Onsala Space Observatory – IVS Network Station

Rüdiger Haas, Gunnar Elgered

Abstract

During 2008 the Onsala Space Observatory contributed as an IVS Network Station to 38 VLBI sessions organized by the IVS. Additionaly, we performed 27 ultra-rapid dUT1-sessions together with partner telescopes in Japan and Finland. This report briefly summarizes the activities during the year 2008.

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 2007.

Table 1. Staff associated with the IVS Network Station at Onsala. 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 P.I.	Rüdiger Haas	rudiger.haas	5530
Observatory director	Hans Olofsson	hans.olofsson	5520
Head of department	Gunnar Elgered	gunnar.elgered	5565
Ph.D. students	Tobias Nilsson	tobias.nilsson	5575
and post-docs	Tong Ning	tong.ning	5578
involved in GEO-VLBI			
Field system	Michael Lindqvist	michael.lindqvist	5508
responsibles	Rüdiger Haas	rudiger.haas	5530
VLBI equipment	Karl-Åke Johansson	karl-ake.johansson	5571
responsibles	Leif Helldner	leif.helldner	5576
VLBI operator	Roger Hammargren	roger.hammargren	5551
Telescope scientists	Lars Lundahl	lars.lundahl	5559
	Lars EB Johansson (–2008.03)	lars.johansson	5564
	Per Bergman (2008.04–)	per.bergman	5552

2. Geodetic VLBI Observations for the IVS during 2008

In 2008 the observatory was involved in the five IVS-series EUROPE, R1, T2, RDV, and RD08 plus the CONT08 campaign. In total, Onsala participated and acquired useful observations in 38 experiments, see Table 2. All experiments were recorded on Mark 5 modules. Most of the experiments which data were correlated at the Bonn correlator were additionally recorded in parallel on the PCEVN-computer that is daisy-chained to the Mark 5 computer. The observed data of these experiments were then transferred electronically using the Tsunami-protocol, and no Mark 5 modules were actually sent to Bonn.

Radio interference due to UMTS mobile telephone signals continued to be a disturbing factor for the S-band observations. Additionally, we suffered from problems with the telescope encoders.

Table 2. Geodetic VLBI experiments at the Onsala Space Observatory during 2008.

Exper.	Date	Remarks	Correlated
R1-311	01.14	module shipment to Washington	o.k.
RD08-01	01.16	module shipment to Haystack	o.k.
R1-312	01.22	module shipment to Bonn, one broken disk	o.k.
R1-315	02.11	E-transfer to Bonn	o.k.
R1-316	02.19	E-transfer to Bonn	o.k.
RD08-02	02.20	some scans lost due to encoder and VLBI rack problems	o.k.
RDV-68	04.02	module shipment to Soccoro	o.k
EURO-92	04.21	E-transfer to Bonn	o.k.
R1-325	04.22	E-transfer to Bonn	o.k.
R1-327	05.05	module shipment to Washington	o.k.
R1-334	06.23	1 scan lost, E-transfer to Bonn	o.k.
R1-336	07.07	E-transfer to Bonn	o.k.
EURO-94	07.08	E-transfer to Bonn	o.k.
RDV-70	07.09	module shipment to Soccoro	o.k.
C08-01	08.12	encoder problems, module shipment to Washington	o.k.
C08-02	08.13	encoder problems, module shipment to Washington	o.k.
C08-03	08.14	module shipment to Washington	o.k.
C08-04	08.15	encoder problems, 7 scans lost, module shipment to Washington	o.k.
C08-05	08.16	wrong pointing at beginning, module shipment to Washington	o.k.
C08-06	08.17	encoder problems, 17 scans lost, module shipment to Washington	o.k.
C08-07	08.18	encoder problems, some scans lost, module shipment to Washington	o.k.
C08-08	08.19	encoder problems, 3 scans lost, module shipment to Washington	o.k.
C08-09	08.20	module shipment to Washington	o.k.
C08-10	08.21	module shipment to Washington	o.k.
C08-11	08.22	module shipment to Washington	o.k.
C08-12	08.23	module shipment to Washington	o.k.
C08-13	08.24	module shipment to Washington	o.k.
C08-14	08.25	module shipment to Washington	o.k.
C08-15	08.26	module shipment to Washington	o.k.
EURO-95	09.01	E-transfer to Bonn	o.k.
RD08-07	09.10	1 scan lost, o.k., module shipment to Haystack	o.k.
R1-344	09.15	ca. 7 scans lost, E-transfer to Bonn	o.k.
T2-057	09.23	no cable-cal and first hour lost, module shipment to Washington	o.k.
RD08-08	10.07	module shipment to Haystack	o.k.
T2-058	11.11	ca.2 hours lost due to Mark 5 problems, E-transfer to Bonn	not yet
R1-353	11.17	E-transfer to Bonn	o.k.
R1-354	11.24	E-transfer to Bonn	o.k.
RD08-09	12.02	2 scans missed due to Mark 5 problems, module shipment to Haystack	o.k.

