeline will lead to a success story in the end. At the same time we are very keen to see many other VGOS telescopes become operational, which are in the construction phase at the moment. Their contributions will make the VGOS network more robust and more sensitive to the geodetically interesting parameters.

In the domain of data analysis, the preparations for and the actual computations of the IVS input to the International Terrestrial Reference Frame 2020 (ITRF2020) has taken quite some energy for the IVS Analysis Centers (AC) and, in particular, for the IVS Analysis Coordinator. The heavy coordination work is necessary to guarantee consistent processing approaches of the ACs in terms of geophysical modeling and parameterization. With the computations of the ACs being almost finished at the time of writing, the last and equally important work now lies with the IVS Combination Center. Although the final submission of the combined IVS solution is still a few days ahead, I am sure that the IVS will have produced a data set which underpins the importance of the VLBI technique for the scale of the ITRF and for precise coordinates of many reference points on the Earth's surface as well as for precise positions of radio sources in the celestial reference frame. Let me thank all IVS associates for their invaluable contributions to these results. This is not only for the analysts but more so for the staff at the observatories and the correlators as well as for the many individuals working in the field of coordination and other background services.

Due to the COVID-19 pandemic, the reporting period has only seen first-class IVS-related meetings in 2019. In conjunction with the 24th Working Meeting of the EVGA, the 3rd VLBI Training School of the

IVS Committee on Training and Education took place at Las Palmas de Gran Canaria, Spain, from March 14 to March 16, 2019. The purpose of this school, as of the previous two, was to help to prepare the next generation of researchers to understand VLBI systems and inspire them in their future careers. The event attracted some 50 participants from all over the world. In the same week, also the 20th IVS Analysis Workshop provided a good forum for extensive discussions. From May 5 to May 9, 2019, the 10th IVS Technical Operations Workshop took place at Haystack Observatory, Westford, MA, USA. The 8th International VLBI Technology Workshop from November 18 to November 20, 2019, was hosted by CSIRO Radiophysics Laboratory in Sydney, Australia.

And then the pandemic hit. Had we first hoped that the 11th IVS General Meeting could still take place at Annapolis MD, USA, from March 22 to March 28, 2020, we had to learn the hard way that a pandemic can really also stop worldwide travel. Eventually, the meeting had to be cancelled, and I am really sad for having missed this opportunity of a fruitful personal exchange. Even more sorry am I for the organizers from NVI, Inc., who went through a vast load of organizational issues to finally be stopped abruptly with the decision to cancel the meeting entirely without the option for postponement. And let's not forget all of the work for unwinding all of the arrangements made already. We are all very glad that the organizers found ways to get compensated for at least some of the financial burdens. "The GM which never happened" will keep its place in the annals of the IVS. The next IVS GM is planned for early 2022 in Helsinki, Finland.

Before COVID-19, the IVS Directing Board met in person two times: on March 21, 2019 in Las Palmas de Gran Canaria, Spain, and on September 30, 2019 in Bonn, Germany. All subsequent DB meetings had to take place remotely. The 42nd DB meeting was split into two parts, one on March 26, 2020 (ersatz #1) and a second on June 25, 2020 (ersatz #2); likewise, the 43rd meeting was held on September 25, 2020 (ersatz #1) and on December 17, 2020 (ersatz #2).

Even though we only met in front of computer screens, many issues were discussed and a number of important decisions were made. On June 25, 2020, the new IVS Network Coordinator (NC), Stuart Weston of the Institute for Radio Astronomy & Space Research (IRASR), Auckland University of Technology, New Zealand, attended his first board meeting after he

Table 1 Former IVS Directing Board members of the past two years.

Ed Himwich	NVI, Inc./NASA Goddard Space Flight Center, USA	Network Coordinator	(until June 2020)
Laura La Porta	IGG-B, Reichert GmbH, Max-Planck-Institut für Radioastronomie, Bonn, Germany	Correlators and Operation Centers Representative	Feb 2019 – Apr 2019
Oleg Titov	Geoscience Australia, Australia	IAG Representative	Aug 2015 – Jul 2019

had been elected by the DB in a competitive election. The long-term NC, Ed Himwich, relinquished his position in early 2020 after performing these duties since the foundation of the IVS in 1999. Ed, thank you very much once again for your continuous and successful efforts. On September 25, 2020, the DB approved the proposal of ETH Zurich to become an IVS Associate Analysis Center.

A very prominent decision of the DB is the adoption of the “IVS Infrastructure Development Plan 2030” (this volume). In this document the IVS Directing Board expresses its views of the current status of the IVS and the foreseen future path of developments to document the background of its decisions and to provide a basis for discussions with its stakeholders.

Another item is that the IVS DB has established a mechanism for IVS Resolutions. The Directing Board adopts resolutions to guide the IVS community and to address issues in a formalized way. The IVS Resolutions give the Associates as well as others a proper means as reference for actions.

Unfortunately, there are also less pleasant issues for the Chair to report. In late 2020, the Kashima 34-m telescope of NICT was dismantled after it had been in operation since 1988. This is a severe loss to the IVS legacy telescope network. On September 30, 2020, also the VLBI group at the Institute of Geodesy and Geoinformation of the University of Bonn closed down

its VLBI research activities and its IVS operations for good after more than 40 years of existence. In the natural course of new elections but also for some unexpected resignations, the IVS DB said farewell to a few members over the last two years (Table 1). We are grateful for their service to the IVS and to the DB.

The last item to report is that this is the last Chair's report for which I have to take responsibility, because my term as chair ends on February 28, 2021. I was part of the Steering Committee establishing the IVS in 1999, served as the IVS Analysis Coordinator for almost 14 years, and chaired the IVS DB for the last eight years. It has always been an honor for me to be the IVS Analysis Coordinator and to chair the IVS through its directing board. The latter task brought with it the responsibility for representation both to the inside and to the outside, such as to our parent organizations IAG and IAU as well as to the IERS and the other IAG services. The tasks have been challenging but also rewarding. I believe that the IVS bears my footprint, but whether this has a positive attribute remains for others to decide.

When this Biennial Report will be published, the new IVS DB Chairperson will have been elected. I wish him or her a successful and fulfilling future with many big steps forward.