IVS Chair's Report

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Another two years have passed with the IVS making considerable progress in its developments. As in many other disciplines, communities, and organizations, the individual steps might get lost in the overall complexity, but are necessary however small they may be. In this respect, the Biennial Report 2017–2018 once again documents the bigger achievements but not the tiny details—though the latter may have caused more headaches than the general concepts. I thank all of you for your efforts to develop the IVS further, with small and large pieces of the puzzle, and for documenting them in this report. It is always a very valuable reference for information, which may be hidden or even lost in the course of time.

Concerning the observations, the IVS network operated as planned by the IVS Observing Program Committee (OPC) heavily supported by the IVS Coordinating Center at NASA Goddard Space Flight Center. No major change in the overall program was introduced. With this, the IVS exploited all its observing and correlation capacity to the full extent. Another CONT campaign, CONT17, was observed during the period from November 28 to December 12, 2017. This time, the campaign consisted of three separate networks: two legacy S/X networks observing for 15 consecutive days and one VGOS broadband network observing for five consecutive days in the middle of the CONT17 period. This put again quite a heavy burden on the telescopes and on the correlators. The results are really noteworthy and a special issue on CONT17 is planned to be published in Journal of Geodesy.

Institut für Geodäsie und Geoinformation der Universität Bonn

Chair

IVS 2017+2018 Biennial Report

With the VGOS broadband system, a network of 3–7 stations has been observing VGOS Test (VT) sessions about every other week for 26 sessions each in 2017 and 2018. Level 1 data analysis (polarization combination and fringe fitting with ionosphere estimation) has not been trivial and might have been underestimated in its complexity. When you read this, the data of the 24-hour sessions should have been released to the community for further analyses. Although the IVS is far behind its own expectations concerning the VGOS developments, there are a couple of good news. The first publication on the VGOS processing chain appeared (Niell et al., 2018) and in Europe, a group started to look into VGOS observations and processing with alternative developments (Alef et al., 2019).

Under the guidance of the International Astronomical Union (IAU) Working Group on the Third Realization of the International Celestial Reference Frame (ICRF3), several IVS Analysis Centers (ACs) prepared CRF solutions as input to ICRF3. The new frame was adopted at the IAU General Assembly in Vienna, Austria, on August 30, 2018 under Resolution B2. ICRF3 contains positions of more than 4,000 extragalactic radio sources at three frequencies and became the current realization of the International Celestial Reference System (ICRS) on January 1, 2019.

With the advent of powerful and affordable terrestrial laser scanners (TLS), the issue of path delay variations and position changes due to gravitational deformations of the radio telescopes surfaced again lately. From earlier investigations, it is clear that gravitational deformations have a direct effect on the delay observables. As a consequence, these delay effects then change the vertical position of the telescope in a global frame by several millimeters. Within the report period, a few more telescopes were investigated

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

Alessandra Bertarini	Reichert GmbH, BKG, Germany	Correlators and Operation Centers Representative	Feb 2015 – Sep 2017
Ludwig Combrinck	Hartebeesthoek Radio Astronomy Observatory, South Africa	IAG Representative	–
David Hall	U.S. Naval Observatory, USA	Correlators and Operation Centers Representative	Feb 2017 – Feb 2019
Thomas Hobiger	Onsala Space Observatory, Sweden	Technology Development Centers Representative	Feb 2017 – Feb 2019
Alexander Ipatov	Institute of Applied Astronomy, Russia	At Large Member	Feb 2015 – Feb 2017
Ryoji Kawabata	Geospatial Information Authority, Japan	At Large Member	Feb 2015 – Feb 2017
Jim Lovell	University of Tasmania, Hobart, Australia	Networks Representative	Feb 2013 – Feb 2017
Chopo Ma	NASA Goddard Space Flight Center, USA	IERS Representative	–
Arthur Niell	Haystack Observatory, USA	Analysis and Data Centers Representative	Feb 2015 – Feb 2019
Bill Petrachenko	Natural Resources Canada, Canada	Technology Coordinator	–
Torben Schüler	BKG, Germany	Networks Representative	Feb 2015 – Feb 2019
Takahiro Wakasugi	Geospatial Information Authority, Japan	At Large Member	Feb 2017 – Feb 2019
Guangli Wang	Shanghai Astronomical Observatory, China	At Large Member	Feb 2017 – Feb 2019

by TLS measurements and subsequent data analysis. From these, empirical correction models were developed, which can now be applied in VLBI data analysis. Everybody should be aware that the radio telescope coordinates produced without these corrections suffer a severe systematic deficit. For this reason and for a full positive impact on the scale of the ITRF, possibly closing the scale gap between VLBI and SLR, all telescopes need to be measured and modeled. Therefore, I would like to encourage all of you to address this issue at your station and increase the endeavors that every telescope is surveyed appropriately. I am glad to give advice where needed.

The reporting period has seen a number of first-class IVS-related meetings, which were attended by many IVS colleagues. From April 30 to May 4, 2017, the 9th IVS Technical Operations Workshop took place at Haystack Observatory, Westford, MA, USA. The inauguration of the Onsala Twin Telescopes on May 18, 2017, brought us to Gothenburg, Sweden, where the 23rd Working Meeting of the European VLBI Group for Geodesy and Astrometry (EVGA) and the 18th IVS Analysis Workshop were held the days before. The 6th International VLBI Technology Workshop on October 9–11, 2017, was hosted by Istituto di Radioastronomia at Bologna, Italy. The year 2018 saw another big event, the inauguration of the Ny-Ålesund Twin Telescopes embedded in the 10th IVS General Meeting at Longyearbyen, Norway, on June, 3–8, 2018, including the 19th IVS Analysis Workshop. Finally, the 7th International VLBI Technology Workshop was held at Krabi, Thailand, November, 12–15, 2018. The inaugurations of the telescopes were highlights of the IVS and the hosting agencies—Chalmers University of Technology and the Norwegian Mapping Authority—created memorable events for all who participated. They mark important steps on the growth of the VGOS network, which, hopefully, will soon start regular observations and streamlined processing for the determination of Earth orientation parameters and telescope coordinates.

The IVS Directing Board (DB) met in person three times: in Gothenburg, Sweden, on May 19, 2017; in Bologna, Italy, on October 12, 2017; and in Longyearbyen, Norway, on June 9, 2018. Many important decisions were made. One of them is the creation of an IVS Office for Outreach and Communications (OOC) at the end of 2018. The OOC is hosted by MIT Haystack Ob-

servatory and led by Nancy Kotary. It is established to promote awareness and understanding of the unique and vital role of geodetic VLBI and the IVS in science and society to the larger scientific community, decision makers, and the general public. Activities will include the creation of a dedicated Web site, of social media accounts, and of extensive educational materials. It is anticipated that the OOC will improve collaboration across institutions, sponsor organizations, and scientific associations on education and outreach work.

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.

In early 2017, I was re-elected as chair of the IVS. I am honored by this trust and I hope that I can fulfill your expectations. Of course, there is always more on ones table to cope with in a satisfactory time frame and some good ideas may disappear under the pile of unattended tasks just for constantly changing priorities. The time ahead is dominated by a phase of transition to VGOS observations, but the legacy type of observations and processing will still play an important role. The IVS relies on every individual to keep up with all the challenges in the pipeline.