



# NATIONAL REPORT FROM SWEDEN – WGRF AND WGFP

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NKG SCIENCE WEEK, REYKJAVIK, ICELAND, 9–11 MARCH 2020

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LANTMÄTERIET



# LANTMÄTERIET'S RESPONSIBILITY

“to meet the society’s needs for a homogeneous, sustainable geodetic infrastructure and to guarantee its availability and use”



# DEPARTMENT OF GEODETIC INFRASTRUCTURE

## Geodetisk Infrastruktur



*Tillgodose samhällets behov av en enhetlig,  
hållbar geodetisk infrastruktur samt säkerställa  
dess tillgänglighet och användning*



## Referenssystem

SWEREF 99  
RH 2000



## SWEPOS

Positioneringstjänster

## Geodetisk mätning och stöd

Råd och stöd  
HMK



# REVIEW AND UPDATE OF SWEREF 99



Original SWEREF 99 campaign

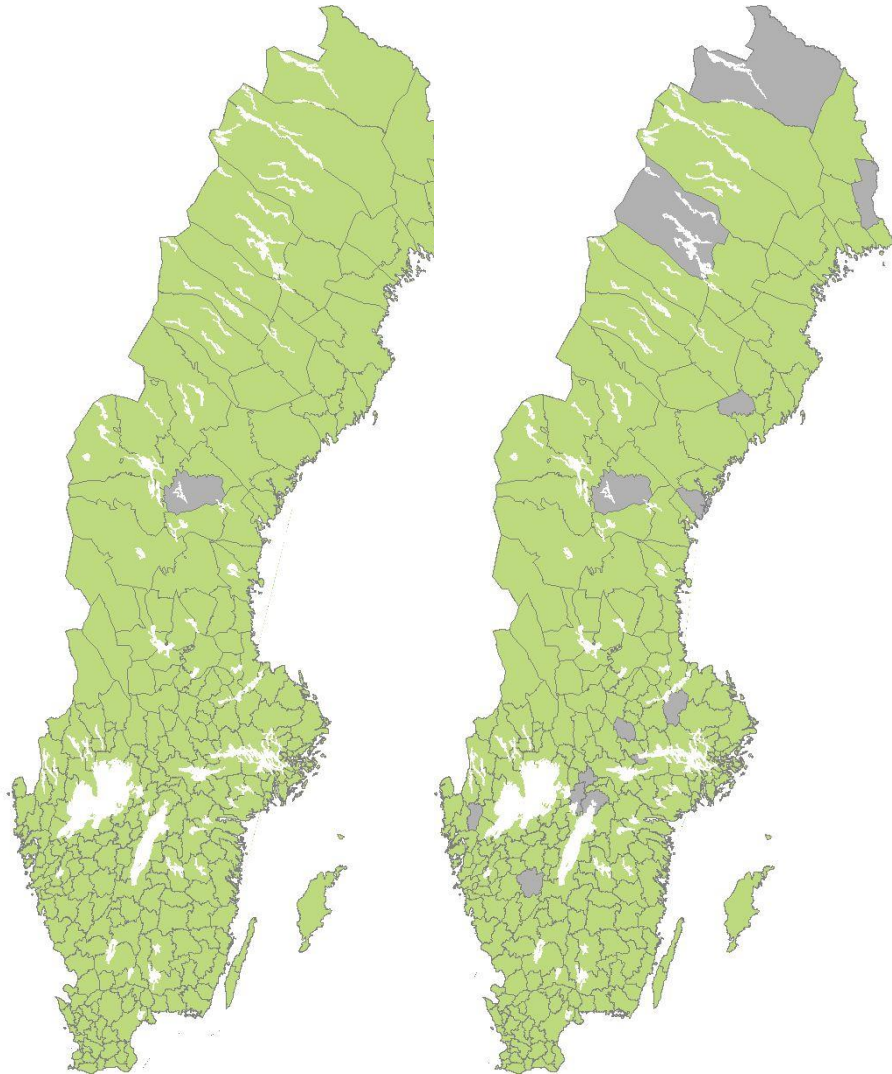
- Updated SWEREF 99 coordinates on SWEPOS stations will be based on a GNSS solution from autumn 2019 and NKG solutions and products
- Important that
  - Coordinate processing prior and after the update will be consistent
  - Users of the SWEPOS services obtain the same coordinates as 1999 possible within the uncertainty limits

