Onsala Space Observatory – IVS Network Station

Rüdiger Haas, Gunnar Elgered, Hans-Georg Scherneck

Abstract

We give a short overview of Onsala Space Observatory (OSO) in it's function as IVS Network Station. Current status and plans for the future are described.

1. General Information

Onsala Space Observatory (OSO) is the Swedish National Facility for Radio Astronomy and connected with the Department of Radio and Space Science at Chalmers University of Technology. It is located 30 km south-west of Gothenburg at the Swedish west coast. The site is located on the Eurasian plate in the southern part of the Fennoscandian uplift area.

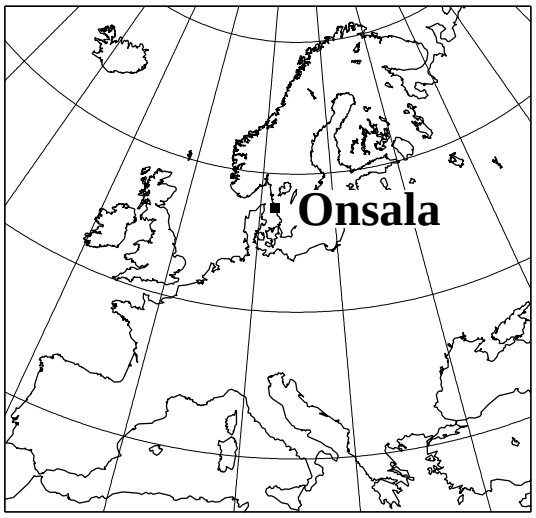

Figure 1: Location of Onsala Space Observatory (OSO) at the Swedish west-coast in the southern part of the Fennoscandian uplift area.

Figure 2: The 20 m radio telescope at Onsala enclosed inside the radome. Note the Onsala water vapor radiometer (WVR) and the GPS antenna of the Onsala IGS permanent station on the left hand and right hand side, respectively.

Table 1. Address and location of Onsala Space Observatory (OSO).

Onsala Space Observatory (OSO)	Longitude	11.93° E
SE-439 92 Onsala, SWEDEN	Latitude	57.40° N
t. +46-31-772-5500,	f. +46-31-772-5590,	`http://www.oso.chalmers.se`

2. Technical Description of the Geodetic VLBI Equipment at Onsala

The 20 m radio telescope at Onsala used for geodetic VLBI was constructed in 1975/76. It is an az-el mounted telescope enclosed inside a radome and is equipped with a secondary receiving feed system. The slewing speeds are 2.4°/s and 1.0°/s in azimuth and elevation, respectively. The system equivalent flux density values in X- and S-band are 2450 and 3200 Jy, respectively. Onsala uses a Mark-IV data acquisition terminal and since May 1998 triple-cap heads are installed at the recorder unit which enables thin and thick tape operation. There are two hydrogen masers at Onsala, one Oscilloquartz EFOS-7 and one Kvartz CH1-75 [1].

The stability of the antenna tower is monitored by permanent measurements of vertical height and temperature of the concrete tower [2]. Inside the concrete wall of the tower are 16 temperature sensors at different height levels and azimuth directions. The temperature measurements started in December 1994. Besides this there is an invar rod mounted at the top of the tower which allows measurement of relative vertical height changes. Figure 3 shows the Onsala invar and temperature measurement devices and approximately 2 years of measurements of temperature and vertical height.

Since 1997 Onsala is also equipped with a Micro Rain Radar (MRR) in order to infer the rain rate and liquid water in the atmospheric boundary layer, and to access the quality of the WVR data.

3. Current Status of Onsala Space Observatory

The pioneering participation in geodetic VLBI of the Onsala Space Observatory dates back to 1968 [3]. In 1998/99 OSO participates in three geodetic VLBI series, the EURO, CORE-B and RDV series with 6 experiments per year each. Figure 4 gives an overview of the geodetic VLBI experiments per year observed and Table 2 lists the geodetic VLBI experiments between March 1998 and March 1999 involving the Onsala Space Observatory.

