



NLS
FINNISH GEOSPATIAL
RESEARCH INSTITUTE
FGI

National Report - Finland

NKG WGRF meeting

Gävle, Sweden, March 27-28, 2025

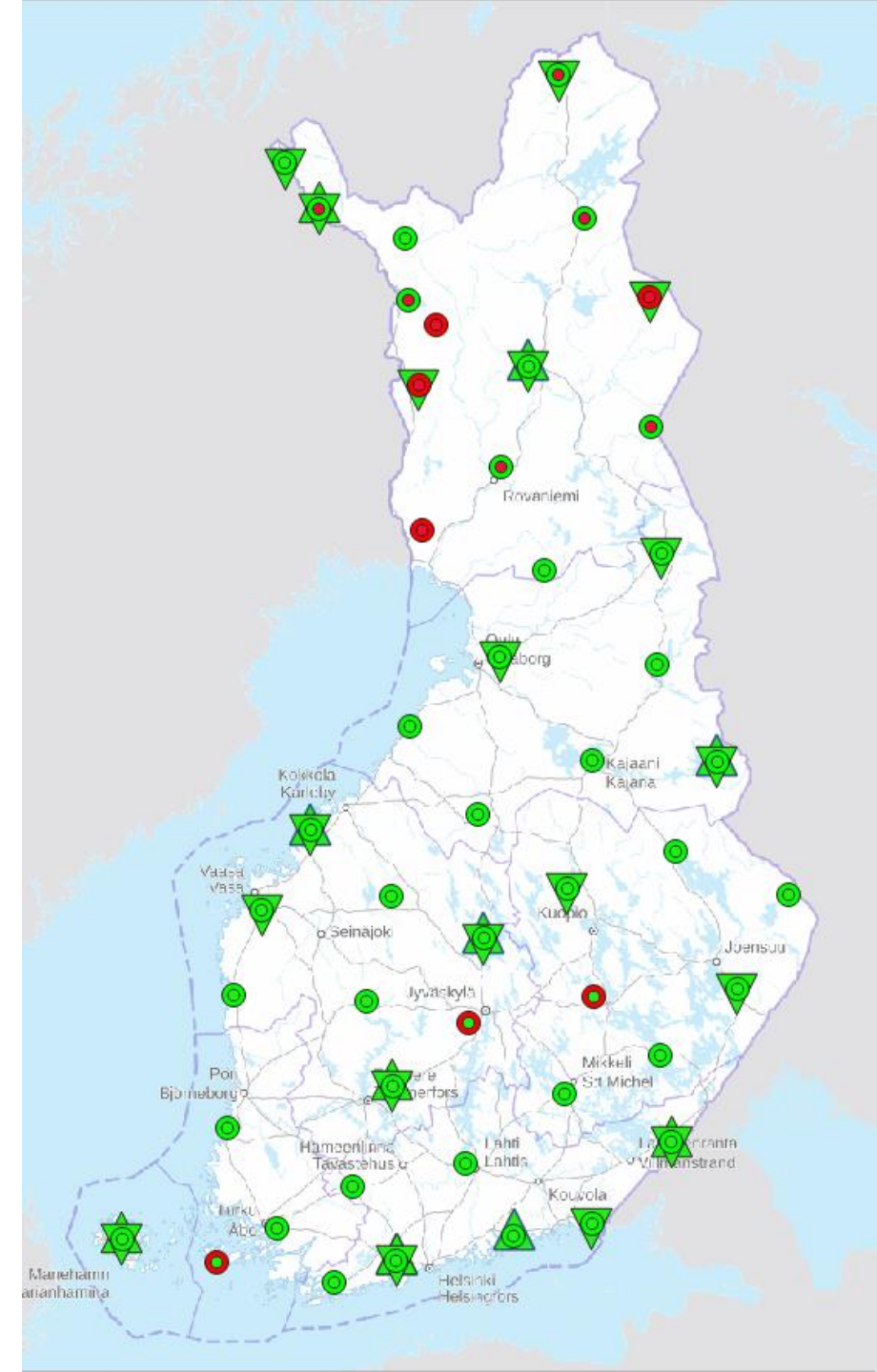
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+ NLS Core geospatial data services - Geodetic infrastructures

