The IVS Network Station Onsala Space Observatory

Rüdiger Haas, Gunnar Elgered

Abstract

This report shortly summarizes the status of the Onsala Space Observatory in its function as an IVS Network Station. We describe the activities during the year 2005, the current status, and future plans.

1. Staff Associated with the IVS Network Station at Onsala

The staff associated with the IVS Network Station at Onsala remained mainly the same as reported in the IVS Annual Report 2004 [1]. At the end of November 2005 Prof. Roy Booth retired from the position as director of the observatory and in December 2005 Prof. Hans Olofsson took over this position.

Table 1. Staff associated with the IVS Network Station at Onsala. The complete telephone numbers start with the prefix +46-31-772.

Function	Name	e-mail	telephone
Responsible P.I.s	Rüdiger Haas	haas@oso.chalmers.se	5530
	Gunnar Elgered	kge@oso.chalmers.se	5565
Observatory director	Roy Booth (until 2005.11.30)	roy@oso.chalmers.se	5520
	Hans Olofsson (since 2005.12.01)	hans.olofsson@chalmers.se	5520
Ph.D. students and	Sten Bergstrand	sten@oso.chalmers.se	5566
Postdoc involved in	Camilla Granström	camilla@oso.chalmers.se	5566
VLBI observation	Martin Lidberg	lidberg@oso.chalmers.se	5578
	Tobias Nilsson	tobias@oso.chalmers.se	5575
	Borys Stoew (until 2005.05.31)	boris@oso.chalmers.se	5575
Field system	Biörn Nilsson	biorn@oso.chalmers.se	5557
responsibles	Michael Lindqvist	michael@oso.chalmers.se	5508
VLBI equipment	Karl-Åke Johansson	kaj@oso.chalmers.se	5571
responsibles	Leif Helldner	helldner@oso.chalmers.se	5576
VLBI operator	Roger Hammargren	roger@oso.chalmers.se	5551
Telescope scientists	Per Bergman (until 2005.03.31)	bergman@oso.chalmers.se	5552
	Lars EB Johansson (since 2005.04.01)	leb@oso.chalmers.se	5564
	Lars Lundahl	lundahl@oso.chalmers.se	5559

2. Geodetic VLBI Observations During 2005

In 2005 the observatory was involved in the five VLBI-experiment series EUROPE, R1, T2, RDV, and RD05. Furthermore, we participated in the CONT05 campaign and three e-Intensive experiments with Tsukuba. In total, Onsala participated in 42 geodetic VLBI experiments during 2005 (see Table 2). Only the first RDV experiment was still recorded on tapes, all other experiments were recorded on Mark 5 disc modules or the data were transferred via optical fibre.

Table 2. Geodetic VLBI experiments at the Onsala Space Observatory during 2005.

Exper.	Date	Remarks (problems)	Exper.	Date	Remarks (problems)
RD05-01	01.19	o.k.	C05.01	09.12	o.k. 1 scan lost
RD05-02	02.08	o.k., some scans lost	C05.02	09.13	o.k., encoder problems
RDV-49	02.09	o.k., tape recording	C05.03	09.14	o.k., encoder problems
EURO-75	03.22	o.k.	C05.04	09.15	o.k.
RD05-03	03.30	o.k., at start warm RX	C05.05	09.16	o.k., encoder problems
T2-038	04.05	o.k.	C05.06	09.17	o.k., encoder problems
RD05.04	04.06	o.k., encoder problems	C05.07	09.18	o.k.
R1-170	04.11	o.k., encoder problems	C05.08	09.19	o.k., encoder problems
R1-174	05.09	o.k.	C05.09	09.20	o.k., encoder problems
R1-176	05.23	o.k., encoder problems	C05.10	09.21	o.k.
R1-177	05.31	o.k., encoder problems	C05.11	09.22	o.k., encoder problems
RD05-06	06.21	o.k., encoder problems	C05.12	09.23	o.k., encoder problems
T2-039	06.28	o.k.	C05.13	09.24	o.k., encoder problems
EURO-76	07.04	o.k., encoder problems	C05.14	09.25	o.k.
K05.197	07.10	o.k., warm RX, eVLBI	C05.15	09.26	o.k.
RD05.07	07.12	o.k., RX cooling problem	RDV-53	09.28	no correlation report yet
K05.205	07.24	o.k., warm RX, eVLBI	R1-198	11.14	o.k.
RD05.08	08.17	no correlation report yet	RD05.09	11.15	no correlation report yet
K05.240	08.28	o.k.	RD05.10	12.07	no correlation report yet
EURO-77	09.05	o.k.	EURO-78	12.13	o.k.
R1-191	09.06	o.k., encoder problems	RDV-54	12.14	no correlation report yet

