

National report - Norway

NKG General Assembly - Vilnius



Photo: Bjørn-Owe Holmberg

Education in geomatics (and geodesy) at Norwegian Universities



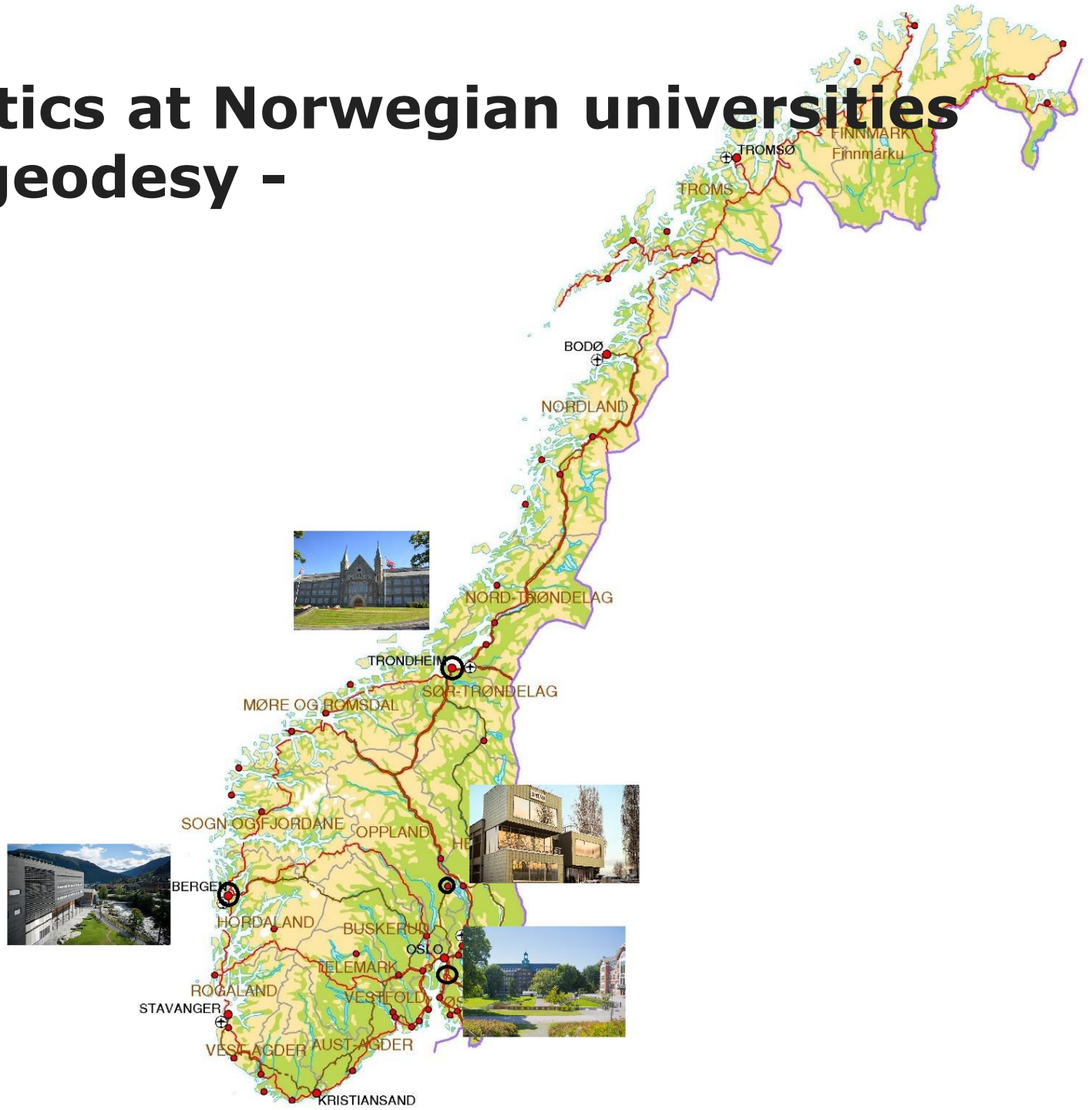
University / location	Name	BSc geomatics	MSc geomatics	PhD geomatics	MSc geodesy	PhD geodesy
HVL Bergen	Høgskolen på Vestlandet / Western University of Applied Sciences	X				
NMBU Ås	Norges Miljø og Biovitenskapelige universitet / Norwegian University of Life Sciences	X	X	X	X	X
NTNU Gjøvik	Norges teknisk-naturvitenskapelige universitet / Norwegian University of Science and Technology	X				
NTNU Trondheim	Norges teknisk-naturvitenskapelige universitet / Norwegian University of Science and Technology		X	X	X	X

Education in geomatics at Norwegian universities

- including geodesy -



Norwegian
University of
Life Sciences



Changes in Geodesy Division 2026

New head of division Astrid Marie Flattum Muggerud (acting)

Change in organisational structure:

Head



Astrid Marie F. Muggerud
(acting)

Staff

Stine Ø. Henriksen (acting)

Global geodesy

Gro Grinde (acting)

Positioning services

Siri A. Baklid

Reference frames

Morten T. Brunes (acting)

GNSS Development

Zeljka Jakir

R&D

Anne Guro Nøkleby (acting)



Kartverket

Earth observatory at Ny-Ålesund

Twin VLBI telescopes in Ny-Ålesund contributing to both VGOS and legacy VLBI sessions.

