Metsähovi Geodetic Fundamental Station in Finland — New VGOS Site, Plans, and Current Status

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Abstract A new VGOS telescope will be built at the Metsähovi Geodetic Fundamental Station. We present here our plans concerning the VGOS project. Also we give an overview of the instruments located at the Metsähovi Geodetic Fundamental Station.

Keywords VGOS, fundamental station

1 Introduction

The Metsähovi Geodetic Fundamental Station in Southern Finland (60.2N, 24.4E) is a key infrastructure of the Finnish Geospatial Research Institute (FGI)[1]. It is a Global Geodetic Observing System (GGOS) core site, i.e., a member of the global network of geodetic stations which is used for maintaining global terrestrial and celestial reference frames, for computing precise orbits of satellites, and for geophysical studies. Metsähovi is one of the few geodetic stations that has all major geodetic observing instruments co-located. These include satellite laser ranging (SLR), very long baseline interferometry (VLBI), global navigation satellite systems (GNSS), superconducting and absolute gravimeters, and a DORIS beacon. The station has been operational since 1978. It contributes to several global services of the International Association of Geodesy (IAG) and, due to its long existence, helps to retain sustainability in the maintenance of global reference frames.

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2 VGOS Project

In the autumn of 2015, FGI obtained funding to build a new VGOS-compatible radio telescope system. This project is funded by the Finnish Ministry of Agriculture and Forestry and the National Land Survey. The site chosen for a new telescope is within 100 m of other facilities of the Metsähovi Geodetic Fundamental Station. We aim for a 12–13 m telescope and expect to complete the procurement process of the telescope during summer 2016. The telescope will be founded on bedrock (Figure 1).

Fig. 1 Future VGOS telescope site.

The site preparation will begin with forest removal around the place selected for the new telescope. Also other infrastructure work will be started in summer 2016. The instrumentation and operation rooms will be placed in Metsähovi's main building. The selection and procurement of signal chain components will start

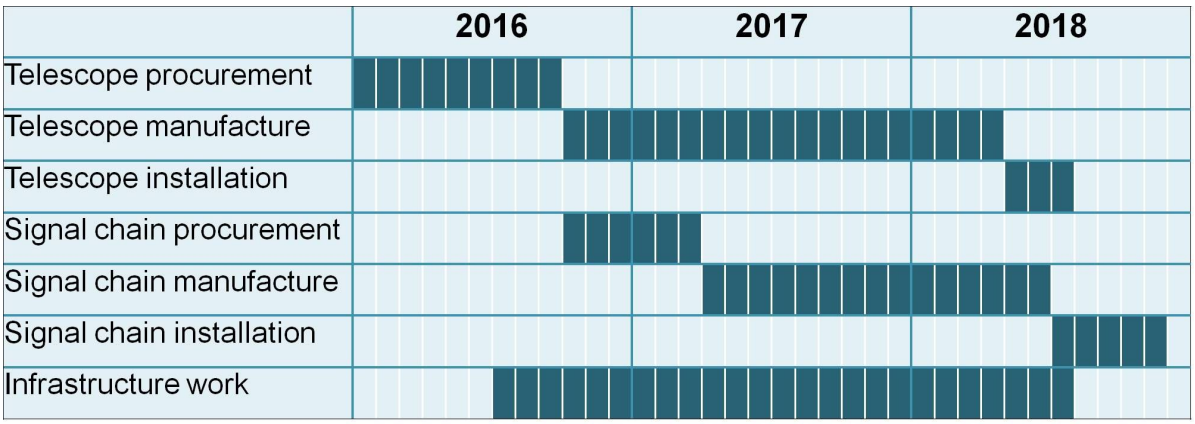

Fig. 2 Preliminary schedule for the Metsähovi VGOS project.

after the telescope tendering has finished. The plan is to be operational by the end of 2018. The preliminary schedule for the Metsähovi VGOS project is presented in Figure 2.

3 Metsähovi Geodetic Fundamental Station

Fig. 3 Superconducting gravimeter.

The Ministry of Agriculture and Forestry has allocated a special funding for the renewal of Metsähovi instruments and infrastructure during 2012–2018.

- Finnish Permanent GNSS Network FinnRef (∼20 receivers)
- Superconducting gravimeter; new instrument in 2014 (Figure 3)
- Upgrade of the absolute gravimeter
- Satellite laser ranging; new 2-kHz system. Work ongoing, expected to be operational in 2016 (Figure 4)
- VGOS telescope system

Fig. 4 The new Metsähovi SLR observatory.

The following major instruments or facilities exist at Metsähovi (Figure 5):

- Satellite laser ranging (SLR) facility. First observations were started in 1978, but during recent years

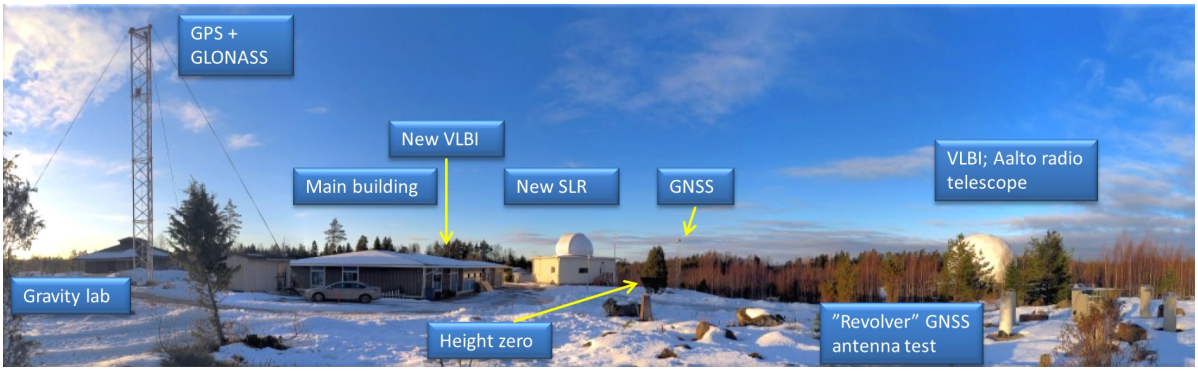

Fig. 5 Metsähovi Geodetic Fundamental Station.

the SLR system has been under renovation. A new SLR will be completed in 2016, with a brand new 0.5 m telescope and a 2-kHz laser [2].

- GNSS receivers. Metsähovi has been a part of the IGS network since the early 1990s. Recently GNSS receivers have been modernized, and they are capable of tracking all GNSS satellite systems [3].
- VLBI radio telescope. Geodetic VLBI observations have been made since 2004 using the radio telescope of Aalto University Metsähovi station. A few IVS campaigns per year have been carried out.
- Gravimeters. A new superconducting gravimeter and the upgrade of the FG5X-221 absolute gravimeter have been done in 2013.
- The CNES/IGN Doris beacon, located a few kilometers from Metsähovi.
- TerraSAR-X retroreflector (DLR and Technical University of Munich).

Additionally there are necessary infrastructure, weather stations, a local geodetic network for local ties, a leveling test line, and a calibration and test field for GNSS antennas.

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