The previously reported problems with the azimuth encoders [1] continued unfortunately also during 2005. During most experiments between 1-15 scans were lost, see Table 2. In order to solve this problem, we started to build a completely new antenna control system that is going to replace the old one during the year 2006. In the summer of 2005 we experienced some problems with the receiver cooling system. A disturbing factor in 2005 was again radio interference in S-band, due to UMTS mobile telephone signals.

3. Geodetic eVLBI Activities During 2005

Already since 2003 the Onsala Space Observatory is connected to the Swedish Internet backbone via a 1 Gb/s optical fibre link [2]. This allowed to participate in three Sunday e-Intensive experiments with Tsukuba during the summer of 2005. Data were recorded on Mark 5 modules and transferred after the experiments with fast-ftp to the Tsukuba correlator.

In September 2005, we installed Coarse Wavelength Division Multiplexer (CWDM) equipment at the observatory and at Chalmers. This allows to share the optical fiber link between the Mark 5 unit and the rest of the observatory with different wavelengths, different MTU buffer sizes, and different data rates. The installation of this equipment made it possible to successfully participate in the real-time eVLBI demonstrations iGRID in San Diego and SC05 in Seattle in September and November, respectively. In both demonstrations transatlantic real-time eVLBI fringes with a data rate of 512 Mbps were achieved, sending data from Onsala, Westford and Goddard to the correlator at Haystack. Figure 1 shows the network constellation between the Onsala Space Observatory and

the Swedish University Net (SUNET) after the installation of the CWDM equipment in September 2005. Table 3 lists the geodetic eVLBI activities in 2005.

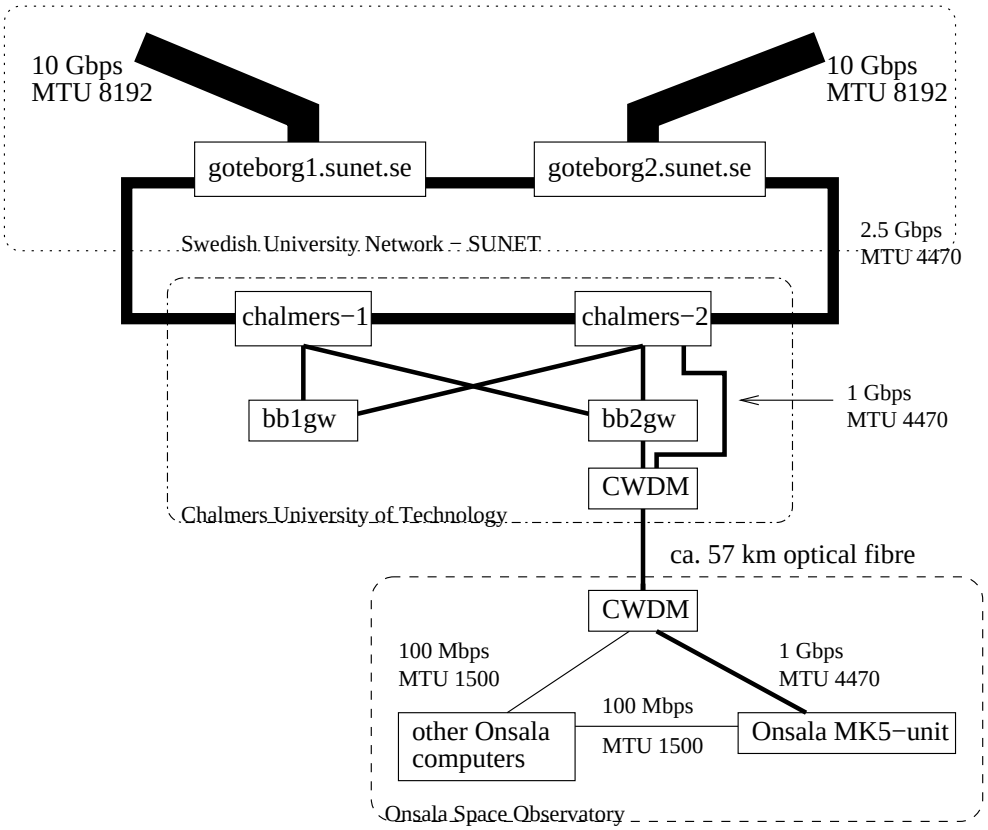

Figure 1. Network configuration between the Onsala Space Observatory and the Swedish University Network (SUNET) after the installation of the CWDM equipment in September 2005.