FinnRef: Backbone of Finnish reference systems

- **Precise levelled N2000 (EVRS) heights** for all (or most of the) stations by ~2025-2026
 - Now 40/47 (2025: 2 stns)
- **Centering measurements** (heights from the reserve markers to the GNSS antenna)
 - now 37/47 (2025: ~9-10 stns)
- ▼ **Repeated absolute gravity measurements**
 - 20/47 stations with AG pillar
 - Measured every 3 years
- ▲ **SAR reflectors**
 - 6/7 stations Zarges
 - 5/5 stations MK3D (+ 2 at Aboa Antartctica)



FinnRef stations and related

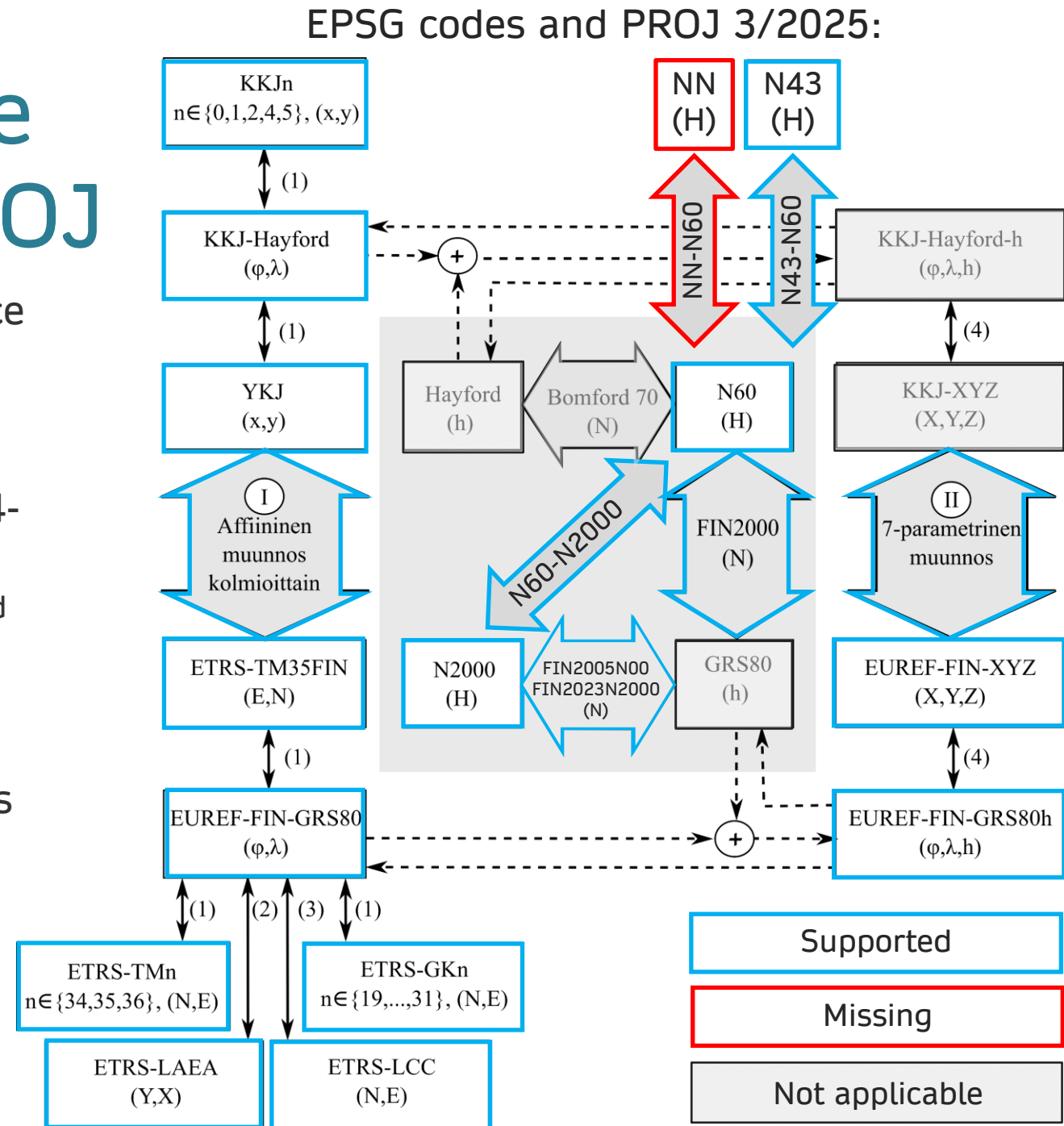
- Interference has not been problem at FinnRef stations. Some FINPOS (“class B”) stations at south-east have had large scale interference since summer 2024
- 2024/12: real-time data transmission to EPN stopped (all 20 stations)
- 2025: replace all Javad reference receiver flash memories (20 in EPN, 47 in total). Also general maintenance on FinnRef stations
- 2025: whole NLS prepares to move to a new IT infrastructure provider (CGI)
- FINPOS station levellings in future?



