National report from Norway

by

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Outline

- ***Reference networks***
  - ✓ ***Densification of the EUREF89 (ETRF89) network.***
  - ✓ ***General plan for leveling and calculation of a new height system***
- ***Permanent stations and RTK-services***
- ***Transformations from ITRF current epoch to ETRF89***

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Hierarchy of the EUREF89 network

- **3D-stations**
  - ✓ 130 stations. The first realization of ETRS89 in Norway
  - ✓ 1994-1995
  - ✓ Processed by use of Gipsy
- **Stamnett (1st order network)**
  - ✓ 770 points calculated in 1996
  - ✓ Adjustment of vectors of length ca 20 km
- **Landsnett (2nd order network)**
  - ✓ A densification of Stamnett
  - ✓ 10657 points so far…
  - ✓ Completed in 2007
- **Old triangle network**
  - ✓ All points recalculated. Completed in 2007
  - ✓ More than 50 000 points

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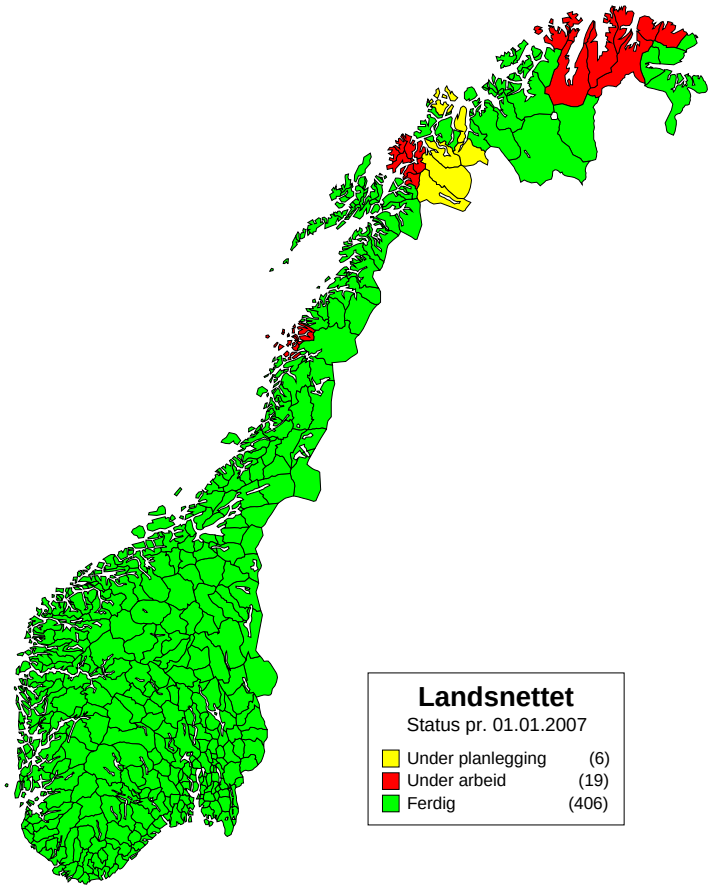
Landsnett (2nd order network)



- *Established in 406 of 431 municipalities*
- *The municipalities, the road authorities and other official and private organizations supports financially*

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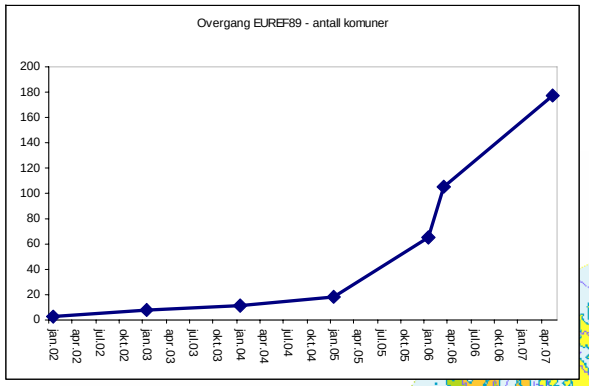
EUREF89 in the municipalities