# PCO/PCV FROM SWEPOS STATION CALIBRATION

- Estimated vertical PCO/PCV from SWEPOS station calibration obtained from in-situ calibrations (see picture) have been compared with the IGS type mean model
- No significant differences (mean  $< 0.05$  mm/year) in the vertical velocities obtained from the different PCO/PCV models



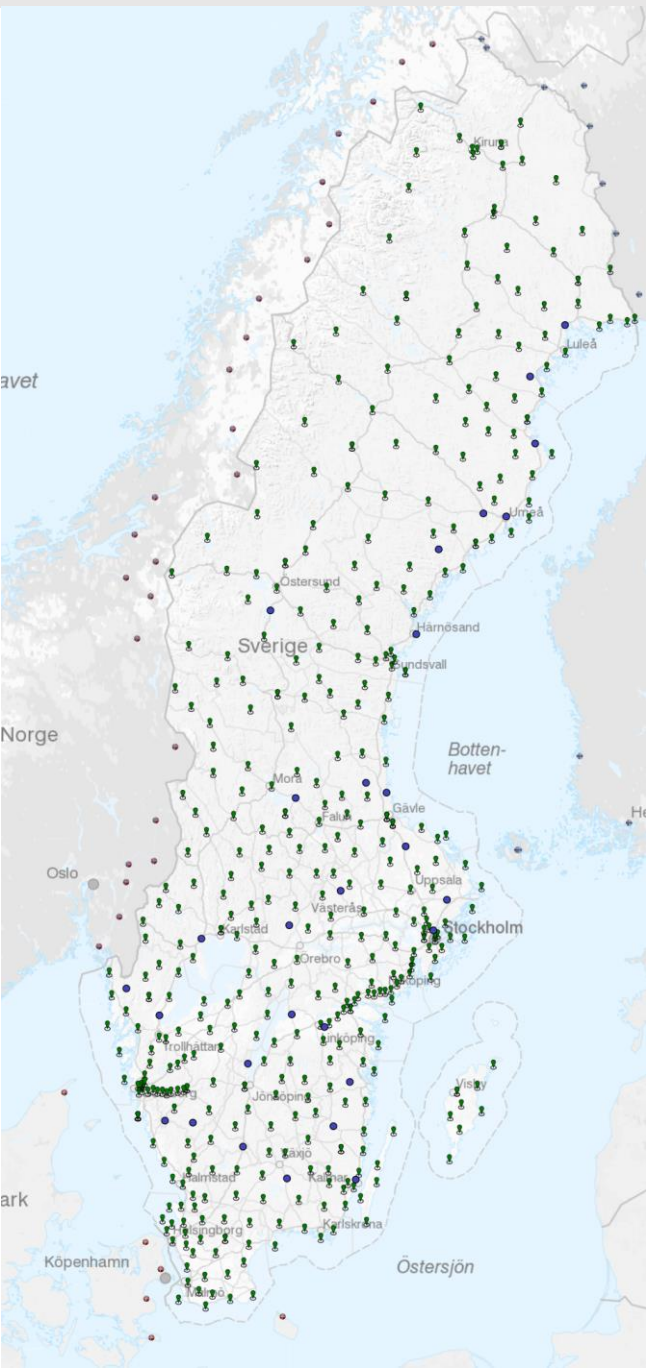
# SWEREF 99 AND RH 2000



- Out of the 290 Swedish municipalities
  - 289 have introduced SWEREF 99
  - 276 have introduced RH 2000
- The policy for the maintenance of the national geodetic control networks has been updated
  - Passive points
  - Active stations (SWEPOS)



