The IVS Network Station Onsala Space Observatory

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Abstract

We give a short overview of the status of the Onsala Space Observatory in its function as an IVS Network Station. The activities during 1999 and 2000, the current status, and future plans are described.

1. Introduction

The IVS Network Station at the Onsala Space Observatory (OSO) has been described to some extent in the last IVS annual report [1]. There are only minor changes in the technical setup of the station. The staff associated with the IVS Network Station remained the same as reported in [1] with the exception that Rune Byström left the observatory.

2. Geodetic VLBI observations

The observatory has been involved in the geodetic VLBI-series CORE-B, CORE-3, EUROPE and RDV during 1999 and 2000 [2] (see Table 1). Two experiments have been lost due to pointing problems and due to encoder problems, respectively. During one experiment we had tape recording problems due to usage of wrong recorder vacuum for some period. The weak S1 channels during two CORE-3 experiments were due to a problem in the formatter firmware with the 1-bit, 1:2 fanout observing mode. A PROM with the necessary firmware update to solve this problem was shipped to us by Haystack Observatory and was installed successfully during November 2000.

Table 1. Geodetic VLBI experiments at the Onsala Space Observatory during 1999 and 2000.

Exper.	Date	Remarks (problems)	Exper.	Date	Remarks (problems)
EURO47	990201	high parity errors	RDV18	991220	
RDV13	990308		RDV19	000131	
RDV14	990415		EURO53	000127	high parity errors on one tape
EURO48	990426	high parity errors	EURO54	000207	formatter jump
RDV15	990510		RDV20	000313	
CB602	990519		EURO55	000316	
RDV16	990622		EURO56	000515	
EURO49	990629		C3001	000712	high parity errors
CB603	990630	tape speed problems	EURO57	000807	some recording problems
RDV17	990802		C3002	000823	lost due to encoder problems
EURO50	990816		EURO58	000904	two bad tracks
CB604	990823	lost due to pointing problem	C3004	001018	channel S1 weak
CB605	991004	tape speed problems	C3005	001101	channel S1 weak
EURO51	991011		EURO59	001207	
EURO52	991013		C3006	001213	
CB606	991018				

3. Monitoring the Performance of the VLBI System

The log file of each experiment is analysed in order to detect problems and fix them accordingly. The cable delay, the difference between GPS and formatter time, the physical temperature in the dewar for the front end HEMT amplifiers of the receivers, the measured system temperatures and the parity errors are monitored (see figures 1–3). The monitoring of the parity errors indicates some transient problem with tracks numbers 31–33 in recent experiments. Currently investigations are ongoing to identify the reasons.

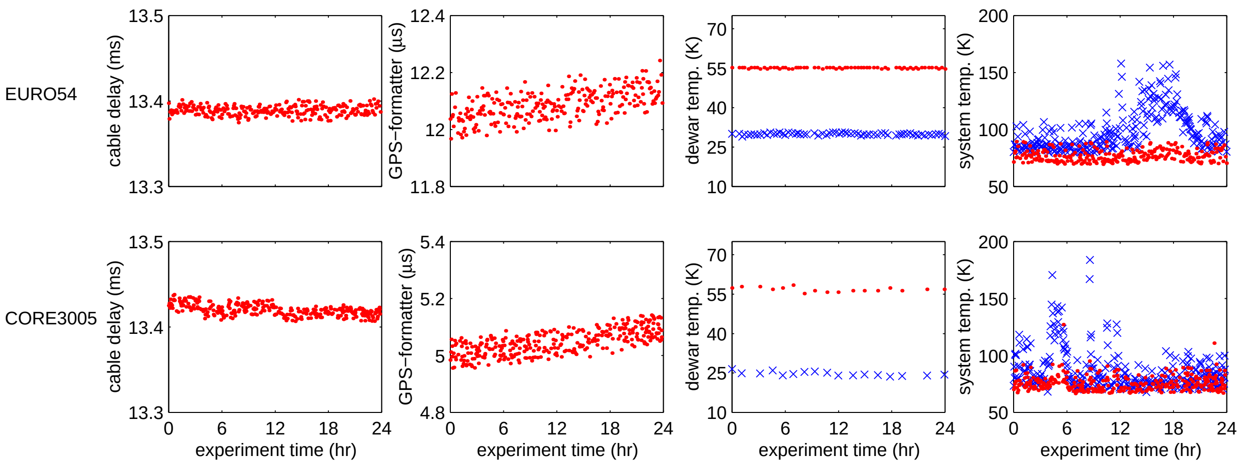

Figure 1. Cable delay, GPS-formatter time difference, dewar temperatures (20K station marked with crosses, 70K station marked with dots) and system temperatures (IF1 marked with crosses, IF2 marked with dots) for EURO54 and CORE3005.