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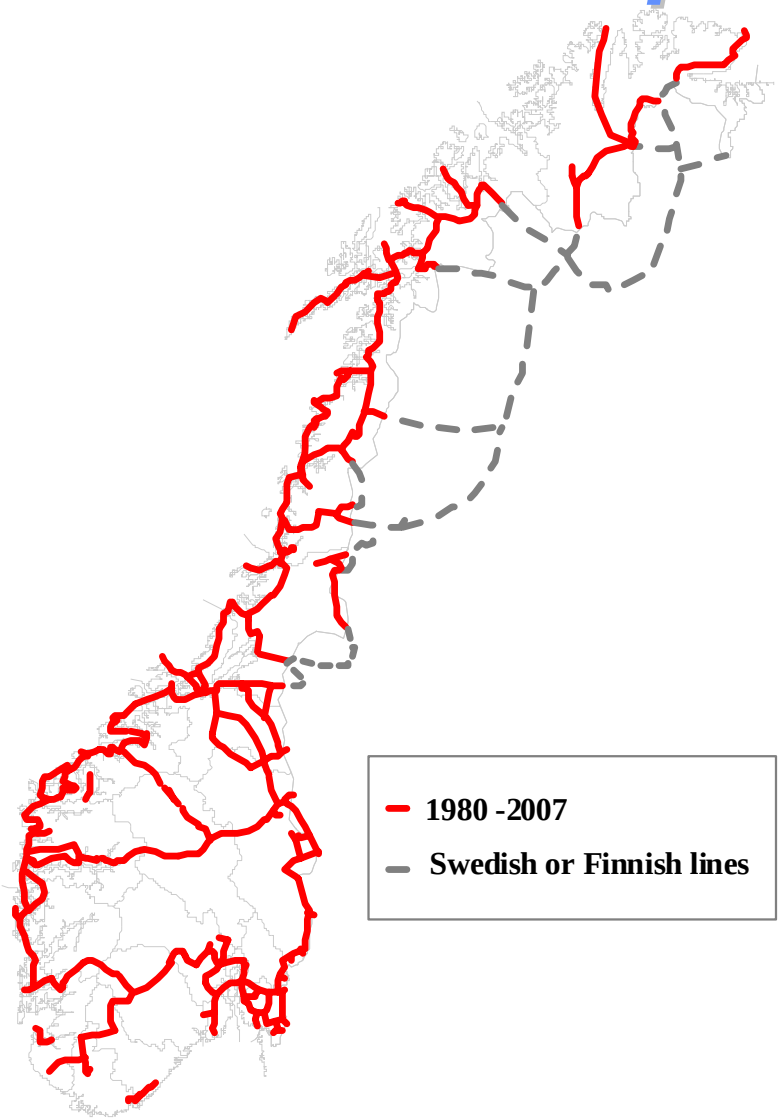
General plan for leveling



- *The project started in 1980 as a cooperation with Sweden, Finland and Denmark within NKG*
- *The plan has been revised many times*
- *10 000 km has been leveled (360 km/yr)*
- *The whole network consist of are 20 000 1st order bench marks (many of the old ones are destroyed.)*

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New height system

- An extension of the new height systems in Sweden and Finland
  - Fundamental point is ‘New Amsterdam Peil’
  - Normal heights
  - Epoch 2000
  - Zero tidal system
  - A slightly different land uplift model may be used
- Name: NN2000
- Final adjustment of the 1st order leveling network in December this year.

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NN2000-heights in Landsnett (2nd order network)

- *Some Landsnett-points are leveled, but most of them are GPS-measured and have ellipsoidal height only.*
- *However, a geoid model fitted to 2 100 gps/leveling points (height reference model) gives NN2000 heights better than 3 cm in non-leveled Landsnett-points.*
  - ✓ *If the distance to the nearest gps/leveling point is more than 10-15 km the accuracy is poorer*
- *More than 2000 km more leveling is necessary to obtain reliable NN2000 heights in the Landsnett countrywide*