The SLR system was successfully installed in summer 2026 and is currently under data quarantine prior to delivering data to the ILRS.

The buildings were stabilized by replacing the pillars and anchoring them deeper into bedrock.

Office building renovated.



Long-term geodetic observations from Svalbard benefitting other scientific disciplines:

- Monitoring land uplift and environmental change
- Tracking glacier and ice-sheet dynamics
- Improving sea-level rise assessments
- Supporting Arctic geodynamic research

Research and Development Department

About

We focus on innovations to enhance the collection, management, and sharing of geodata, and support critical societal needs such as:

- social security and preparedness
- climate, environment and nature management
- safe and efficient transport

Our mission is to deliver impactful, data-driven solutions for a sustainable and resilient society.

Building networks

We are establishing an international, interdisciplinary research network focusing on internal Earth processes, surface dynamics and advanced observational techniques.

Geographic area: Ny-Ålesund and Svalbard

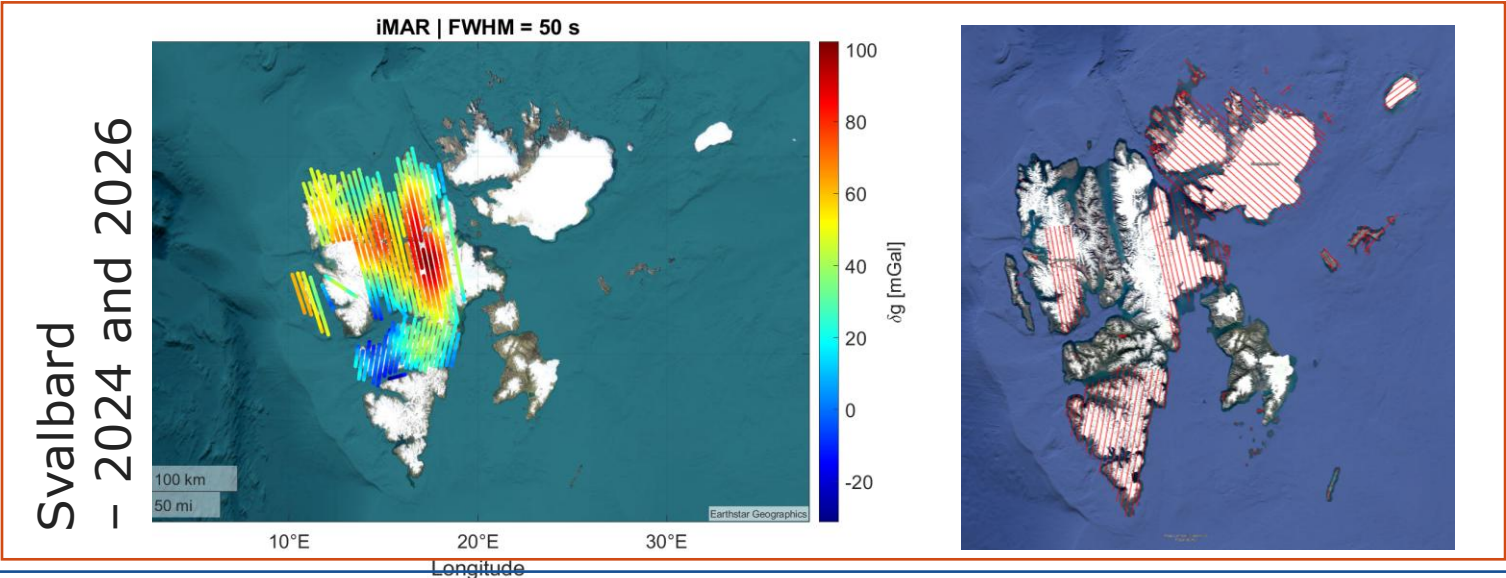
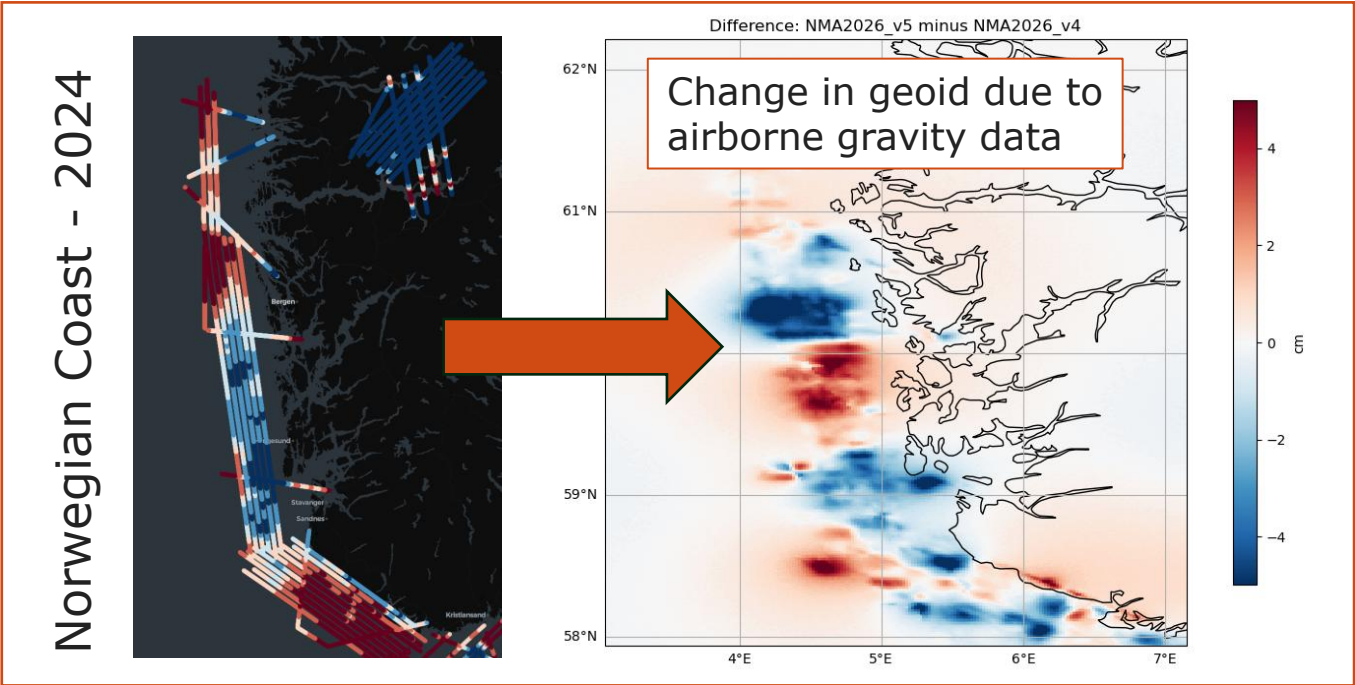
R&D portefolio with Geodesy relevance

