EUREF 2005 Symposiumm
1-3 June 2005, Vienna, Austria

National report of Finland

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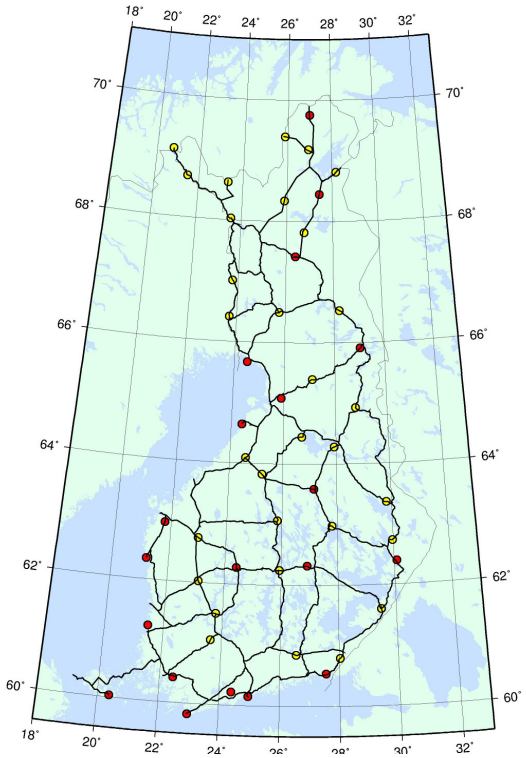

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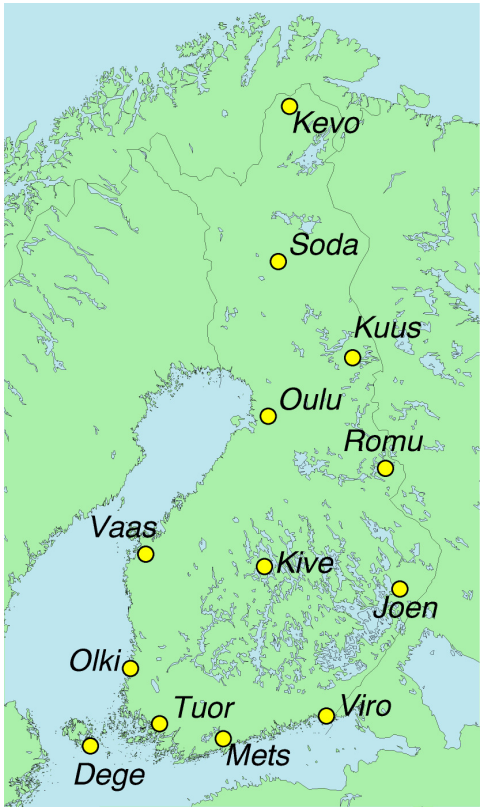
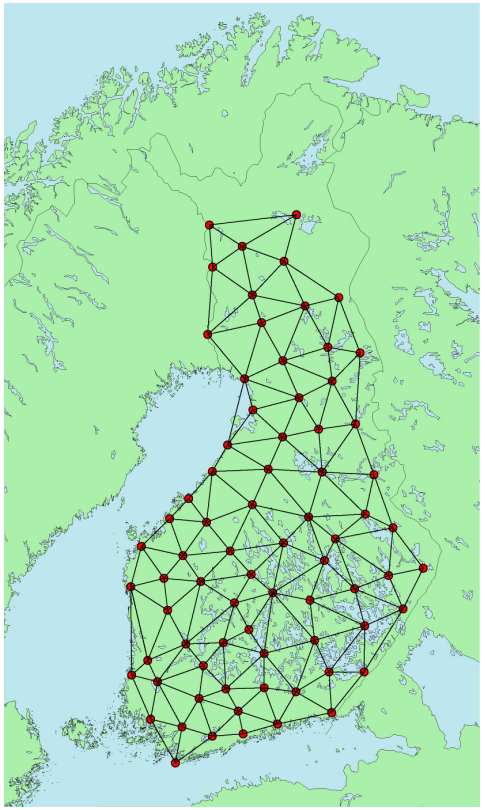
The permanent GPS networks



