

Ny-Ålesund Geodetic Observatory

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Abstract In 2017/2018, the 20-m telescope at Ny-Ålesund, Svalbard, operated by the Norwegian Mapping Authority (NMA), was scheduled in 259 24-hour and 80 one-hour observations of the IVS program. The new geodetic observatory with twin 13-m VGOS telescopes was officially inaugurated in 2018 and will gradually take over from the 20-m telescope.

1 General Information

The Geodetic Observatory of the Norwegian Mapping Authority (NMA) is situated at 78.9° N and 11.9° E in Ny-Ålesund, in Kings Fjord, on the west side of the island Spitsbergen. This is the biggest island in the Svalbard archipelago. In 2017/2018, Ny-Ålesund was scheduled for 259 24-hour VLBI observations, including R1, R4, EURO, RD, and T2 sessions, and a two-week CONT session (in November–December 2017). Ny-Ålesund also participated in 80 one-hour observations within the Intensives program.

In addition to the 20-meter VLBI telescope, the Geodetic Observatory has two GNSS receivers in the IGS system and a Super Conducting Gravimeter (SCG) in the Global Geodynamics Project (GGP) installed at the site. A second SCG is installed at the new geodetic observatory at Brandal, approximately 1.5 km away. The French Institut Geographique National operates a DORIS station close by. In 2018, the beacon was moved from the center of Ny-Ålesund to the vicinity of

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Fig. 1 Geodetic observatory, 20-m telescope, and the GFZ's satellite station.

the light sensitive cabin, approximately 2.75 km NW of its previous location, placing it closer to the new geodetic observatory and ensuring better co-location of the geodetic techniques on site. Instrumentation at the observatory also includes a GPS Ionospheric Scintillation and TEC Monitor (GISTM; running since 2004), which is operated in the frame of ISACCO, a research project on ionospheric scintillation observations led by the Italian Institute of Volcanology and Geophysics (INGV). Another Real-Time Ionospheric Scintillation (RTIS) Monitor was set up by the NMA in November 2012.

2 Component Description

The antenna with 20-m diameter is intended for geodetic use and receives in S- and X-band. Its design and construction are similar to those at Green Bank and

Kokee Park. A DBBC2 streams the data to a Mark5B+ recorder, having replaced the previously used analog rack. Another Mark5B+ unit is used to transfer data via network to the correlators. Timing and frequency is provided by a NASA NR maser, which is monitored by a CNS system.

3 Staff

The staff in Ny-Ålesund consists of four people (see Figure 2) employed at 75-100%, with 3.5 full-time positions currently covered. Station staff are part of the Department for Global Geodesy at the Geodetic Division of the Norwegian Mapping Authority, which has its main office in Hønefoss (near Oslo).

Axel Meldahl has been working as an operating engineer at the observatory since 2015, while Trond Sandmo and Simon L'orange joined as operating engineers in 2017 and 2018, respectively. Piotr Kupiszewski joined the team in mid-2018 as operations manager and has been acting head of the Department for Global Geodesy since November 2018.

The staff in Ny-Ålesund work closely with colleagues located on the mainland at NMA's Hønefoss and Oslo offices: Ann-Silje Kirkvik (VLBI data analyst), Leif Morten Tangen (VLBI technical manager), Gro Grinde (project leader for the new geodetic observatory), and Laila Løvhøiden (head of department) (see Table 1 for an overview).



Fig. 2 Ny-Ålesund geodetic observatory core team: Trond Sandmo, Piotr Kupiszewski, Simon L'orange, Axel Meldahl.

Table 1 Staff related to VLBI operations in Ny-Ålesund.

Head of department	Laila Løvhøiden
Acting head of department	Piotr Kupiszewski
Project leader (new observatory)	Gro Grinde
Technical manager	Leif Morten Tangen
Operations manager	Piotr Kupiszewski
Operating engineer	Axel Meldahl
Operating engineer	Simon L'orange
Operating engineer	Trond Sandmo
VLBI data analyst	Ann-Silje Kirkvik

4 Current Status and Activities

4.1 Maintenance

The 20-m telescope has been in operation for 25 years, and considerable maintenance is required to keep it operational. Among the maintenance carried out in 2017 and 2018 were installation of new tachometers and motor brushes, exchanging the X-band waveguide window in order to fix dewar leakage issues, and exchanging a malfunctioning azimuth encoder.

In March 2017, maser power supply issues caused many sessions to be lost. Due to the leaking dewar, the receiver was operated warm for most of the sessions from July to November 2018. Furthermore, during summer 2018, false alarms triggered by electrical faults during antenna operation in humid conditions hampered observations on a regular basis. The latter issue unfortunately remains unsolved, and a proper fix requires a major overhaul of the cabling. In order to increase the lifetime of the radio telescope, wind speed limits for operation have been decreased, with the threshold now set to $15 \frac{\text{m}}{\text{s}}$. Wind speeds over this value prompt an alarm, and the observation is stopped.

In addition to maintenance of the telescopes, a major clean-up and re-organization of the office and storage space has been carried out. A new fire escape double door has been installed at the Rabben office, providing a grand view of the fjord and mountains. Finally, a new internet site for the geodetic observatory has been set up: (<https://www.kartverket.no/en/About-The-Norwegian-Mapping-Authority/geodetic-earth-observatory/>).

4.2 New Observatory

In June 2018, the new geodetic observatory at Brandal (see Figure 3) was officially opened, coinciding with the 10th conference of the International VLBI Service for Geodesy and Astrometry, IVS2018, in Longyearbyen. 110 delegates were invited to participate in the official opening and were transported to Ny-Ålesund by boat for the inauguration.

The new observatory features fast-slewing VGOS (VLBI Global Observing System) twin telescopes and will have a broadband (2-14 GHz) signal acquisition chain. The telescopes are 13.2 meters in diameter and are 18 meters above the ground.

A tri-band feed is currently installed and will be used for testing of the facility and transfer of the data series from the 20-meter radio telescope at Rabben. Backend equipment consisting of a DBBC3 and flexbuff is already in place for the first telescope.



Fig. 3 The new geodetic observatory at Brandal.

5 Future Plans

Fully operationalizing the twin telescopes at the new geodetic observatory is at the center of attention for the upcoming couple of years. Most notably, completion and installation of the broadband signal acquisition chain is planned for 2019–2020. Work is currently ongoing to complete the first broadband feed at Yebes, Spain, with shipping to Ny-Ålesund planned for summer 2019. Delivery of the second broadband feed is planned for summer 2020. Efforts to operate the first telescope with a tri-band feed are ongoing, and the station will hopefully join in tag-along mode in the very near future, so that connection of the time series from the old 20-m telescope and from the new facility can begin. Concurrently, it is aimed to keep the 20-m telescope operational for a few more years in order to carry out parallel observations with the new telescope and to provide the best possible contribution to the ITRF2020. Nonetheless, due to limited resources, operationalizing the new observatory is prioritized, and it has to be expected that down-time for the 20-m telescope will increase when technical issues are encountered.