The IVS Network Station Onsala Space Observatory

Rüdiger Haas, Gunnar Elgered

Abstract

We briefly summarize the status of the Onsala Space Observatory in its function as an IVS Network Station. The activities during the year 2007, the current status, and future plans are described.

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 2006 [1]. However, one Ph.D. student left the observatory during the year, one new Ph.D. student joined the observatory, and one of the operators left.

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	rudiger.haas@chalmers.se	5530
	Gunnar Elgered	gunnar.elgered@chalmers.se	5565
Observatory director	Hans Olofsson	hans.olofsson@chalmers.se	5520
Ph.D. students	Martin Lidberg (until 2007.11.30)	lidberg@oso.chalmers.se	5566
involved in VLBI	Tobias Nilsson	tobnil@chalmers.se	5575
observation	Tong Ning (since 2007.09.01)	tong.ning@chalmers.se	5578
Field system	Biörn Nilsson	biorn@oso.chalmers.se	5557
responsibles	Michael Lindqvist	michael@oso.chalmers.se	5508
VLBI equipment	Karl-Åke Johansson	karlake@chalmers.se	5571
responsibles	Leif Helldner	helldner@chalmers.se	5576
VLBI operators	Roger Hammargren	rogham@chalmers.se	5551
	Fredrik Blomqvist (until 2007.08.31)	blomqvist@oso.chalmers.se	5552
Telescope scientists	Lars EB Johansson	lars.johansson@chalmers.se	5564
	Lars Lundahl	lars.lundahl@chalmers.se	5559

2. Geodetic VLBI Observations for IVS during 2007

In 2007 the observatory was involved in the five IVS-series EUROPE, R1, T2, RDV, and RD07. In total, Onsala participated successfully in 27 experiments. See Table 2. All experiments were recorded on Mark 5 modules, and for many experiments the data were transferred by e-VLBI to the Bonn correlator [2] using the PCEVN-computer [3]. The latter is daisy-chained to the Mark 5 computer to allow us to record in parallel on Mark 5 modules and the PCEVN raid-system and also to simultaneously transfer the data in real-time from the PCEVN to the correlator. In the second half of 2007 we upgraded the PCEVN raid-system to a capacity of 2 TB, i.e. large enough for most of today's IVS experiments.

Radio interference due to UMTS mobile telephone signals continued to interfere with S-band observations.

Table 2. Geodetic VLBI experiments at the Onsala Space Observatory during 2007.

Exper.	Date	e-VLBI transfer	Remarks
EURO-85	01.08	no	o.k.
R1-258	01.09	yes, real-time	o.k.
R1-260	01.22	no	o.k., spurs in X-band
R1-262	02.05	yes, real-time	o.k.
T2-049	02.06	yes, real-time	o.k., noisy S-band phase cal
R1-263	02.12	yes, real-time	o.k., clock jump -1 sec
R1-265	02.26	yes, real-time	o.k., encoder problems, 6 scans lost
R1-270	04.02	no	o.k., encoder problems, 4 scans lost
R1-271	04.10	no	o.k., noisy phase cal
R1-273	04.23	no	o.k., encoder problems, 14 scans lost
R1-274	05.02	yes, off-line	o.k.
RD07-04	06.27	no	o.k.
EURO-88	07.03	yes, off-line	o.k.
RDV-64	07.10	no	o.k.
RD07-05	07.11	no	o.k., spurs in X-band, encoder problems, about 22 scans lost
R1-285	07.16	yes, off-line	o.k., encoder problems, 18 scans lost
R1-291	08.27	yes, off-line	o.k., X-band spurs, RX problems, encoder problems, 2 scans lost
EURO-89	09.03	yes, off-line	o.k., spurs in X-band, encoder problems, 3 scans lost
R1-292	09.04	no	o.k., spurs in X-band
R1-293	09.10	yes, off-line	o.k., spurs in X-band, encoder problems, some scans lost
RD07-07	09.12	no	o.k., spurs in X-band, encoder problems, some scans lost
R1-294	09.17	no	o.k., spurs in X-band, encoder problems, 14 scans lost
R1-295	09.24	yes, off-line	o.k., power failure, 4 hours lost
EURO-90	11.22	yes, off-line	o.k.
T2-052	11.27	yes, off-line	o.k.
RDV-66	12.05	no	o.k.
RD07-10	12.12	no	no correlator report yet

The previously reported problems with the azimuth encoders [4] continued partly during 2007, and a power failure in September caused a loss of about 4 hours of observations. See Table 2.

The new S/X receiver with dual polarization was installed in early July. Unfortunately the filters proved not to be good enough, and spurious phase cal signals affected the first couple of X-band channels for several experiments. See Table 2. To avoid these disturbances, an additional filter for right circular polarization was installed in November.

3. Fennoscandian-Japanese Ultra-rapid dUT1 Measurements

Together with our colleagues in Metsähovi, Kashima and Tsukuba, we started a project for Fennoscandian-Japanese ultra-rapid dUT1 measurements in order to determine dUT1 with very low latency. The project involves real-time data transfer from Fennoscandia to Japan, near real-time data conversion from Mark 5 to K5, near real-time correlation with the Japanese software correlator, creation of VLBI databases, and quick data analysis. It allows the determination of dUT1 within 30 minutes after the end of an observing session, as demonstrated by the baselines Onsala—Kashima and Onsala—Tsukuba. See Table 3.

Table 3. Fennoscandian-Japanese ultra-rapid dUT1-experiments involving Onsala in 2007.