FinnRef, FGI
13 stations
4 EPN stations
1 IGS station
Recording interval 30 sec



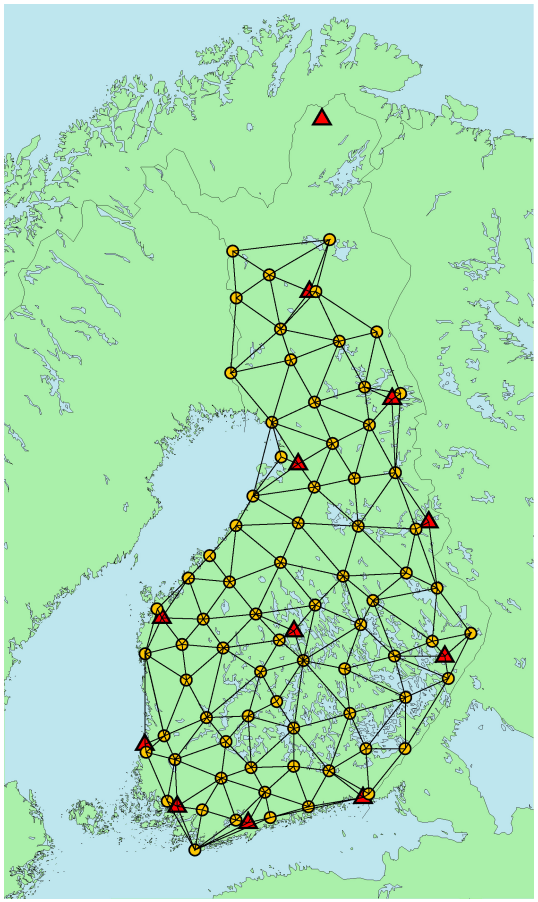
GPSNet.fi, Geotrim Ltd.
74 stations (15.5.2005)
Recording interval 1 sec
RTK, VRS and DGPS solutions

Introducing ETRF89 into the new permanent network

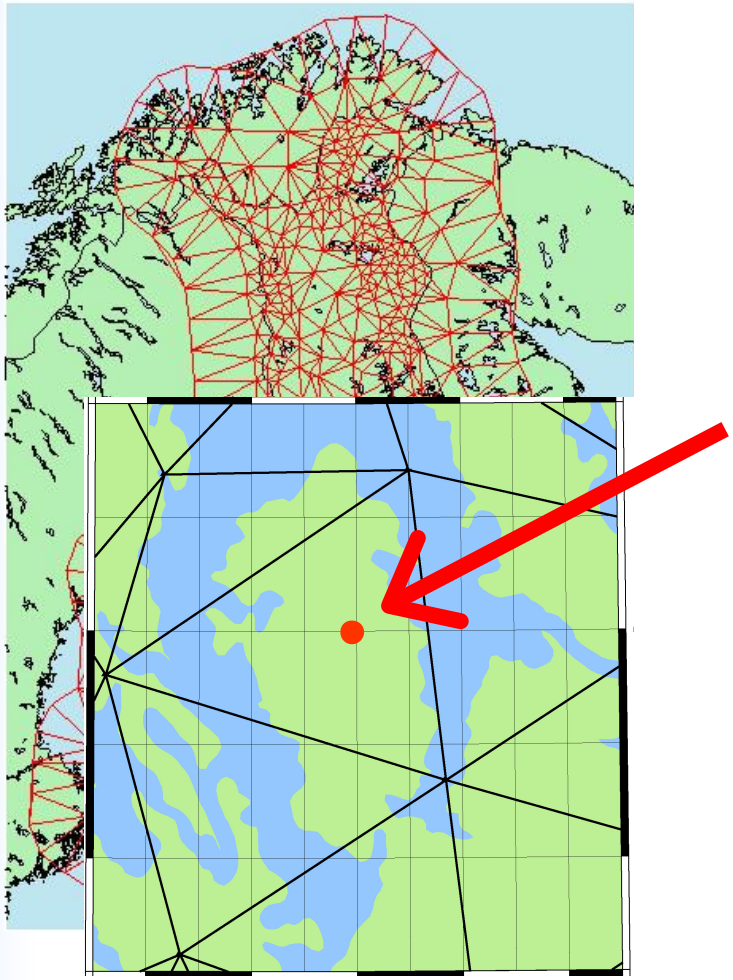
The ETRS89 is realized by the 12 stations of the FinnRef-network.

FinnRef and GPSNet.fi networks have no common stations.

The ETRS89 sytem is introduced into the network using the coordinates of the FinnRef stations (ETRS89) as initial cordinates in the determination of the coordinates of the new stations.