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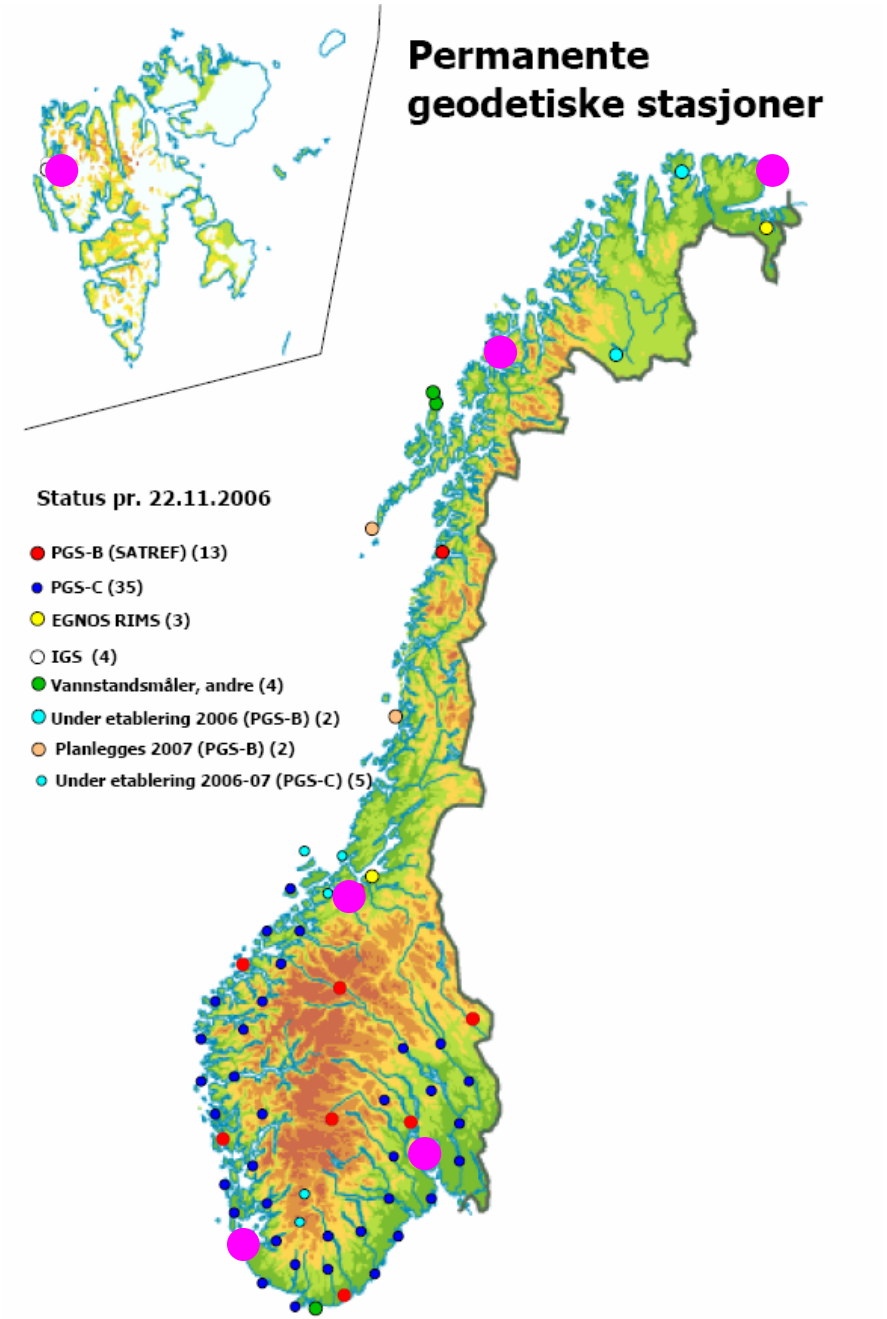
EUREF station