# SWEPOS – MODERNISATION AND STATION DENSIFICATION



48 Class A



399 Class B

64 External

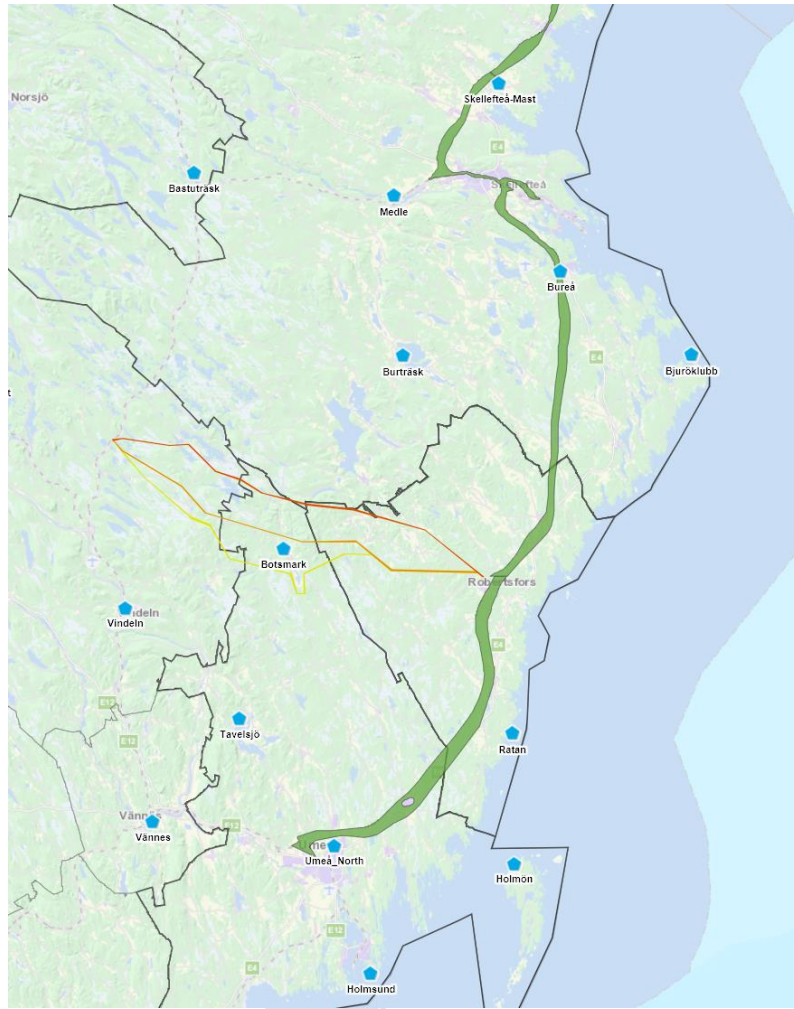


Reference station receivers  
exchanged to Trimble Alloy  
and Septentrio PolaRx5