- **MODI**– Demonstrating the use of autonomous driving for heavy freight transport on both public and private roads.
 - Reference frames and positioning services across national borders.
- **REACTOR**– Increasing the robustness and reliability of positioning services through automatic detection and reporting of signal interference.
 - GNSS interference in port environments.
- **HYPOS**– Developing a scalable method for broadcasting GNSS corrections.
 - A hybrid positioning service using GNSS and 5G technologies
- **QUANTSEA**– Understanding Holocene sea-level variability and coastal evolution.
 - Sea-level projections and land-uplift in Norway.

Airborne gravimetry

New IMU – iCORUS from iMAR
arrived early September 2026

Cooperation with DTU Space, DK

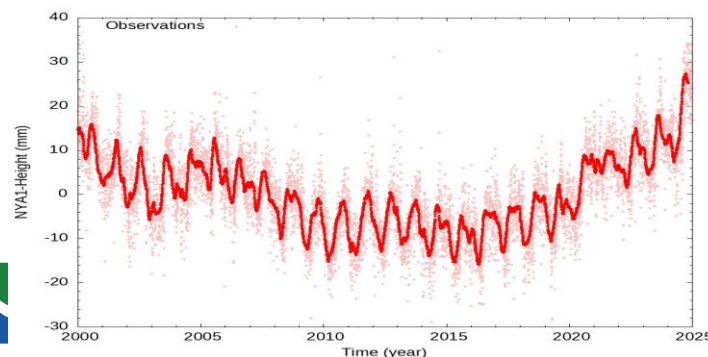
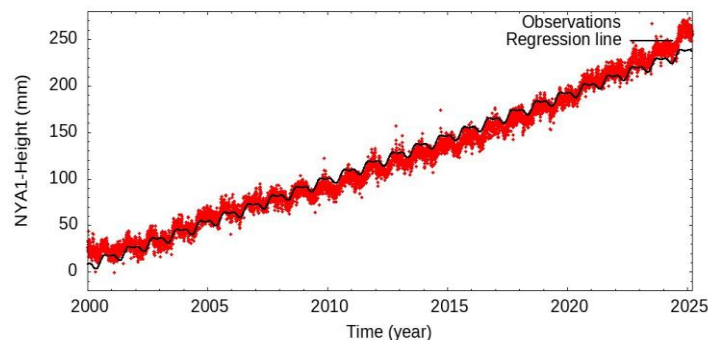




Svalbard research

Main findings in Ny-Ålesund and Svalbard:

- Uplift is varying and increasing (NYAL: from 5 mm/yr to 14 mm/yr)
- The variation explains approx. 50% of the VLBI scale drift in ITRF2020
- Elastic loading due to climate driven ice melt explain ~50%
- Repeated local-ties reveal no significant local deformations at the observatory



Publications:

Kierulf, HP, Kern, LM, Conrad, CP, Kirkvik, A-S, Krasna, H., Moholdt, G, Schuler, TV. Effects of glacial loading in Svalbard on the VLBI scale realisation (in rev. JoG)

Schuler, TV., Benestad, RE., Isaksen K., Kierulf, HP, Kohler, J., Moholdt, G., Schmidt, LS: 2025, Svalbard's 2024 record summer: An early view of Arctic glacier meltdown, *Proceedings of the National Academy of Sciences of the United States of America* (PNAS), Volume 122 (34), p 1-14

Kierulf, HP., Kohler, J., Boy, J.-B., Geyman, E.C. Mémin A., Omang, O.C. , Steffen, H., Steffer, R. 2022a: Time-varying uplift in Svalbard—an effect of glacial changes, *Geophysical Journal International*, Volume 231, Issue 3, December 2022, Pages 1518–1534

Kierulf, HP., WJJ van Pelt, L Petrov, M Dähnn, AS Kirkvik, O Omang, 2022b:

Seasonal glacier and snow loading in Svalbard recovered from geodetic observations, *Geophysical Journal International* 229 (1), 408-425

Handirk, R., Varenus, E., Nilsson, T., Le Bail, K., Bolaño González, R., Garcia-Espada, S., et al. (2026). Obtaining local-tie vectors from short-baseline interferometry between legacy S/X and VGOS telescopes at Ny-Ålesund. *Radio Science*, 61, e2025RS008586. <https://doi.org/10.1029/2025RS008586>

Tangen, O., Kierulf, H.P., Himle, S., Espads, S.G., 2024, Local-ties and repeated stability measurements in Ny-Ålesund, submitted IVS 2024 General Meeting Proceedings.

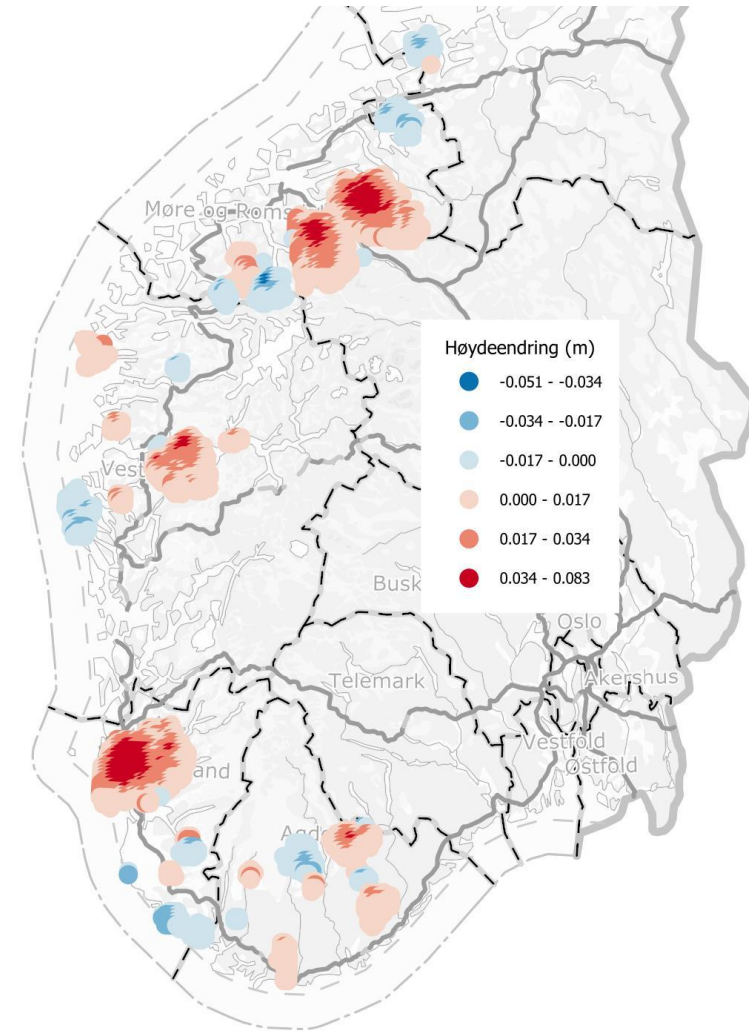
K Senger, F Ammerlaan, P Betlem, MA Dumais... - (2025) Geology of Svalbard: deep-time and deep-Earth (SVALGEOL), Svalbard Integrated Arctic Earth Observing System (SESS-report)

Kierulf HP, Lund, CV, Schuler TV. (2026) Isbresmelting reduserer presset på landjorden – men øker presset på samfunnssystemene/Glacier melt lowers pressure on land—and puts pressure on societal systems (Framcenteret Drift AS on behalf of FRAM)