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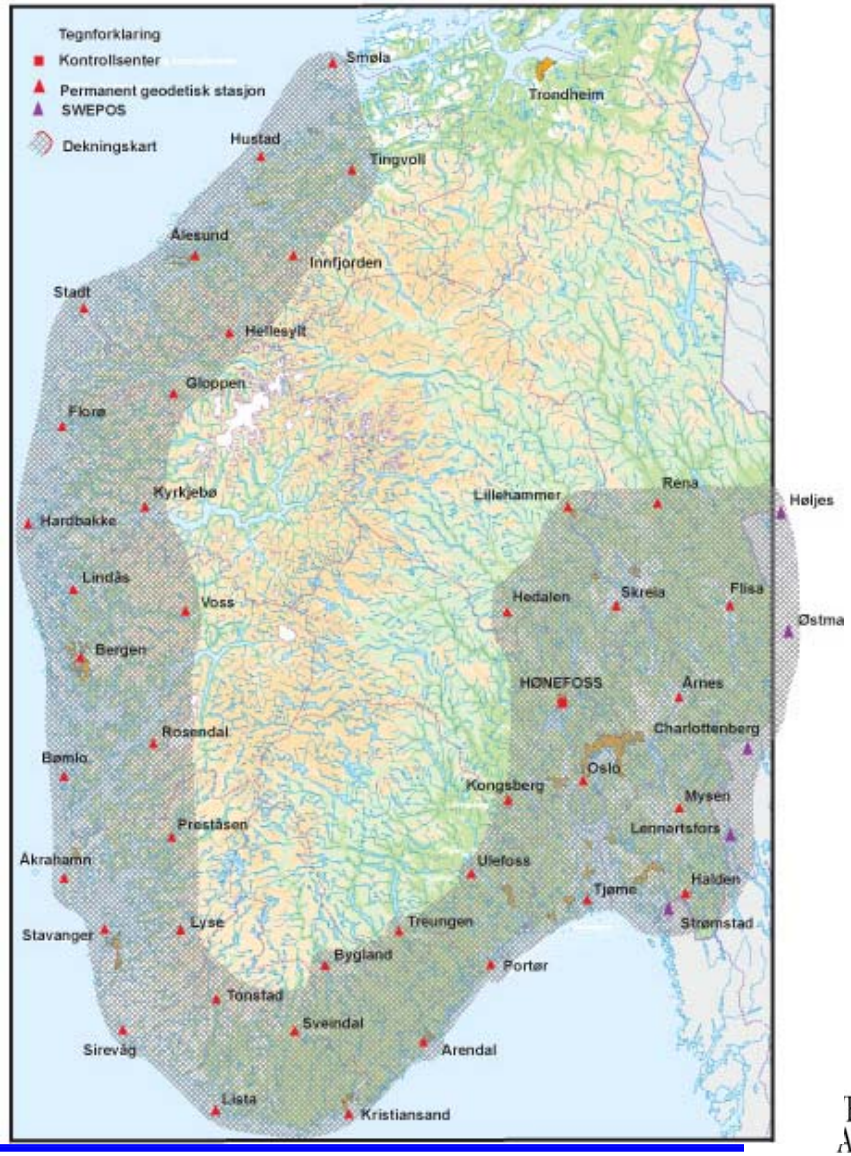
RTC-services

- *210 customers*
- *The net of stations is extended based on local demand.*
- *Establisment and operation is paid by the customers.*
  Need 4 users in two years pr station. (NOK 25 000 pr user pr year)
- *Cpos consists of 47 permanent stations*