Introducing ETRF89 over whole country



The 7-parameter transformation between ETRF89 and National Grid Coordinate system (kkj) gives RMS accuracy of ±0.5 m.

2D transformation from ETRF89-TM35 to the National Grid Coordinate System is made using the affine transformation in a triangle,

The transformation is made using the coordinates of the vertices of the triangle, in which the point to be tranformaed is located.

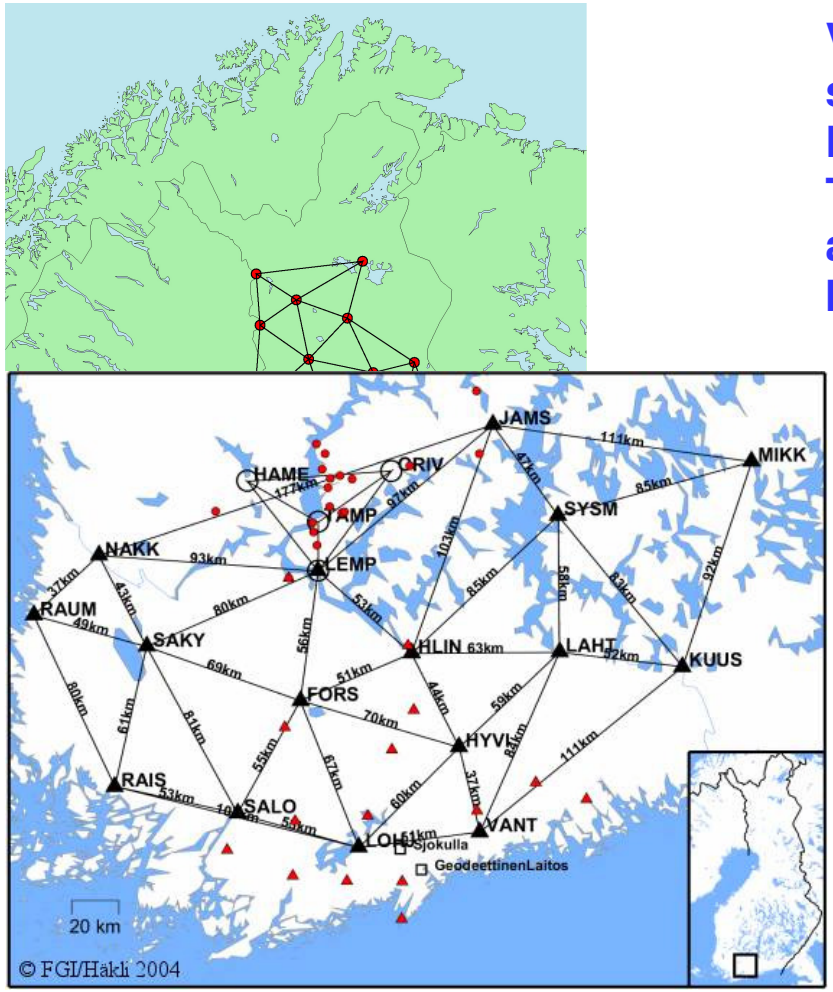
The affin transformation is solved and the transformation is performed.

$$x_2 = \Delta x + a_1 x_1 + b_1 y_1$$

$$y_2 = \Delta y + a_2 x_1 + b_2 y_1$$

Testing the affine transformation at 684 points
RMS of the residuals: N = ±0.02 m, E = ±0.02 m
Max. residuals: N = 0.11 m, E = 0.12 m

Testing the VRS solutions



The active stations of the VRS network of Geotrim Ltd. in 2005 May 18. *http://gpsnet.fi/*

VRS measurements were studied at two separate VRS networks in Southern Finland :
The network of Geotrim Ltd. (GPSNet.fi) and the network of Tampere region (run by the City survey of Tampere)

Test sites: 33 benchmarks with known ETRF89 coordinates.

n = 2152	North (mm)	East (mm)	Height (mm)
RMS	23	14	35
95%	39	28	67
99%	59	37	100