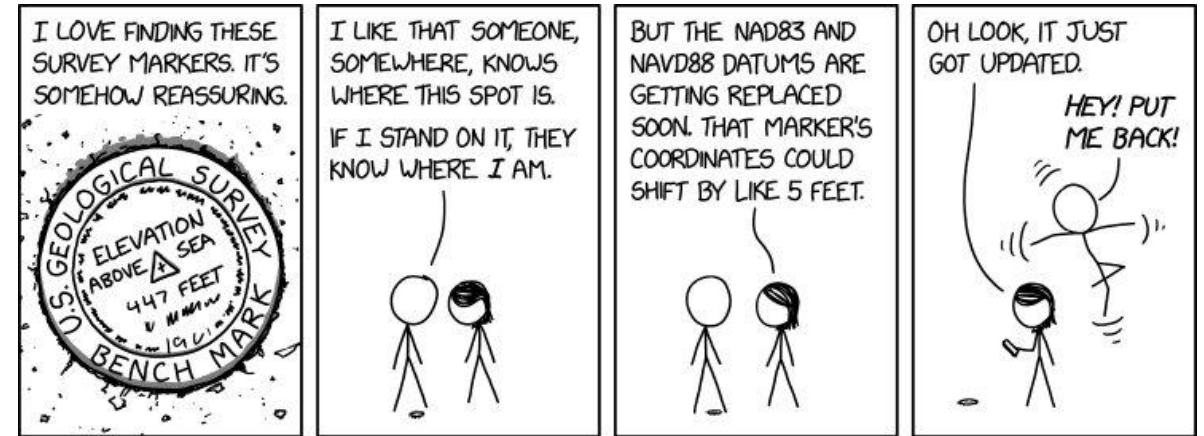
New vertical reference frame

- Leveling has revealed systematic errors in some areas in western Norway
- Correcting the heights has led to a new height reference model (HREF)
- For backward compatibility, we have published a new vertical reference frame called **NN2000:2025** together with corresponding **new EPSG codes**
- Outside the affected areas, heights in the existing frame, NN2000:2018, are identical to those in NN2000:2025. Within the affected area, the differences are up to 10 cm.
- This also results in a number of new compound EPSG codes associated with NN2000:2025.



Modernising National Geospatial Services

- Norway's national geospatial infrastructure is undergoing major modernisation.
- The Geodesy Division has promoted modern handling of reference frames and transformations through adoption of **PROJ** and wider use of the **EPSG Registry**.
- We are preparing the geospatial community for future changes, including a new vertical reference frame and updated EPSG codes for ETRS89.
- Collaboration with public and private stakeholders has highlighted the need for modern, flexible systems capable of managing future reference frame changes.
- The Geodesy Division will continue to support and contribute to the modernisation of Norway's geospatial infrastructure.
- Published guidance for data management in a **two-frame approach**, addressing both technical and user perspectives.
- Established **key principles** for future reference frame management within the Norwegian geospatial infrastructure.
- Developed and maintain a free transformation service based on **PROJ** and **GDAL**, including all relevant Norwegian transformations.
- Preparing implementation of the **new vertical reference frame** and new **ETRS89-NOR** EPSG codes.
- Supporting the geospatial community in adapting to future geodetic changes.



Positioning services

Kartverket provides the following positioning services:

- Network RTK service «CPOS»
 - 5700 subscribers
 - 310 stations (includes stations in SWE/FIN)
- DGNSS service «DPOS»
 - Legacy service, few users
- CORS data streams in RTCM
 - Providing real-time data streams for several commercial service providers. Data streams are used for both NRTK and SSR services.
- Rinex files service «ETPOS»

Current status:

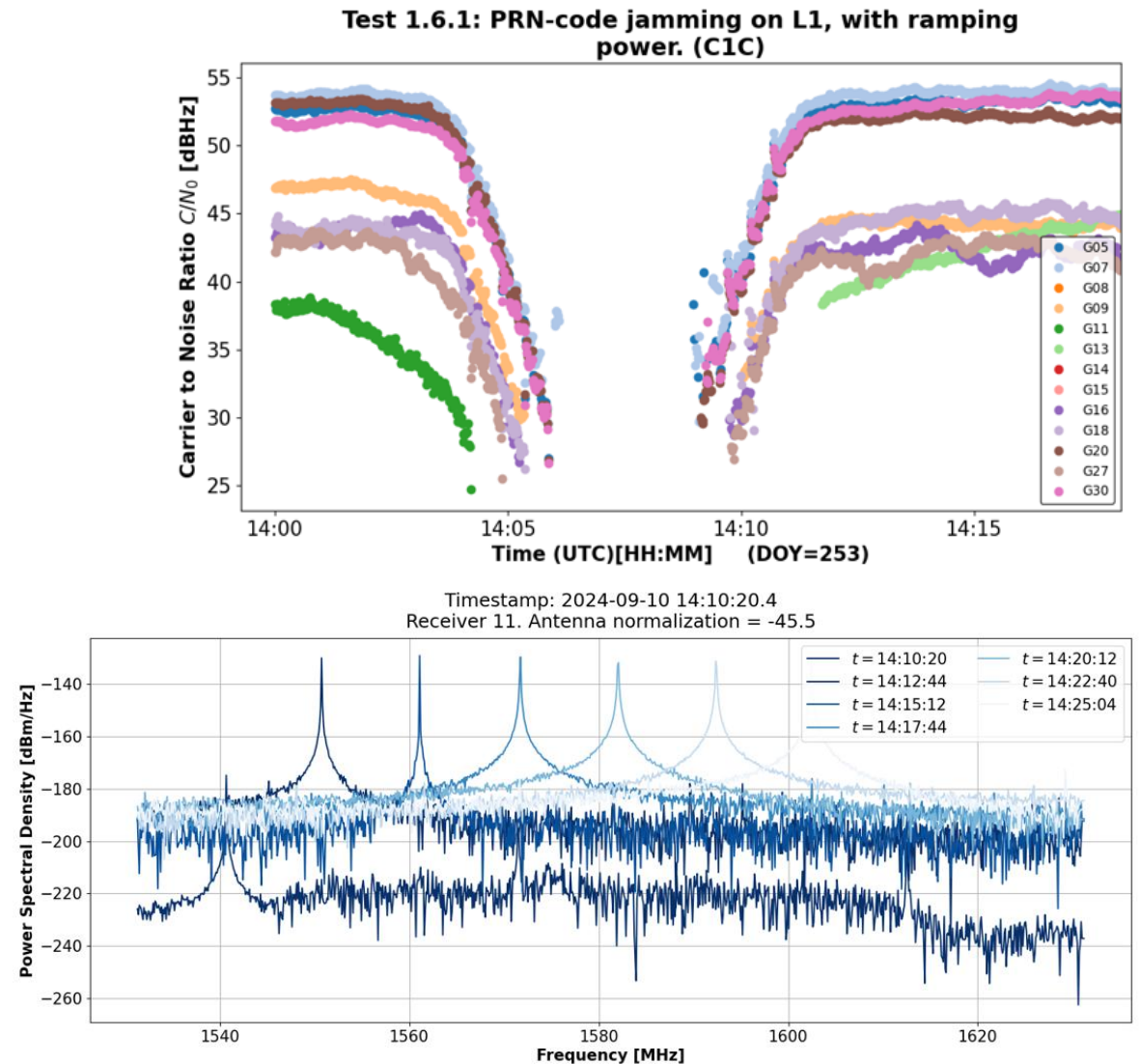
- At 300 stations, the coverage is sufficient for most applications.
- The last couple of years, the focus has been on replacing legacy receiver types, enabling support for all GNSS constellations
- Standardizing on commercially available software solutions, instead of running in-house developed applications.
- Full Beidou-support in both Rinex-files and real-time positioning services is expected this autumn.

Jammertest

NMA is co-organiser of the annual Jammertest at Andøya, a four-day outdoor test laboratory for testing jamming and spoofing resilience of professional and consumer-grade GNSS systems. Participants come from all over Europe and beyond, including surveying, monitoring, automotive and aerospace industries.

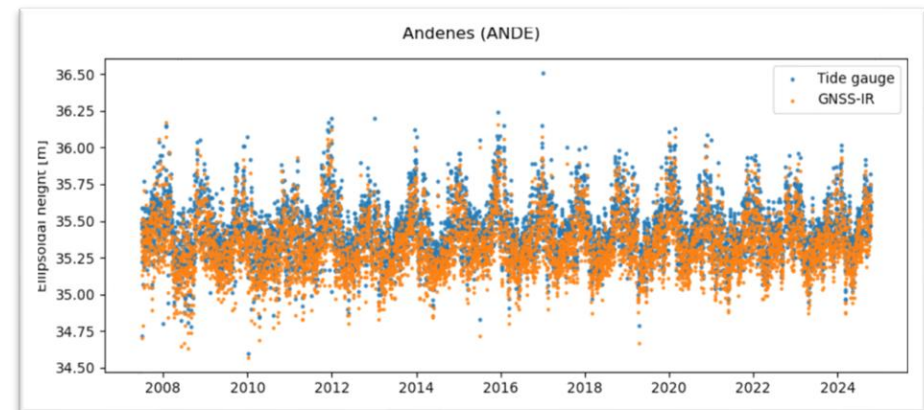
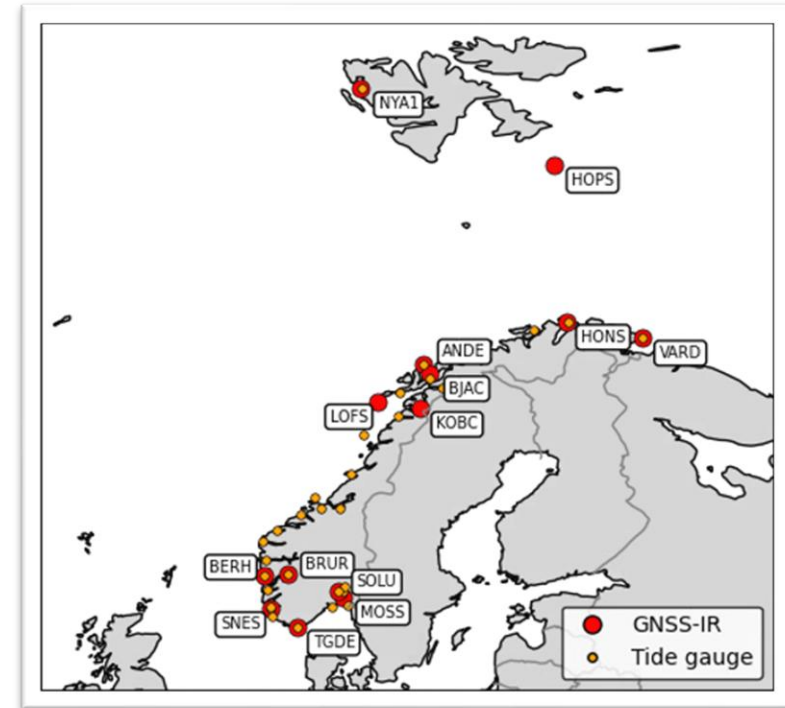
We provide real-time RTCM corrections and near-real-time RINEX data to participants.

