



Contributions of the Onsala Space Observatory to the GGOS

Rüdiger Haas, Gunnar Elgered, Thomas Hobiger, Hans-Georg Scherneck, Jan Johansson

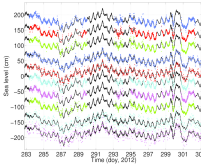
Department of Earth and Space Sciences, Chalmers University of Technology, Onsala Space Observatory, SE 439 92 Onsala, Sweden



The GNSS-R tide gauge.

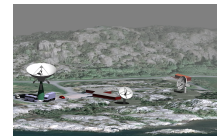


The tide-gauge well with pneumatic and radar-based sensors.

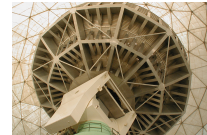


One month of sea level derived from GNSS-R with GPS and GLONASS.

The Onsala Space Observatory (OSO) on the Swedish west coast is the fundamental geodetic station of Sweden and operates several geodetic and geophysical infrastructures that contribute to the GGOS.



An artist's impression of the Onsala Twin telescopes.



The radome-enclosed 20 m radio telescope used for geodetic VLBI.



The ONSA GNSS site.

VLBI

OSO has the longest VLBI observational record in Europe, going back to 1968. Currently about 40–50 sessions per year are observed in IVS programs. OSO participated in all CONT campaigns. In 2012 we received funding for a twin telescope, to be part of the VGOS network. The Onsala Twin Telescopes will be delivered in 2016. Test observations are expected to start in 2017 in order to become fully operational 1–2 years later.

Tide gauges

Since 2011 GNSS-R tide gauge is operated at OSO, utilizing reflected signals from multiple GNSS. Additionally, in 2013 and 2014 several pneumatic sensors and a radar-based sensor have been installed in a dedicated tide gauge well. This installation is operated together with the Swedish Meteorological and Hydrological Institute (SMHI) and will be an official site in the national sea level monitoring network.

GNSS

In collaboration with Lantmäteriet, the Swedish National Land Survey, OSO operates several GNSS sites, among them the IGS station ONSA. A new GNSS array consisting of six additional stations is under construction in the area around the future Onsala Twin Telescopes. Its baselines are of the order of hundreds of metres and will also be operated together with Lantmäteriet.

Atmospheric measurements

Several ground-based microwave radiometers for atmospheric research are operated at OSO. They are used to infer the time delay caused by atmospheric water vapour. This information is used to validate atmospheric parameters estimated from the space geodetic techniques, i.e. VLBI and GNSS, but is also used for in meteorological studies.

Gravimetry

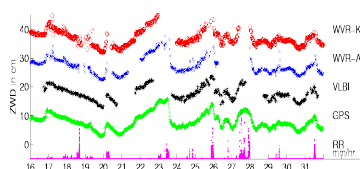
Since 2009 OSO operates a gravimeter laboratory for relative and absolute gravity measurements which is equipped with a superconducting gravimeter. It has been operated continuously since then with a reliability well above 99 %. Data are available via a webpage and are sent to the archive of the Global Geodynamics Project (GGP). In collaboration with the University of Uppsala, a seismometer is operated that is part of the Swedish National Seismic Network (SNSN).

Time

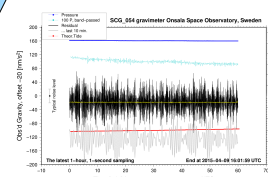
In collaboration with SP Technical Research Institute of Sweden, OSO operates a time and frequency laboratory with several atomic frequency standards. These instruments are used for the local time and frequency distribution for the scientific equipment at OSO, and to generate the Swedish UTC realization.



Microwave radiometers Astrid (left) and Konrad (right).



Atmospheric parameters from microwave radiometry and space geodesy.



Near real-time analysis of data from the superconducting gravimeter.



The superconducting gravimeter.