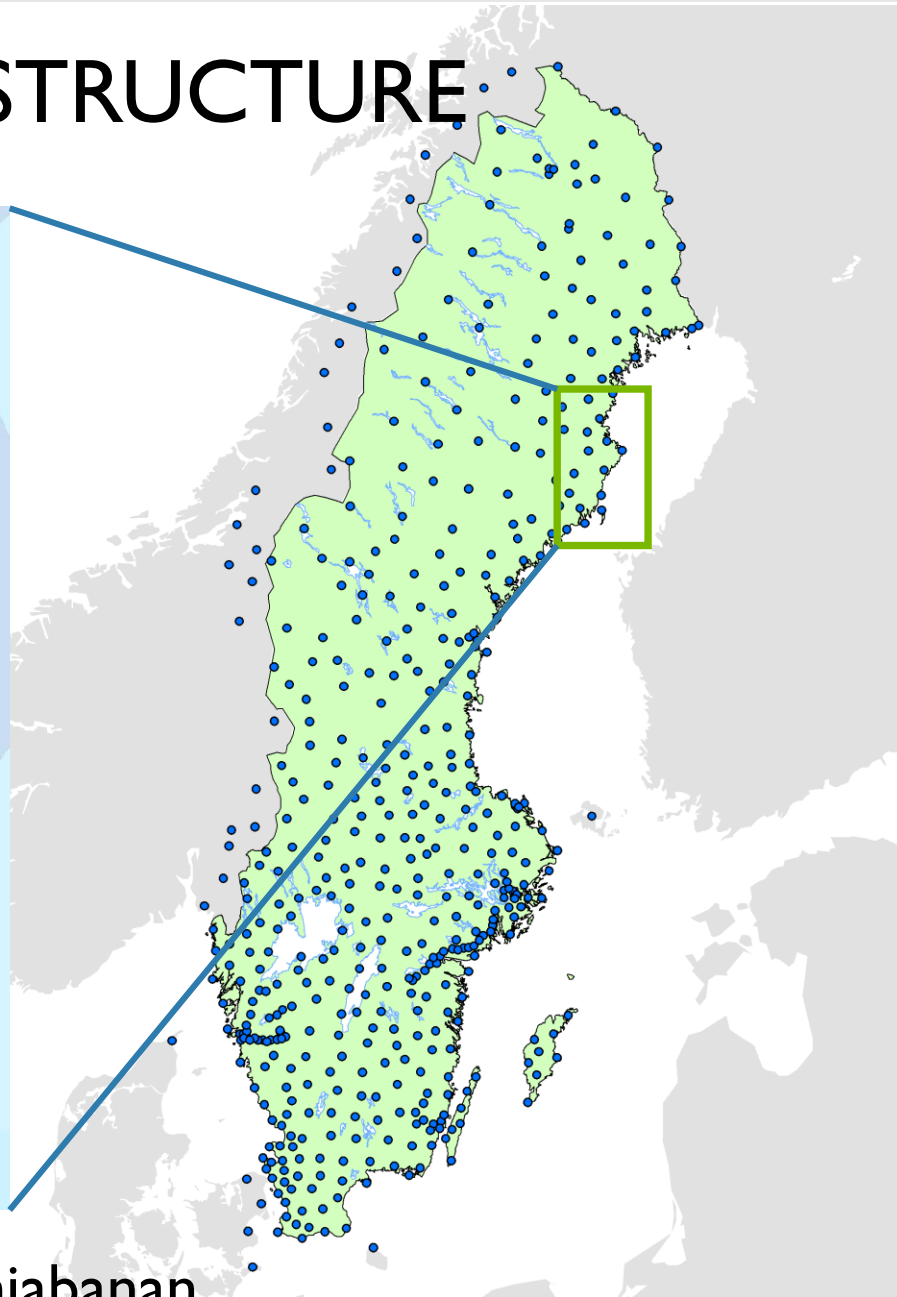
# PROJECT ADAPTION FOR NEW INFRASTRUCTURE



New stations for network RTK



New project: Norrbotniabanan





# SWEPOS ACTIVITIES



Bild: SWEPOS

- 5400 paying network RTK subscriptions
- Test measurements with BeiDou coming up
- Launch of dual data centres during March 2020 to further increase availability and redundancy in services and GNSS data

# EXAMPLE OF TWO ONGOING PROJECTS



- Network RTK Positioning for automated driving (NPAD)
  - Financial support by Vinnova
  - Objective to enable network RTK positioning for a large number of automated vehicles or other mobile platforms on land by applying the standard developed by 3GPP and adapting the existing SWEPOS infrastructure