We participate in testing of equipment used in our CORS RTK network.



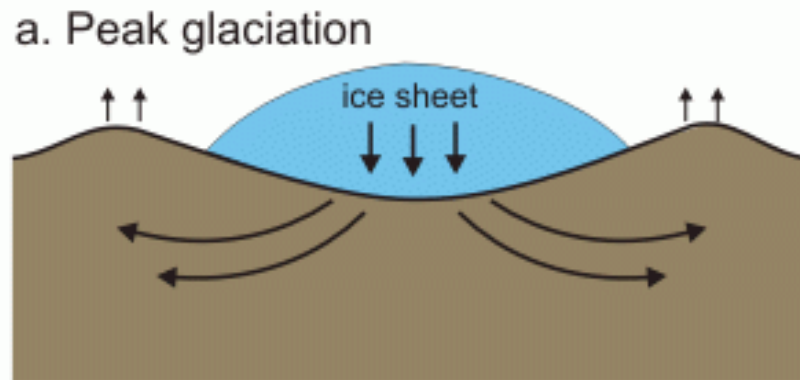
GNSS Interferometric Reflectometry

- Investigations are carried out related to the potential of GNSS reflectometry for water level determination and validation of altimetry data
- Current GNSS station network established for positioning service is used
- GNSS-IR can be useful for water level products:
 - As secondary sensor beside traditional tide gauges
 - Tide prediction
 - Improving the Chart Datum separation models (particularly in remote locations)
 - Controlling the absolute level of traditional water level sensors (especially for pressure sensors planned to use on Svalbard)