Finnish updates to the EPSG registry and PROJ

- EPSG registry: de facto standard for reference frames and transformations
 - Used by most geospatial software and PROJ transformation software
- EPSG data set and PROJ updated in 12/2024-3/2025. Additions:
 - EPSG: EUREF-FIN datum and associated CRSs, geoid models, triangle (TIN) –based transformations
 - PROJ: geoid models
- Both EPSG and PROJ support practically all Finnish nationwide CRSs and transformations now (see figure)
 - PROJ support also NKG transformations (ITRFyy), ongoing discussions for EPSG support

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EPSG codes and PROJ 3/2025:

Nummela Standard Baseline

FGI's renowned metrological length standard was measured for the 17th time since 1947 using the Väisälä Interference Comparator in autumn 2024.

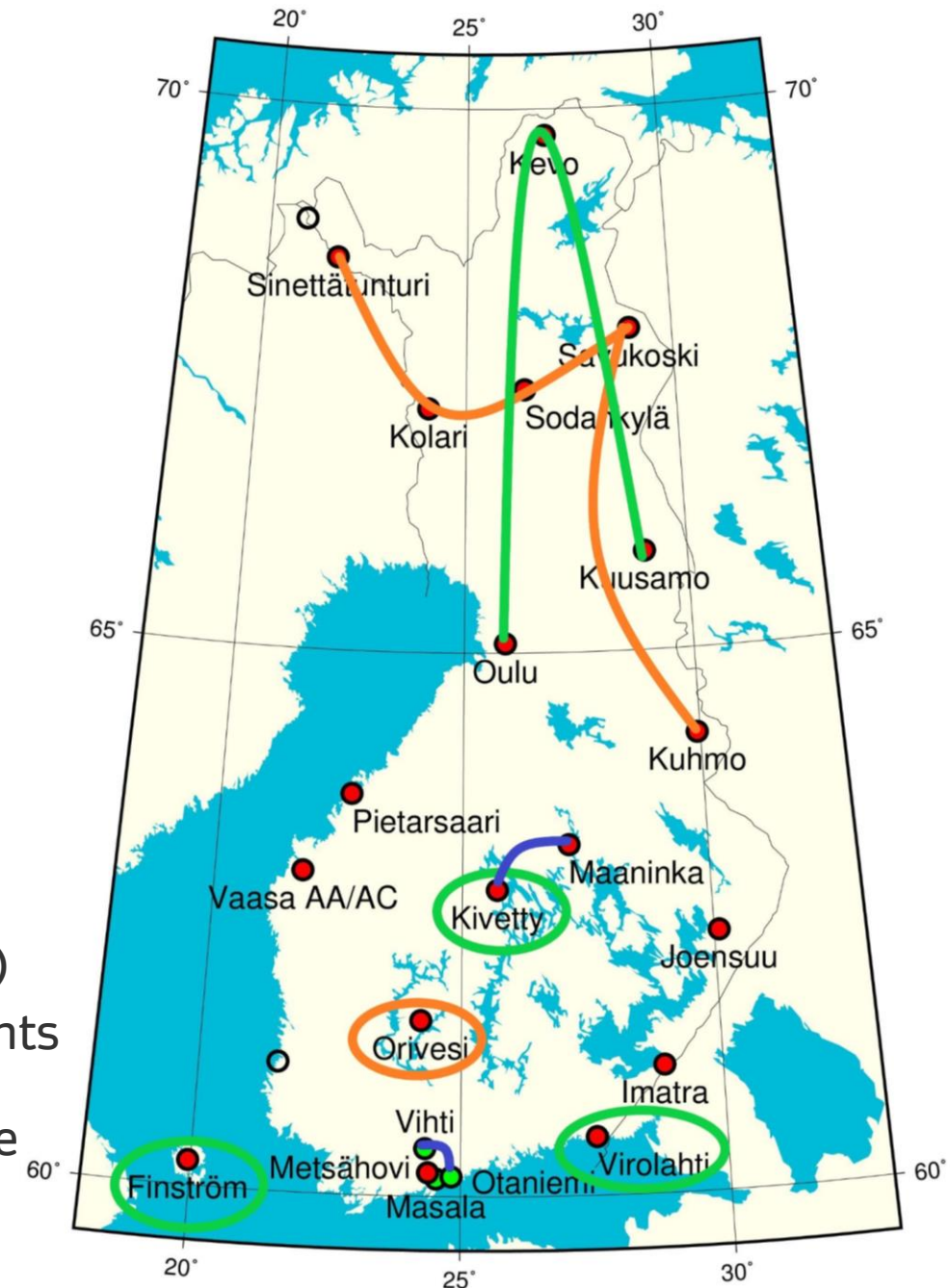
The scale in the comparator is determined using a 1-m-long quartz gauge, the traceable length of which is known from laboratory measurements with 36 nm standard uncertainty. After several multiplications known baseline distances of 24 m, 72 m, 216 m, 432 m and 864 m are obtained, usually with 0.02 mm to 0.09 mm standard uncertainties. The longest distance, 864 122,9 mm \pm 0,1 mm has varied less than 0,07 mm since 1947.

The baseline is used (1) for calibration of the most accurate electronic distance measurement (EDM) instruments, (2) for metrologically traceable scale transfer to other geodetic baselines and test fields, using calibrated instruments as transfer standards, (3) for testing and validation of modern absolute distance measurement (ADM) instruments as part of four European length metrology research projects since 2008, (4) for verifying the scale of measurement instruments used for local tie measurements at Metsähovi global geodetic observation site.



Gravity

- Absolute gravity at FinnRef stations
 - 2024: 7 stations (Metsähovi, Kuusamo, Kevo, Oulu, Kivetty, Finnström, Virolahti)
 - 2025: 7 stations (Orivesi, Kuhmo, Savukoski, Sosankylä, Kolari, Sinettätunturi)
- Calibration lines
 - Otaniemi-Vihti
 - 2024 AG measurements, RG measurements, gradient measurements
 - Kivetty-Maaninka together with GTK
 - 2024 reconnaissance, RG measurements (GTK)
 - 2025 RG measurements, gradient measurements
- FG5X-221 currently at Micro-g for regular maintenance