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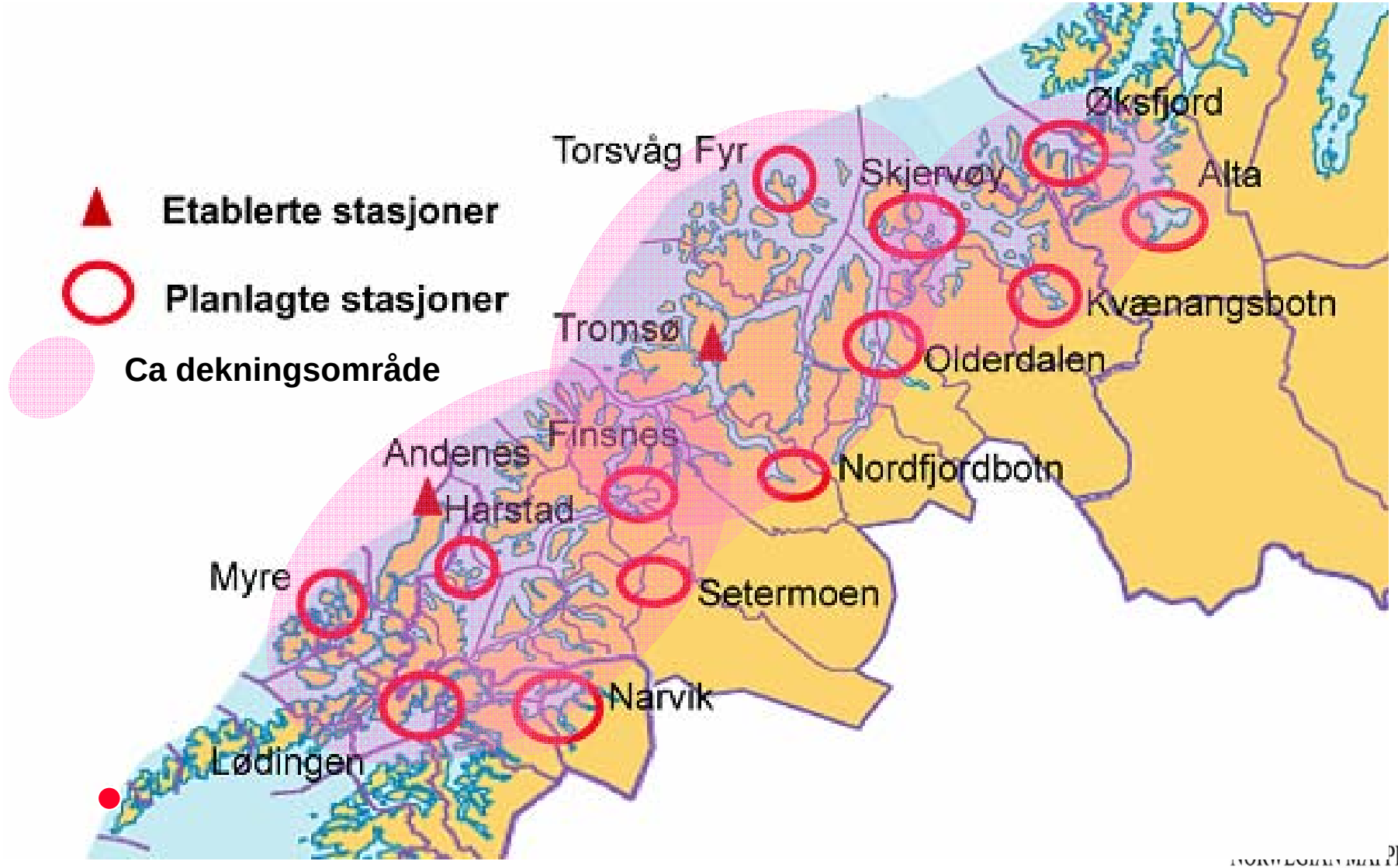
RTC-services (extention)



From ITRF to ETRF89 Publication I

Transformation from a Common Nordic Reference Frame to ETRS89 in Denmark, Finland, Norway, and Sweden – status report

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Abstract

The Nordic countries have implemented national realizations of ETRS89. Depending on when the realizations were made and on which ITRF the realizations are based, there are differences between the realizations up to a few cm. The national realizations have already been introduced to the users and will not be replaced. In this paper we present the transformations from the new developed common Nordic reference frame, NKG_RF03, to the official national ETRS89 realizations. The transformation is performed in two steps. First step is to correct for intraplate deformations using a new developed three dimensional velocity model, NKG_RF03vel. Second step is to perform a seven parameter transformation for each nation.

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From ITRF to ETRF89 Publication II

An Approximate Transformation from ITRF2005 Current Epoch to EUREF89(ETRF89) in Norway for Offshore use.

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Abstract

The Offshore sector has requested a transformation from ITRF2005 current epoch to EUREF89(ETRF89). So far sufficient data are not available to make such a transformation with geodetic accuracy (better then 1 cm). An approximate transformation is therefore released. The transformation gives EUREF89 coordinates within -3 cm to +3 cm in north and east components, and within -6cm to +6 cm for the vertical component at epoch 2007.0

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