

National report Norway 2018-2022





Education in geomatics (and geodesy) at Norwegian Universities

Init / 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

Director General: Johnny Welle, since 2020

National spatial data strategy:



Kommunal- og moderniseringsdepartementet

Strategi

Alt skjer et sted

Nasjonal geodatastrategi fram mot 2025



Norway - to be a leader in the use of geographic information

The overall objectives and the link to geodesy



artverket

The contribution from geodesy:

- 10 cm for accuracy available for everyone who needs it
- The architecture of the geographic ecosystem is designed for automated updating of the reference frame when necessary
- The vertical reference frame has been updated to support seamless datasets in the coastal zone
- Our R&D expertise makes us an attractive partner for players who want to create good solutions based on geographical information

Geodetic Institute





The observatory at Ny-Ålesund

Full operations at both VLBI antennas from august 2022

- Legacy from 2020
- VGOS from august 2022
- VLBI Analysis provided for the ITRF 2020
- SCG from 2018
- Doris from 2019
- GNSS from 2018
- SLR is expected to be operational from January 2025





SLR

- Dome installed on SLR building April 2022.
- Gimbal and telescope will be installed winter 2023.
- Installation of the rest of the equipment are planned for 2024. Opearationalization 2025.





GNSS infrastructure

An increase of 84 stations since 2018, to the total of 294 as of today.

- Densification along non-electrified railway lines to serve the railway authority
- Leica has shut down their infrastructure and transferred parts to us

Positioning services

- Mainly professional users of the services approximately 15.000
- 4200 users connected to NMA CPOS service
- More than 10.000 users indirectly connected to our geodetic realtime infrastructure via 3rd party service operators.

New infrastructure – Radio spectrometers for Solar Radio Burst (SRB) detection



Real-time GNSS-based monitoring of the ionosphere <u>http://sesolstorm.kartverket.no/</u>



https://swe.ssa.esa.int/web/guest/rtim-





Services

Operational prototype of forecast of space weather impact on GNSS in Scandinavia

https://norgeskart.no/romvaer



Details regarding the forecast model can be found in the paper "GNSS positioning error forecasting in the Arctic: ROTI and Precise Point Positioning error forecasting from solar wind measurements" https://doi.org/10.1051/swsc/2021024.

National reference frames

- Reports on reference frames:
 - How to facilitate the adoption of new reference frames
 - How to realize an updated height system
- We have developed methods for calculating separation models between height systems on land and sea. The first version of the models is ready.
- There is need for extensive data collection before the realization of a new height system. So far, progress has been slow due to limited funds.
- We have developed new transformation routines based on PROJ
- All national geodetic standards are under revision and will be adapted to current ISO-standards

















Intelligent Transport Systems

- PISI Point cloud in real time
 - Manage and distribute point clouds along the roads (mobile mapping)
 - Cooperation with Norwegian Public Roads Administration, and maybe private sector at a later stage
 - Experiments with updating a point cloud in real time while driving
- TEAPOT Technology for advanced positioning within the transport system
 - Gain experience with sensors for navigation in nordic weather
 - Experiments with lidar navigation
 - For navigation purposes, do we need point cloud along the roads? (PISI)
- HyPos Hybrid Positioning system
 - Testing and experience with GNSS SSR
 - 5G as a positioning system
 - Hybrid, how can these technologies complement each other







Publication currently being prepared:

Study of time- and distancedependent degradations of network RTK performance at high latitudes in Norway

Knut Stanley Jacobsen, Nadezda Sokolova, Anders Martin Solberg and Mohammed Ouassou



SINTEF





Kartverket have published several papers on land uplift and crustal deformations in Iceland, Svalbard and Fennoscandia

Ny-Ålesund and Svalbard

- Study on how seasonal variations in glacier, weather and climate explain the annual variations seen in the geodetic measurements in Svalbard.
- □ Study of the relation between accelerating uplift and the increased melting of Svalbard glaciers. The paper also discusses the possible impact on ITRF2020 and is a basis for further geophysical investigations on Svalbard.

Fennoscandia

A new GNSS velocity field for Fennoscandia and Northern Europe (the BIFROST solution) was established and compared to isostatic adjustment and other geophysical phenomena. The model is the basis for the land uplift model NKG2016_LU and velocity field NKG_RF17vel

Iceland

Resume of the NKG work on dynamical reference frame on Iceland (DRF-Iceland project). The paper discusses the possible solutions for a reference frame in a tectonic active area. Figur 2: Glacial induced uplift in Svalbard for the period 1990-2010 (left) and 2013-2018 (right)



Figur 3: Land uplift and intraplate deformation in Fennoscandia





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