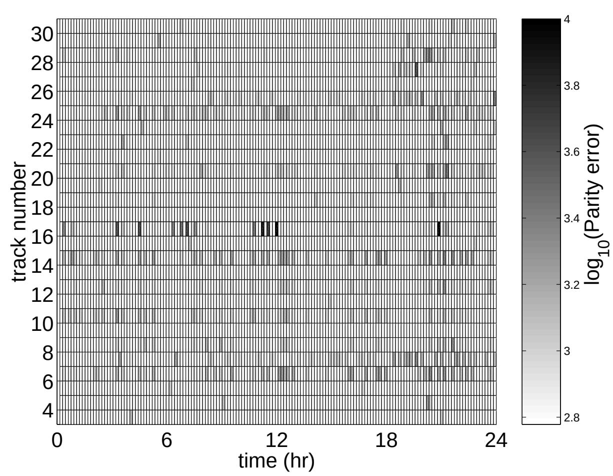

Figure 2. EURO54 parity errors. The colour code covers 600 to 10000 parts per million (ppm), values below 600 ppm are shown in white.

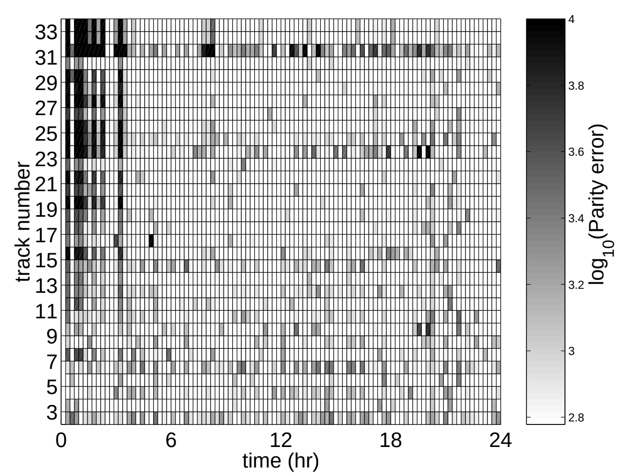

Figure 3: CORE3005 parity errors. The colour code covers 600 to 10000 parts per million (ppm), values below 600 ppm are shown in white.

Since there have been tilting problems of the recorder heads, they had to be sent to Haystack

Observatory for repair in early 1999. Since May 1999 no further changes were done to the head assembly and its run time is now more than six thousand hours. In order to stabilise the recording quality a dry air kit including humidity and temperature sensors has been installed.

Figure 4 shows daily mean values for the offsets GPS-maser and their corresponding root-mean-square (rms) scatter. Since end of February 1999 the Russian Kvarts Ch1-75 maser is used as station clock. The data gap in December 1999 is due to problems with the monitoring computer. The frequency of the maser has been adjusted in March 2000 and the next adjustment is expected to be necessary in several years. Note also the drop in the rms-scatter due to the deactivation of the selective availability (SA) for the GPS system in May 2000.

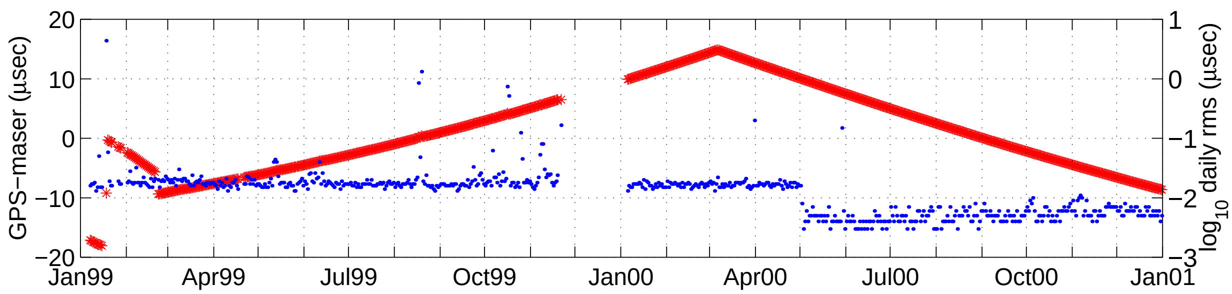

Figure 4. GPS-maser daily offsets (stars, left scale) and root-mean-square scatter (dots, right scale).

