Onsala Space Observatory – IVS Network Station Activities

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Abstract During 2023 and 2024, we participated in total in 96 IVS 24-hour legacy S/X sessions with the Onsala 20-m telescope. We observed in total 58 VGOS 24-hour sessions with one or both of the Onsala twin telescopes. In total we observed 370 VGOS 1-hour Intensive sessions with one or both of the Onsala twin telescopes, the majority together with the partner station Ishioka in Japan, but also several with Kokee Park. In 2023 and 2024, we performed 11 and 9 flux-monitoring sessions of 20–24-hour duration with the Onsala twin telescopes as a standalone instrument.

Fig. 1 The three radio telescopes at the Onsala space Observatory that are used for geodetic VLBI: ONSA13NE (left), ONSALA60 (middle), and ONSA13SW (right).

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Onsala IVS Network Station

IVS 2023+2024 Biennial Report

1 General Information

The Onsala Space Observatory is the national facility for radio astronomy in Sweden with the mission to support high-quality research in radio astronomy and geosciences. The geoscience instrumentation at Onsala includes three antennas used for geodetic VLBI (see Fig. 1), several GNSS installations, a superconducting gravimeter, a platform for visiting absolute gravimeters, several microwave radiometers for atmospheric measurements, both GNSS-based and conventional tide gauge sensors, and a seismometer. The observatory can thus be regarded as a fundamental geodetic station. Since 2021, the observatory receives financial support for geoscience operations kindly provided by Lantmäteriet, the Swedish mapping, cadastral, and land registration authority. The staff members associated with the IVS Network Station at Onsala are listed in Table 1.

2 Legacy S/X VLBI Observations

In total, the 20-m radio telescope (ONSALA60, On) participated successfully in 48 of the originally planned 49 legacy S/X sessions in 2023. The session that was lost was r11135 on 2023-12-27/28. It was observed but due to an unexpected power failure that occurred close before session start, the VLBI system was not set up correctly and no successful S-band observations were performed. In 2024, all planned 48 S/X sessions were observed successfully.

Table 1 Staff members associated with the IVS Network Station at Onsala in 2023–2024. All e-mail addresses have the ending @chalmers.se, and the complete telephone numbers start with the prefix +46-31-772.

Function	Name	e-mail	telephone
Responsible for geoscience operations	Rüdiger Haas	rudiger.haas	5530
Senior staff involved in	Karine Le Bail	karine.lebail	5556
geodetic VLBI observations	Eskil Varenius (until 2024-08-31)	eskil.varenius	5558
	Lim Chin Chuan (since 2024-09-01)	limch	5565
Ph.D. students involved in	Periklis Diamantidis (– 2023-02-28)	periklis.diamantidis	5575
geodetic VLBI operations	Rebekka Handirk (– 2024-08-31)	rebekka.handirk	5575
	Alva Kinman (2024-06-03 –)	kinman@chalmers.se	3601
Responsible for the VLBI Field System	Michael Lindqvist	michael.lindqvist	5508
	Rüdiger Haas	rudiger.haas	5530
	Eskil Varenius (– 2024-08-31)	eskil.varenius	5558
	Lim Chin Chuan (2024-09-01 –)	limch	5565
Responsible for the VLBI equipment	Magnus Dahlgren	magnus.dahgren	5594
	Lars Pettersson	lars.pettersson (– 2023-12-31)	5568
	Peter Hillerström	peter.hillerstrom	55xx
Responsible for the VLBI data	Roger Hammargren	roger.hammargren	5551
recording and transfer equipment	Simon Casey	simon.casey	5529
	Eskil Varenius (– 2024-08-31)	eskil.varenius	5558
	Lim Chin Chuan (2024-09-01 –)	limch	5565
Telescope scientist	Henrik Olofsson	henrik.olofsson	5564
Software engineer	Mikael Lerner	mikael.lerner	5581
Responsible for gravimetry	Maxime Mouyen (– 2024-03-30)	maxime.mouyen	5549
Responsible for tide gauge and radiometry	Gunnar Elgered	gunnar.elgered	5565
Responsible for aeronomy and radiometry	Peter Forkman	peter.forkman	5577
Observatory director	John Conway	john.conway	5503

3 VGOS 24-hour Observations

In 2023, ONSA13NE (Oe) participated successfully in all planned 23 VGOS 24-hour sessions. ONSA13SW (Ow) participated successfully in 21 of these sessions, but missed observing v03081 and vo3341.