3. Fennoscandian-Japanese Ultra-rapid dUT1 Measurements

We continued our involvement in the Fennoscandian-Japanese ultra-rapid dUT1 project, together with our colleagues in Metsähovi, Kashima and Tsukuba. The aims for 2008 were to achieve

Table 3. Fennoscandian-Japanese ultra-rapid dUT1-experiments involving Onsala in 2008.

Exper.	Date	Stations	Mbps	Tranfer	Correlation	Comments/latency
u8052a	02.21	Onsa - Tsuk	256	real-time	real-time	dUT1 within 30 min
u8052b	02.21	Onsa - Tsuk	256	real-time	real-time	dUT1 within 47 min
u8052c	02.21	Onsa - Tsuk	256	real-time	real-time	dUT1 within 7 min
u8052d	02.21	Onsa - Tsuk	256	real-time	real-time	dUT1 within 4 min
u8053a	02.22	Onsa - Kash	256	real-time	failed	transfer problems
u8053b	02.22	Onsa - Kash	256	real-time	partly failed	transfer problems
u8053c	02.22	Onsa - Kash	256	real-time	real-time	dUT1 within 1h11m
u8053d	02.22	Onsa - Kash	256	real-time	real-time	dUT1 within 18 min
u8053e	02.22	Onsa - Kash	256	real-time	real-time	dUT1 within 21 min
u8053f	02.22	Onsa - Kash	256	real-time	real-time	dUT1 within 1h6m
u8113a	04.22	Onsa - Kash	256	real-time	real-time	dUT1 within 6h42m
		Onsa - Tsuk			offline	dUT1 within 11h32m
u8113b	04.22	Onsa - Kash	512	real-time	real-time	dUT1 within 3h46m
		Onsa - Tsuk			offline	dUT1 within 10h2m
u8189a	07.07	Onsa - Kash	128	real-time	failed	wrong setup
u8189b	07.07	Onsa - Kash	128	real-time	failed	wrong setup
u8189c	07.07	Onsa - Kash	128	real-time	failed	wrong setup
u8189d	07.07	Onsa - Kash	128	real-time	failed	wrong setup
u8189e	07.07	Onsa - Kash	128	real-time	real-time	dUT1 within 30 min
u8189f	07.07	Onsa - Kash	128	real-time	real-time	dUT1 within 1h46m
u8193a	07.11	Onsa - Kash	128	real-time	real-time	dUT1 within 25 min
u8193b	07.11	Onsa - Kash	256	real-time	failed	telescope problems
u8193c	07.11	Onsa - Kash	512	real-time	failed	telescope problems
u8193d	07.11	Onsa - Kash	128	real-time	failed	telescope problems
u8193e	07.11	Onsa - Kash	256	real-time	real-time	dUT1 within 44 min
u8193f	07.11	Onsa - Kash	512	real-time	real-time	dUT1 within 1h42m
u8245a	09.01	Onsa - Tsuk	512	real-time	offline	dUT1 offline
u8245b	09.01	Onsa - Tsuk	256	real-time	offline	dUT1 offline
u8245c	09.01	Onsa - Tsuk	512	real-time	offline	dUT1 offline

automized telescope operations, real-time data transfer with high data rates, and automized near-real-time correlation and dUT1-analysis. The highlight was the determination of final dUT1-results within 4 minutes after the end of the observing session, see Table 3.

4. Monitoring Activities in 2008

We continued the monitoring activties as described in previous annual reports. This included the calibration of the Onsala pressure sensor using a Vaisala barometer borrowed from the Swedish Meteorological and Hydrological Institute (SMHI). The old NASA pressure sensor (Setra Systems) was removed in late December 2007, and the new Vaisala sensor was used in all VLBI experiments in 2008. Figure 1 shows time series of differences between these three sensors, the corresponding amplitude spectra, and the pressure differences versus the pressure values.