Exper.	Date	Stations	Mbps	tranfer	Correlation	Comments/latency
u7093a	04.03	Onsa - Kash	256	off-line	off-line	dUT1 within 3 hours
u7113	04.23	Onsa - Kash	128	real-time	off-line	dUT1 within 2 hours
u7122	05.02	Onsa - Kash	128	real-time	real-time	correlation within 10 minutes
u7150	05.30	Onsa - Kash	128	real-time	real-time	dUT1 within 28 minutes
u7151a	05.31	Onsa - Kash	128	real-time	real-time	dUT1 within 30 minutes
u7155	06.04	Onsa - Kash	256	real-time	real-time	dUT1 within 31 minutes
u07195	07.14	Onsa - Kash	128	real-time	off-line	
u07196	07.15	Onsa - Kash	256	real-time	off-line	
u7298	10.25	Onsa - Kash	256	real-time	off-line	
a07326	11.22	Onsa - Tsuk	256	real-time	real-time	dUT1 within 30 minutes
b07326	11.22	Onsa - Tsuk	256	real-time	real-time	
u7330a	11.26	Onsa - Kash	128	real-time	off-line	
u7330b	11.26	Onsa - Kash	256	real-time	off-line	
u7330c	11.26	Onsa - Kash	512	real-time	off-line	
u7330d	11.26	Onsa - Kash	128	real-time	real-time	dUT1 within 25 minutes
u7330e	11.26	Onsa - Kash	256	real-time	real-time	dUT1 within 27 minutes
u7330f	11.26	Onsa - Kash	512	off-line	off-line	
u7348a	12.14	Onsa - Kash	128	real-time	real-time	dUT1 within 30 minutes
u7348b	12.14	Onsa - Kash	256	real-time	off-line	

4. Monitoring Activities in 2007

The monitoring of the vertical height changes of the telescope tower by the invar monitoring system at the 20 m telescope [5] was continued.

We also continued the calibration campaign for the Onsala pressure sensor [1]. For this purpose we borrow a Vaisala barometer from the Swedish Meteorological and Hydrological Institute (SMHI). This instrument is calibrated once per year at SMHI. We do parallel manual recordings with the SMHI barometer (Vaisala-SMHI), the Onsala barometer (Setra Systems) that has been used for VLBI for many years, and another Vaisala barometer (new-Vaisala) that was installed in 2007 at the observatory as part of a new weather station. Figure 1 shows time series of differences between these three sensors and the corresponding amplitude spectra.

The microwave radiometer Astrid was repaired during 2007. The microwave radiometer Konrad was out of service during 2007. We expect Konrad to be in routine operation again in 2008.

The observatory hosts a gravimeter platform, which has been used for repeated absolute gravity measurements for several years. In May three absolute gravity observation teams visited the observatory—from the University for Environment and Life Sciences at Ås, Norway; the Institut für Erdmessung, University of Hannover, Germany; and the Swedish National Land Survey.

During 2007 we started preparing for the installation of a superconducting gravimeter at the observatory. The house for the new gravimeter is expected to be constructed during spring 2008, and the actual superconducting gravimeter is expected to be delivered mid-2008.

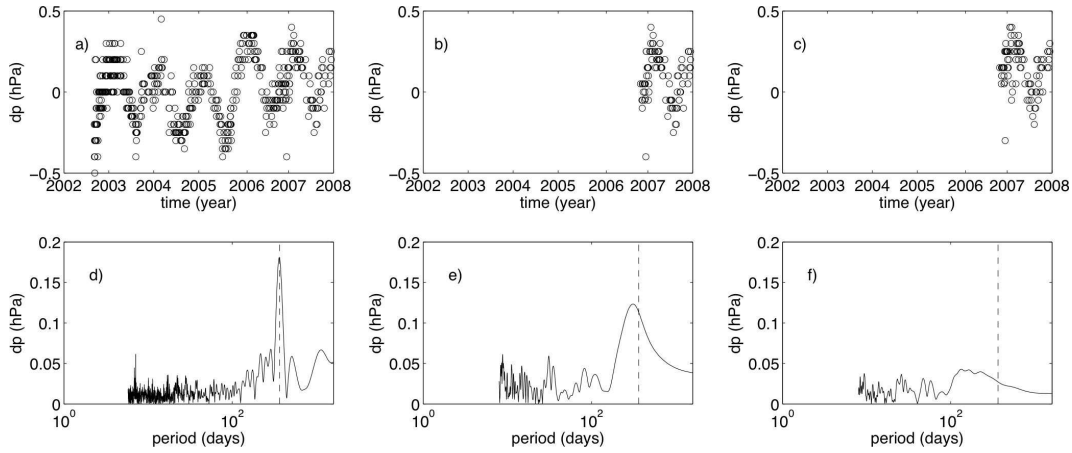

Figure 1. Top: pressure differences (a) Setra - Vaisala-SMHI, (b) Setra - new-Vaisala, (c) Vaisala-SMHI - new-Vaisala. Bottom: corresponding amplitude spectra. The annual period is indicated as a vertical line.

5. Outlook and Future Plans

The Onsala Space Observatory will continue to operate as an IVS Network Station and to participate in the IVS observation series. For the year 2008 a total of 25 experiments in the series EUROPE, R1, T2, RDV, and RD08 are planned. We will also prepare to participate in a possible CONT08 campaign. We aim at an increased and regular use of e-VLBI data transfer using the PCEVN. 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 data quality. This monitoring activity includes the stability of the telescope, the local tie, the pressure sensor calibration and the operation of microwave radiometers. The new superconducting gravimeter is expected to be in service in the second half of 2008.

References

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