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Metsähovi Geodetic Research Station

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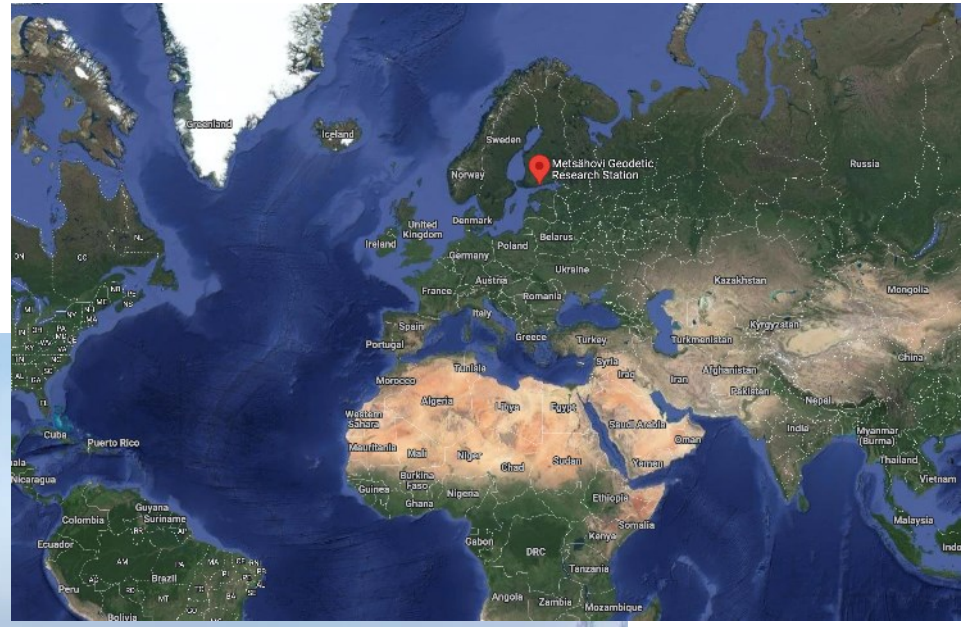
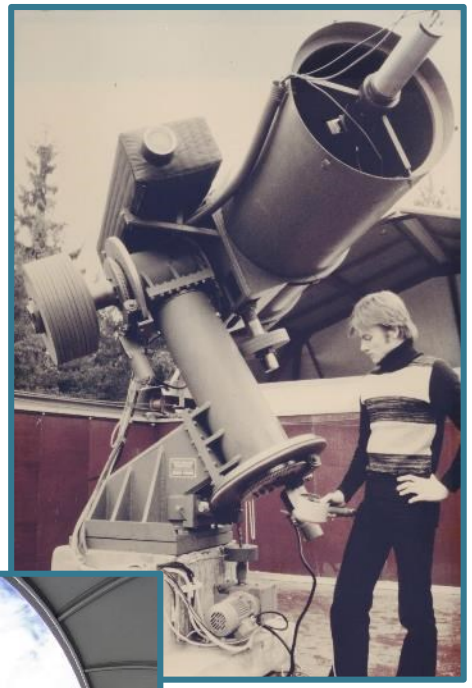
Metsähovi Geodetic Research Station

- 60.21N, 24.39E
- The easternmost and northernmost geodetic core site within the EU



Metsähovi Geodetic Research Station

- First geodetic measurements (SLR) in 1978
- Operated continuously since with measurement techniques added along the way
- Metsähovi is the Finnish contribution to the UN 2015 GA resolution on Global Geodetic Reference Frame for Sustainable Development
- **In 2012 a major upgrade of all equipment was started**
- Currently the upgrade is mostly finished, with the commissioning of the next gen. VLBI and SLR under way
- After the commissioning of these we will be a fully equipped GGOS core station
- Also major upgrades to the station infrastructure



Metsähovi Geodetic Research Station

- All the equipment have foundations anchored in bedrock
- DORIS beacon is located ~3 km away to avoid RFI for the geodetic and the astronomical telescopes (latter operated by Aalto Univ.). Local tie measurements between sites are done regularly.

New Main building

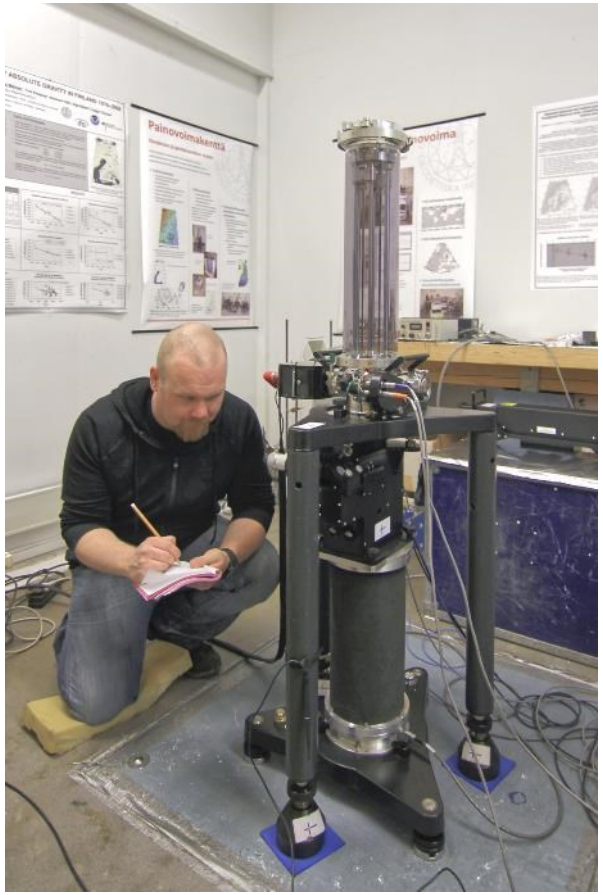
- Construction of the new main building started in October 2021
- The building was handed for us in August 2022
- New building designed with VLBI in mind
  - dedicated space for VLBI operation
  - special attention to reducing RFI, including building-wide RFI shielding mesh/netting