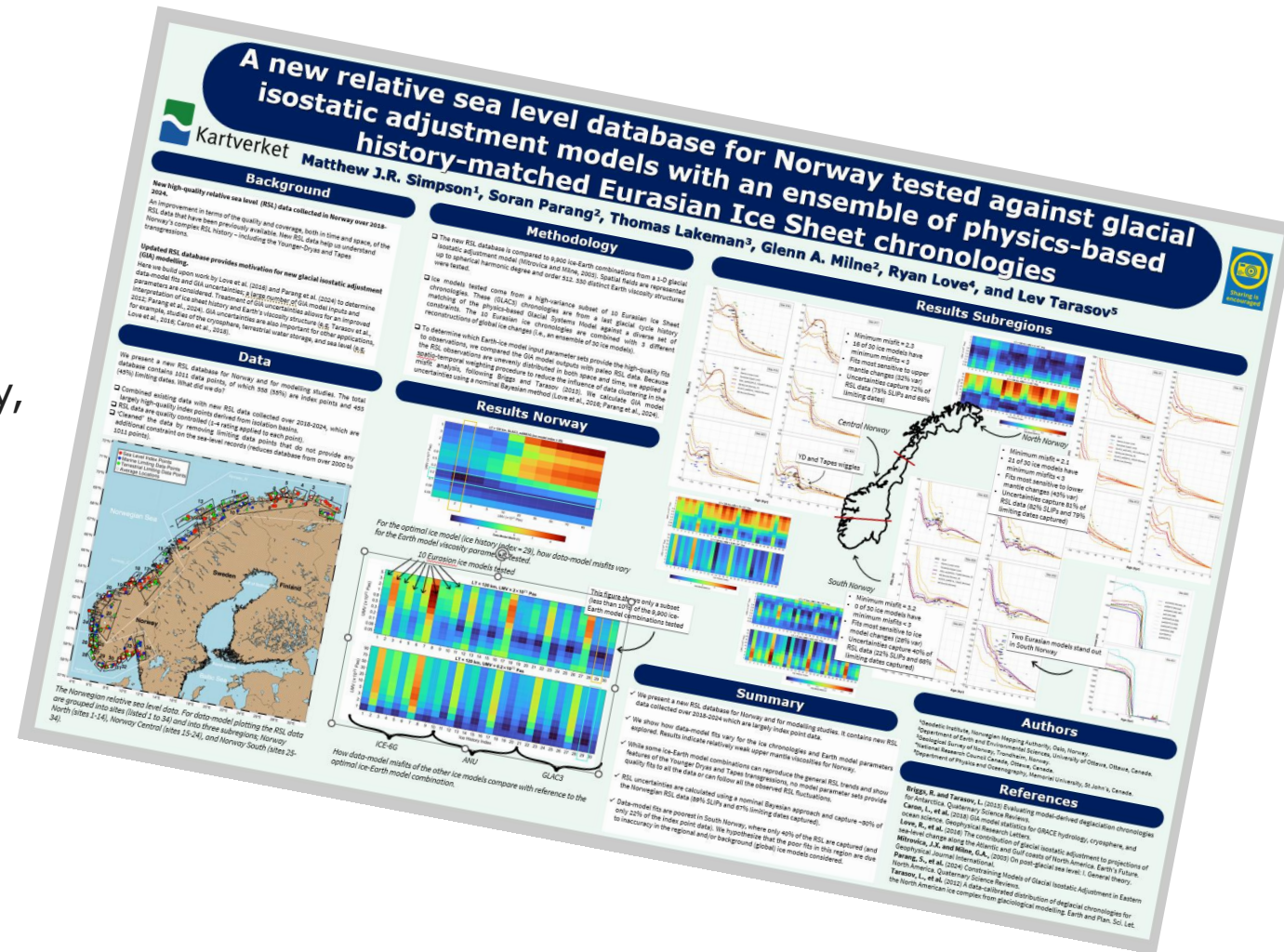


QUANTSEA

- We have put together a new relative sea level database for Norway.
- These data have been tested against a large number of GIA models.
- Result: A better understanding of GIA in Norway, including GIA uncertainties. Presented at EGU 2026.



Courtesy of Tom James

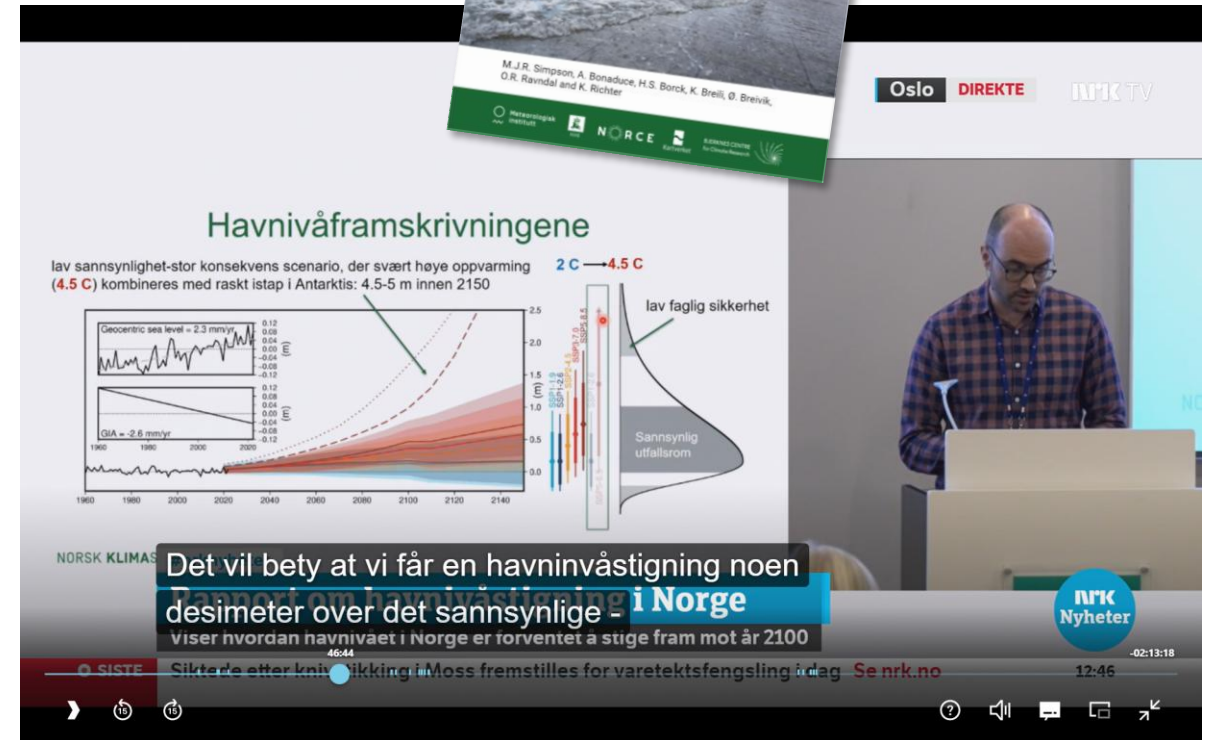


Sea level and coastal water levels

- New sea level report launched 2024.
- Forms part of the knowledge base for planning and climate adaptation along the coast!

Other developments:

- Kartverket is now a partner in the Norwegian Centre for Climate Services (NCCS).
- The Norwegian environment agency recommends Kartverket for the role as Norway's national authority on sea level.





Kartverket