4. Monitoring the telescope stability and local ties

The change of the vertical position of the telescope tower, mainly due to thermal expansion, is monitored continuously using an invar rod measurement system [3] (see Fig. 5).

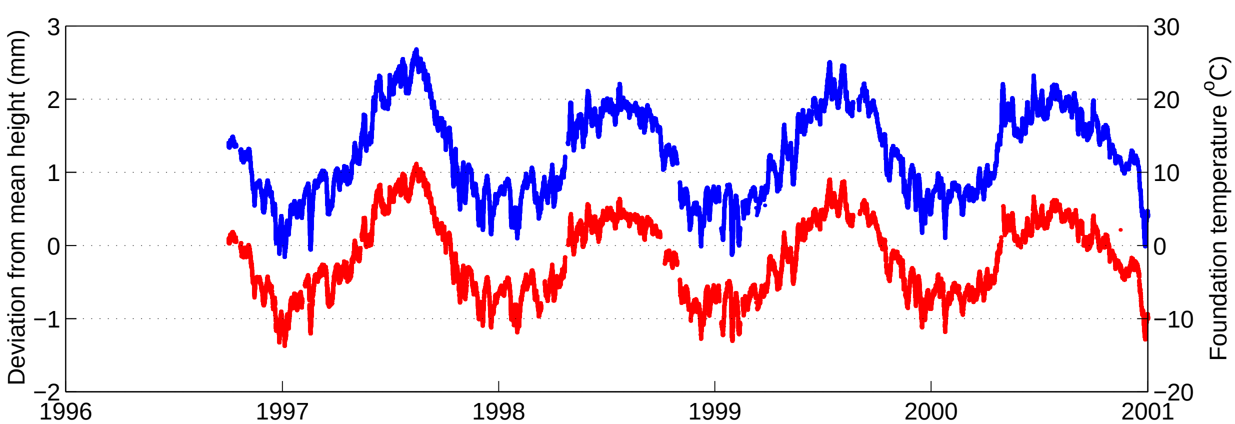

Figure 5. Invar measurements of vertical height of the telescope tower (bottom curve, left scale) and mean temperature in the concrete wall of the foundation (top curve, right scale).

During 1999 a new VLBI-GPS local tie at OSO has been established by mounting two GPS antennas on top of the VLBI telescope [4]. The GPS measurements are performed on a campaign basis whenever the telescope is available for our purposes and not occupied by astronomical observations or geodetic VLBI. The results are also compared to the vertical height changes measured with the invar rod measuring system [5].

5. Outlook

The Onsala Space Observatory will continue to participate in the observation series CORE-3, RDV and EUROPE. For the year 2001 a total of 24 experiments is planned.

A repeated measurement of the local footprint of the Onsala site and a classical survey of the telescope reference point are planned for spring/summer 2001. The footprint measurements will concentrate first on the inner network with baselines of an approximate length of 1 km and then on the outer network with baselines reaching 20–70 km.

The measurement of the vertical height of the telescope tower with the invar rod measurement system will go on continuously and the GPS observations on top of the VLBI telescope will be repeated at regular intervals.

References

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[2] Bergstrand, S., R. Haas, and G. Elgered, Geodetic Very Long Baseline Interferometry at the Onsala Space Observatory 1999–2000, In: Proc. of the 14th Working Meeting on European VLBI for Geodesy and Astrometry, P. Tomasi, F. Mantovani and M.-A. Perez-Torres (eds.), 105–106, 2000.

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

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[5] Bergstrand, S., R. Haas, and J. M. Johansson, An independent stability check of the Onsala 20m radio telescope using the Global Positioning System, In: Proc. of the 14th Working Meeting on European VLBI for Geodesy and Astrometry, P. Tomasi, F. Mantovani and M.-A. Perez-Torres (eds.), 83–88, 2000.