We also continued to monitor the vertical height changes of the telescope tower using the invar

rod system at the 20 m telescope. In collaboration with the University of Karlsruhe we additionally performed a reference point determination of the 20 m telescope and local-tie measurement between the VLBI and GNSS reference points. For this project we used a laser tracking system and the results agree at the sub-millimeter level with the results obtained in 2002. However, in 2008, we could derive the complete covariance matrix of the local tie.

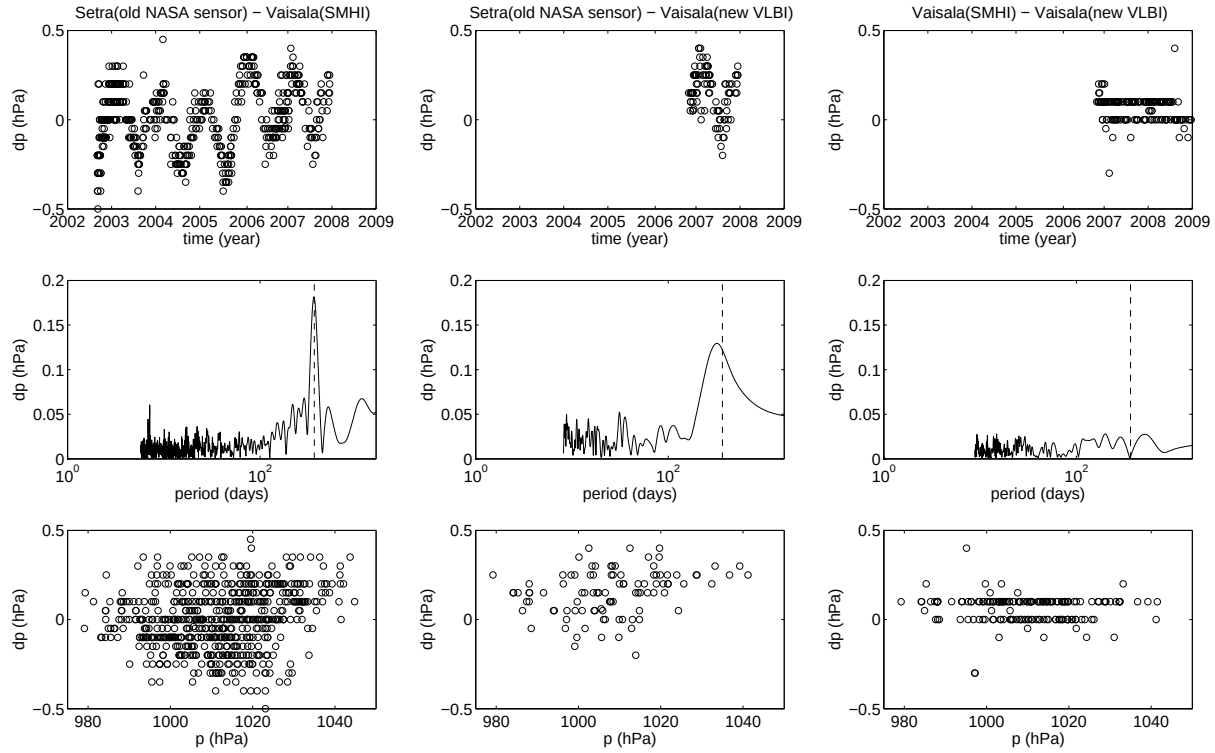

Figure 1. Top row: time series of pressure differences between pairs of pressure sensors. Middle row: corresponding amplitude spectra (the annual period is indicated as vertical line). Bottom row: pressure differences as a function of measured pressure. Left column: pressure differences between Setra (old NASA sensor) and Vaisala (SMHI). Middle column: pressure differences between Setra (old NASA sensor) and Vaisala (new VLBI). Right column: pressure differences between Vaisala (SMHI) and Vaisala (new VLBI).

5. Outlook

The Onsala Space Observatory will continue to operate as IVS Network Station and to participate in the IVS observation series. For the year 2009 a total of 23 experiments in the series EUROPE, R1, T2, and RD09 are planned, and we aim at transferring as many as possible of those electronically to the correlators. We will also continue our activity in the Fennoscandian-Japanese ultra-rapid dUT1-project. Our goal is to achieve and maintain high quality of the observational VLBI data. For this purpose we will continue to monitor the relevant VLBI system parameters in order to detect possible errors as early as possible.