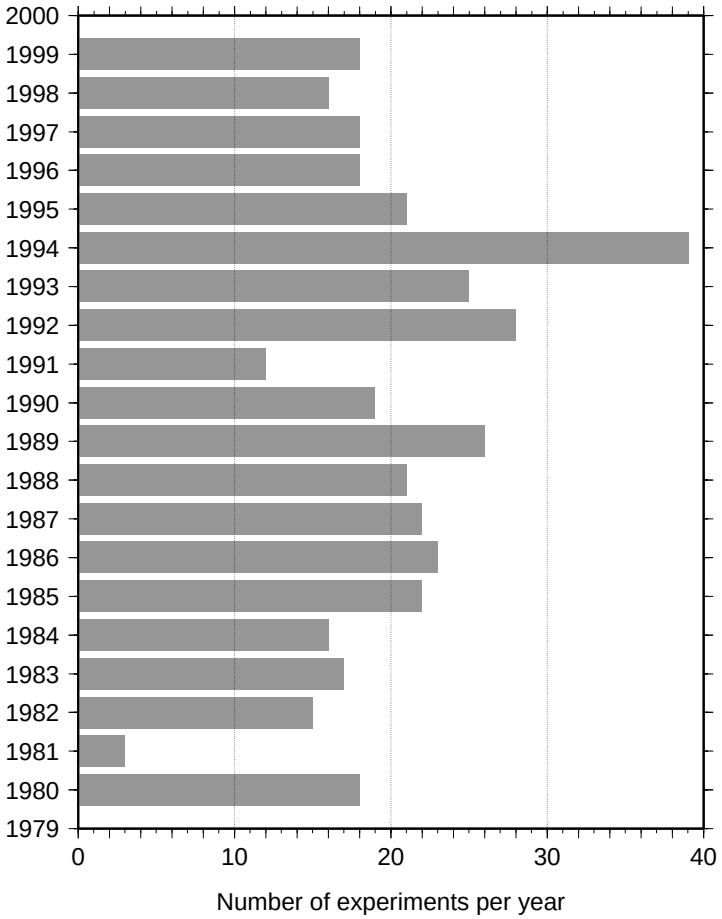

Figure 4: Geodetic experiments per year involving the Onsala Space Observatory since 1980.

Table 2: Geodetic VLBI experiments involving Onsala Space Observatory between March 1998 and March 1999.

Exper.	Date	Remark
CB107	980311	
CB108	980408	
RDV08	980415	
EURO42	980420	
CB109	980520	
EURO43	980622	50% data lost, tracks overwritten
RDV09	980624	
CB110	980701	
RDV10	980810	
EURO44	980817	50% data lost, tracks overwritten
CB111	980826	antenna pointing problems
RDV11	981001	
EURO45	981012	
CB112	981104	
EURO46	981214	inch-worm motor failure
RDV12	981221	inch-worm motor failure
EURO47	990201	

Currently a new S/X-feed system is completed at Onsala to replace the old one using two seperate feed horns for the two frequencies. The new one consists of a dual frequency corrugated horn and a two reflector feed system [2]. Most of the system is completed, some remaining parts will be finished in the near future [4].

4. Staff at Onsala Associated with the IVS Network Station

The staff at Onsala associated with the IVS Network Station is: Per Bergman (telescope scientist), Sten Bergstrand (Ph.D. student) Roy Booth (scientist, director), Rune Byström (engineer), Fredrik Corneliusson (technician), Gunnar Elgered (scientist), Lubomir Gradinarsky (Ph.D. student), Rüdiger Haas (scientist), Roger Hammargren (technician), Karl-Åke Johansson (engineer), Lars E.B. Johansson (telescope scientist), Biörn Nilsson (engineer), Hans-Georg Scherneck (scientist), and Borys Stoew (Ph.D. student). (The corresponding e-mail addresses and telephone numbers can be found on the Onsala web page.)

5. Outlook

After installation of the new S/X-feed system we plan to join the CORE-A VLBI experiments on a bi-weekly basis replacing our involvment in the CORE-B experiments. We will continue to participate in the European observation series.

During the summer of 1999 we plan to do a remeasurement of the Onsala local footprint to check the stability of our site. This will include measurements with a GPS antenna mounted in the VLBI telescope in an effort to try to establish a new type of tie between the two observational methods.

References

[1] Elgered, G., and R. Haas, Geodetic Very-Long-Baseline Interferometry at the Onsala Space Observatory 1996–1997, In: Proceedings of the 12th Working Meeting on European VLBI for Geodesy and Astrometry, held at Hønefoss, Norway, September 12-13, 1997, edited by B. R. Pettersen, Statens Kartverk, pp. 49–53, 1997

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[3] Scherneck, H.-G., G. Elgered, J. M Johansson, and B. O. Rönnäng, Space geodetic activities at the Onsala Space Observatory: 25 years in service of plate tectonics, Phys. Chem. Earth, Vol. 23, No. 7–8, pp.811–823, 1998

[4] Elgered, G., R. Haas, and L. Pettersson, The IVS Technicnology Development Center at the Onsala Space Observatory (this volume)