Table 3. Geodetic eVLBI activities at the Onsala Space Observatory during 2005.

July 10/24, August 28	e-Intensives with Tsukuba
September 29	Real-time demonstration experiment at the iGRID 2005 conference, successful real-time fringes at 512 Mbps Onsala–Westford–Goddard [4]
November 16	Real-time demonstration experiment at the SuperComputing 2005 conference, successful real-time correlation at 512 Mbps Onsala–Westford–Goddard, 512 Mbps real-time fringes for several hours

4. Monitoring Activities

We continued also in 2005 to monitor the vertical height changes of the telescope tower by the invar monitoring system [2], [3], and the campaign based GPS measurements using an antenna mounted on top of the VLBI telescope.

The calibration campaign for the Onsala pressure sensor was continued [2]. Figure 2 shows the difference between the Onsala barometer (Setra Systems) and a Vaisala instrument — borrowed from the Swedish Meteorological and Hydrological Institute (SMHI) — which is calibrated yearly at the SMHI headquarters. A clear annual variation with amplitude of about 0.25 hPa is seen, which we suspect is related to temperature influences on one or both pressure sensors.

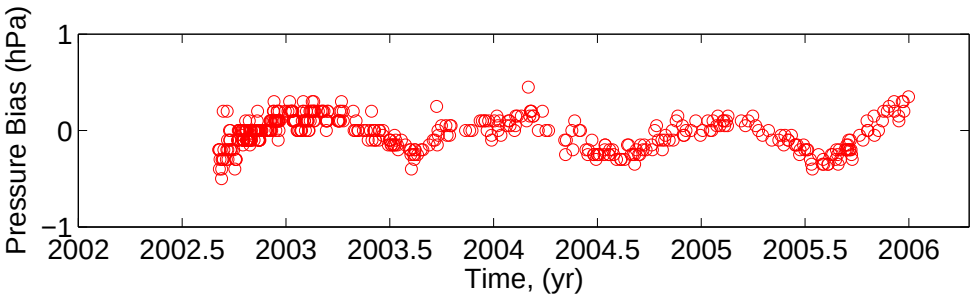

Figure 2. Pressure difference between Setra Systems and Vaisala barometers.

A microwave radiometer is operated continuously at the observatory to monitor the atmospheric water vapor content.

The observatory hosts a gravimeter platform, which is used for repeated absolute gravity measurements since several years. During 2005 a German and a Norwegian team visited the observatory to perform simultaneous observations with absolute gravimeters.

5. Outlook and Future Plans

The Onsala Space Observatory will continue to be an IVS Network Station and to participate in the IVS observation series. For the year 2006 a total of 26 experiments in the series EUROPE, R1, T2, RDV, and RD06 are planned. During 2006 we will install a new antenna control system that hopefully will solve the azimuth encoder problems that we suffered from during the last years. We envisage an active participation in further real-time eVLBI experiments during 2006. We will continue to monitor the relevant VLBI system parameters to be able to detect possible error sources as early as possible and to achieve and maintain high quality of the observational data. This monitoring activity includes the stability of the telescope, the local tie, the pressure sensor calibration and the operation of a microwave radiometer.

References

[1] Haas, R., and Elgered, G.: The IVS Network Station Onsala Space Observatory. In: D. Behrend and K. D. Baver (eds.): *IVS 2004 Annual Report*, NASA/TP-2005-212772, 93–96, 2005.

[2] Haas, R., and Elgered, G.: The IVS Network Station Onsala Space Observatory. In: N. R. Vandenberg and K. D. Baver (Eds.): *IVS 2003 Annual Report*, NASA/TP–2004-212254, 76–79, 2004.

[3] Elgered, G., and Haas, R.: Geodetic Very-Long-Baseline Interferometry at the Onsala Space Observatory 1997–1998. In: W. Schlüter and H. Hase (Eds.): *Proc. of the 13th Working Meeting on European VLBI for Geodesy and Astrometry*, 60–64, 1999.

[4] `http://www.interactions.org/sgtw/2005/1019/evlbi_igrid_more.html`