- Prepare ships
  - Horizon 2020 project
  - Using EGNSS, to allow vessels to navigate safely in close proximity to each other and to stationary objects and creating structure for autonomous maritime navigation



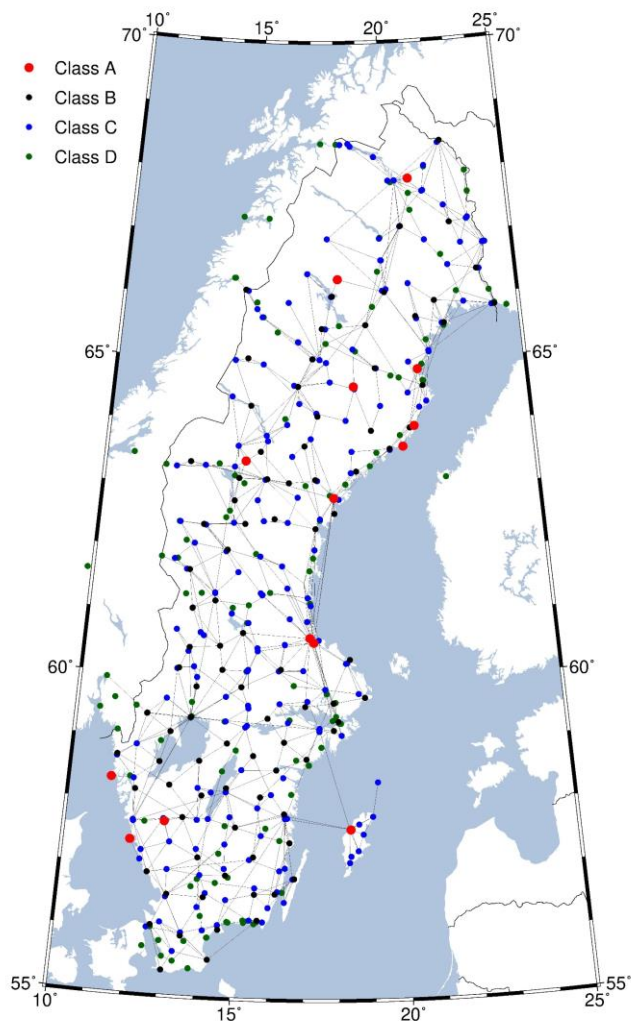
# DOCTORAL DISPUTATION



Picture: Samieh Alissa

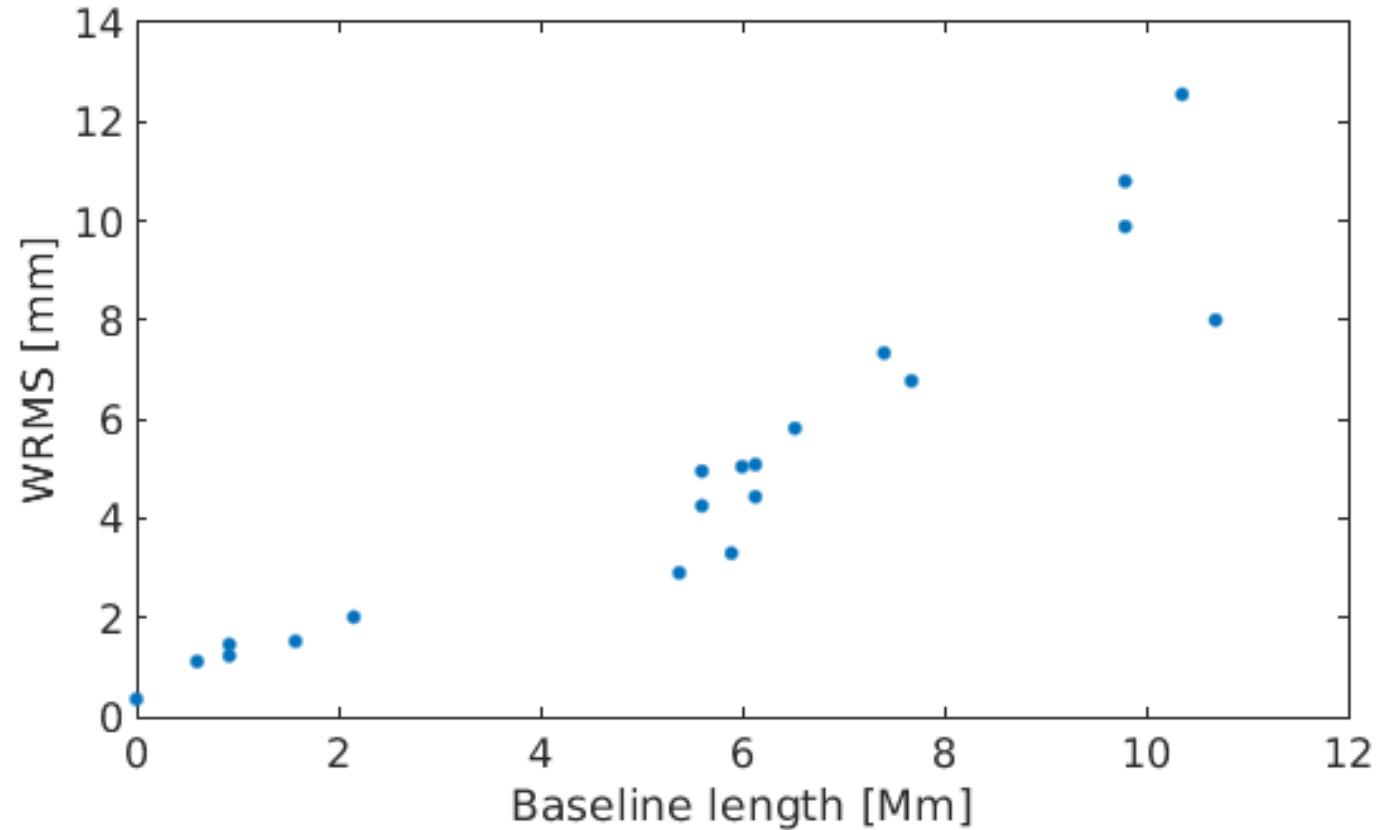
- On 28 February 2020, Martin Håkansson defended his doctoral thesis “GNSS hardware biases in code and carrier phase observables” at KTH, Stockholm
- Available on [www.diva-portal.org/smash/record.jsf?pid=diva2:1390435](http://www.diva-portal.org/smash/record.jsf?pid=diva2:1390435)

# NEW SWEDISH GRAVITY FRAME RG 2000



- Report on the work and results of our new gravity frame RG 2000 is available on <https://www.lantmateriet.se/globalassets/kartor-och-geografisk-information/gps-och-geodetisk-matning/rapporter/lantmaterirapport-2019-3.pdf>

# ONGOING VLBI REANALYSIS



- Baseline length repeatabilities for the VGOS sessions 2017–2019

- Reanalysis of all VLBI sessions 1979–present
  - Possible contribution to ITRF2020
  - In cooperation with Onsala Space Observatory

# NEW VERSIONS OF OUR TRANSFORMATION SOFTWARE GTRANS

- Gtrans version 4.0 released before summer
  - Transformation estimation (2D)
- Gtrans version 4.1 released before the end of 2020
  - Transformation estimation (3D)
  - Proj (handling epochs and NKG transformations)

# NATIONAL BOUNDARY SWEDEN-NORWAY



- Common inspection 2020–2024
  - All boundary markers to perfect shape
  - 5 metres wide cutting
  - RTK positioning of all boundary markers



Pictures: Kartverket and Martin Lidberg

# QUESTIONS?



Picture: Gerd Johanne Valen

# Thank you for your attention!

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### Dan Norin & Lotti Jivall

NKG Science Week, Reykjavik, Iceland, 9–11 March 2020