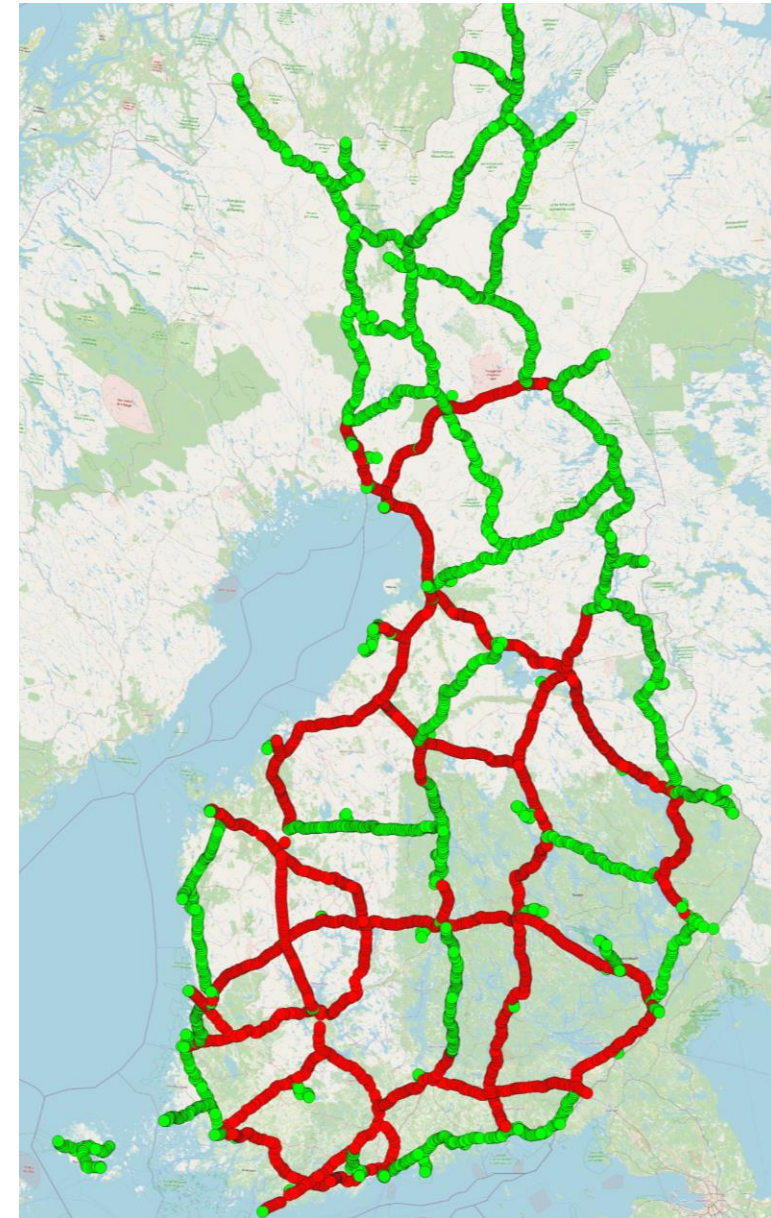


MMM TarGeOp –Project

Levelling network and geoid model optimization for the future height system

Research and investigations as a basis for the decision on the renewal of the height system

- Funded by the Ministry of Agriculture and Forestry
 - 2020-2021 KaRef -project
 - 2022-2023 GeoVaPaa –project
- 2024-2025 TarGeOp – Project
 - Redesign and optimization of the levelling network
 - No railroads, but include FinnRef stations, mareographs and border crossings
 - Study how the geoid model changes due to land uplift
 - 2 graduate students working on their Diploma thesis



Metsähovi

- Commissioning of the VGOS system is progressing
 - In Q4/2024 new H-maser installed
- Contract with DiGOS GmbH (Germany) to finalize the commissioning of the Metsähovi SLR telescope and the SLR system
 - On-sky tests expected to start in Q3/2025
- 3 new technical experts hired 3.2025, technical team now 6 persons
- GNSS, gravimetric, and DORIS measurements have continued without any issues
- Local tie measurements are planned to be repeated in Q2/2025
- Exploring of options for replacement of technical facilities that are still in old building
- Finland established National Space Situational Awareness Center in Q4/2024 (FMI Lead)
 - Metsähovi SLR system update by Q4/2026 to observe space debris



Knowing the Earth – Securing the future