In 2024, Oe participated successfully in all planned 34 VGOS 24-hour sessions. Ow participated successfully in 33 of the sessions, but missed observing vo4178 due to problems with the digital backend.

Additionally to the standard IVS 24-hour network sessions, Oe observed in 2024 also two 24-hour sessions with only the partner station ISHIOKA (Is).

4 VGOS 1-hour Intensive Observations

In 2023, Oe and Ow were planned each for 62 VGOS-INT-B sessions and 62 VGOS-INT-C sessions. Oe observed successfully 57 VGOS-INT-B and 56 VGOS-INT-C, while Ow observed successfully 56 VGOS-INT-B and 52 VGOS-INT-C. For two of the planned VGOS-INT-B and four of the planned VGOS-INT-C, both Oe and Ow could not participate.

Additionally to the VGOS-INT-B and VGOS-INT-C, from January through March 2023, Oe observed 58 VGOS-INT-A together with KOKEE12M (K2), of which three also involved WETTZ13S (Ws). In November 2023, Oe observed another three VGOS-INT-A together with K2 and Ws, and four of these were observed with Oe and Ow together with K2 and Ws.

In 2024, Oe and Ow were planned each for 90 VGOS-INT-B and 90 VGOS-INT-C sessions. Oe observed successfully all VGOS-INT-B and VGOS-INT-C, while Ow observed successfully 75 VGOS-INT-B and 76 VGOS-INT-C.

Additionally, Oe observed ten IVS-INT-1 together with Is in September 2024.

5 VGOS Test Observations

In April 2024, Oe and Ow participated in five VGOS frequency-test sessions of 9-hour duration. In November 2024, Oe and Ow participated in another set of 5 of these test sessions, this time each 6 hours long.

6 Local Flux-monitoring Observations

In 2023 and 2024, eleven and nine flux-monitoring sessions were observed with the local baseline Oe–Ow. These sessions were between 20 and 26 hours long.

7 Monitoring Activities

During 2023–2024, we have continued with the usual monitoring activities, as presented in previous biennial reports, see [1]. In collaboration with Michael Lösler and Cornelia Eschelbach from the Laboratory for Industrial Metrology, Faculty of Architecture, Civil Engineering and Geomatics, Frankfurt University of Applied Sciences, a dedicated measurement campaign was performed during the summer of 2023 to investigate pointing-dependent variation of the reference point of Oe.

8 Future Plans

In the coming two years we plan to:

- participate in about 50 IVS legacy S/X sessions per year with the 20-m telescope ONSALA60;
- participate in as many as possible VGOS sessions with the VGOS telescopes ONSA13NE and ONSA13SW;
- continue with the Onsala flux-monitoring program;
- and continue the monitoring activities at the observatory, including the so-called local-ties.

References

1. Rüdiger Haas, Eskil Varenius, Gunnar Elgered, Periklis-Konstantinos Diamantidis, Hans-Georg Scherneck, Maxime Mouyen, Peter Forkman, Karine Le Bail, Rebekka Handirk (2023), Onsala Space Observatory – IVS Network Station Activities During 2021–2022. In: International VLBI Service for Geodesy and Astrometry 2021+2022 Biennial Report, edited by K. L. Armstrong, D. Behrend, and K. D. Baver, NASA/TP-20230014975, pp. 80–84, 2023.