Satellite laser ranging

- 3rd generation SLR system is being commissioned, major delays due to telescope subcomponent manufacturer
- **2kHz 532nm laser**
- System fully capable of daytime operation
- Fast-moving telescope to minimize the target acquisition time
- New observatory building
- Aircraft avoidance via primarily via ADS-B receivers, no radar

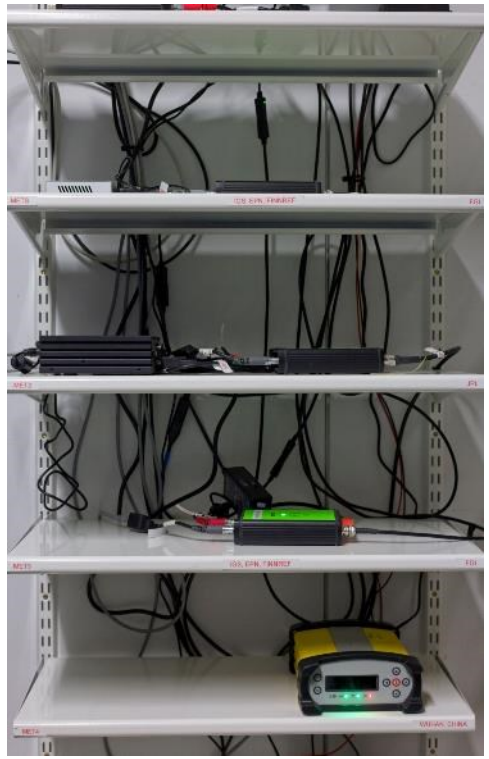
Gravimeters

- First absolute gravimeter in 1988, AG upgraded to FG5X in 2013
- First superconducting gravimeter in 1994. **SGs iOSG-022 and iGrav-013 have been operational since 2016**
- Scintrex CG6 relative gravimeter was procured in 2021 to complement our RG pool
- We are the national metrological laboratory for g



GNSS

- Continuous GPS measurements since 1990
- 2 IGS/EPN receivers (+1 IGS at DORIS site),
- NASA/UNAVCO receiver
- Panda/BeiDou receiver
- Additional receivers for research, time, scintillation etc.
- Calibration/validation field for antennas



DORIS & REGINA

- Doris beacon since 1988
- 4th gen. beacon installed in 2021
- Co-located with REGINA (CNES) IGS receiver since 2013

Local ties

- Local ties between all ref. points in Metsähovi are measured on a regular basis and techniques being developed and refined
- VLBI antenna is continuously monitored via two GNSS antennas attached to the edges of the dish

Geodetic VLBI

- Geodetic VLBI sessions have been observed since 2005 in collaboration with close-by Metsähovi Radio Observatory
- A dedicated VGOS-compatible (single) radio telescope system is being finalized for routine operation
- 13.2 m VGOS radio telescope (MTM) was commissioned in 2019
- A 2.1-14 GHz QRFH broadband receiver (Yebes)
- Receiver first light was obtained in 2020

Connectivity/data transfer

- **New fiber-optics link with 100Gb capacity was installed in 2021**
- Current connection is 10Gb/s. It will be upgraded to 100Gb/s in 2022.
- A 60-km-long time and frequency transfer link via fiber optics has been established between Metsähovi and VTT MIKES (metrology institute of Finland), connecting our time base to the national realization of UTC. Technologies used are both commercial White Rabbit and in-house built (for high-precision frequency transfer).

Official opening August-30-2022

Next steps

- Metsähovi Geodetic Research station (maintenance and operations) is added to the Government budget 2023 –
- NLS creates a new unit called ”Geodetic Infrastructures”
  - FinnRef stations
  - RIMS stations
  - Metsähovi
- 1st tasks of the unit is to get all equipment fully operational

Summary

- Metsähovi Geodetic Research Station has provided various data products to IAG since 1978.
- **In 2012 a major upgrade of all equipment was started**
  - GNSS
  - Absolute gravimeter
  - Superconducting gravimeter
  - Relative gravimeter
  - SLR
  - VLBI
  - Doris/REGINA (by French)
- From 2023 on Geodetic Infrastructure unit

Questions?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