EUVN_DA activity

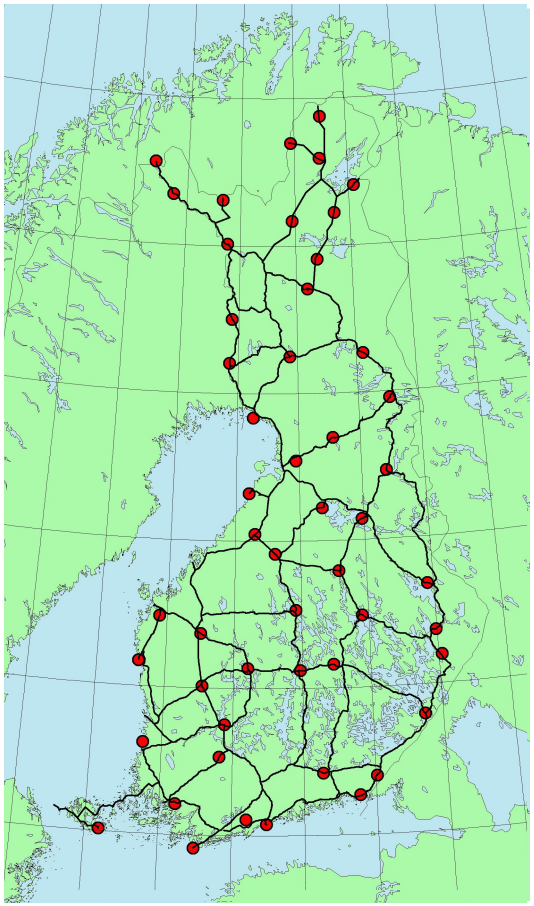
The number of the accepted EUVN_DA stations is 20. The network is too sparse to fulfill the EUVN_DA requirements.

30 precise levelling benchmarks were selected for GPS densification.

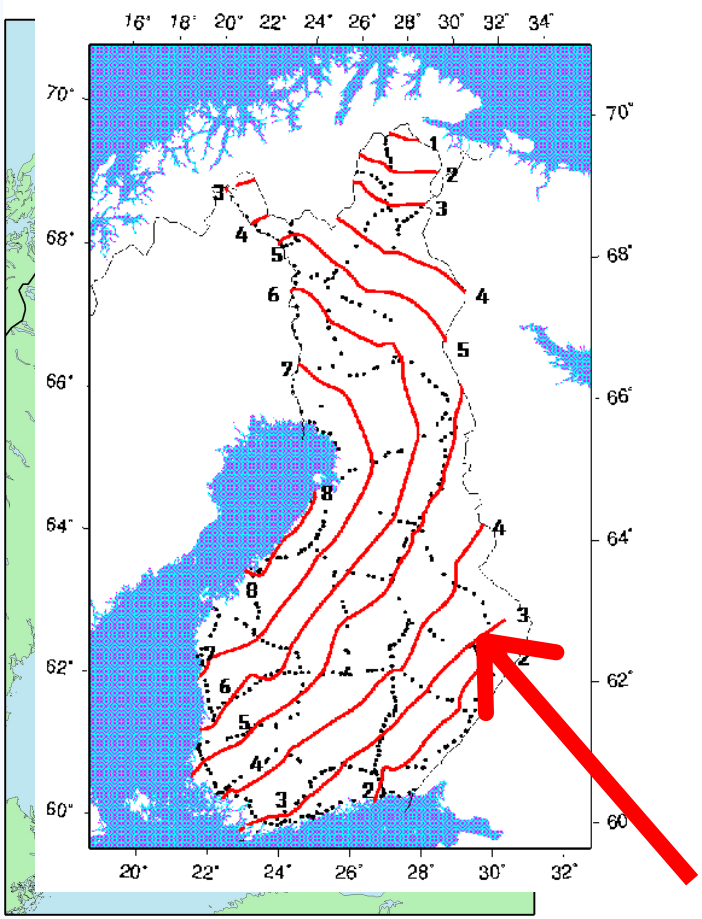
The densification stations will be connected to ETRF89 vie FinnRef, but because the distances from the permanent stations are long ...

... we will use the data from GPSNet-stations in the solution, in order to strengthen the solution.

The final EUVN_DA network consists of 50 stations.



Precise Levelling



The field work of the Third Precise Levelling was completed in 2004.

About 211 km of double-run levelling was performed in 2003 by three field teams using the Zeiss DiNi12 digital levels.

The Ministry of Agriculture and Forestry nominated a working group to study the need for changing the national height system (N60).
According to the report given by the working group the Finnish national height system (N60) should be replaced by a new one, which is based on the following main principles:

The initial level of the height system will coincide with the new European height system EVRS2000.

The height system is based on normal heights.

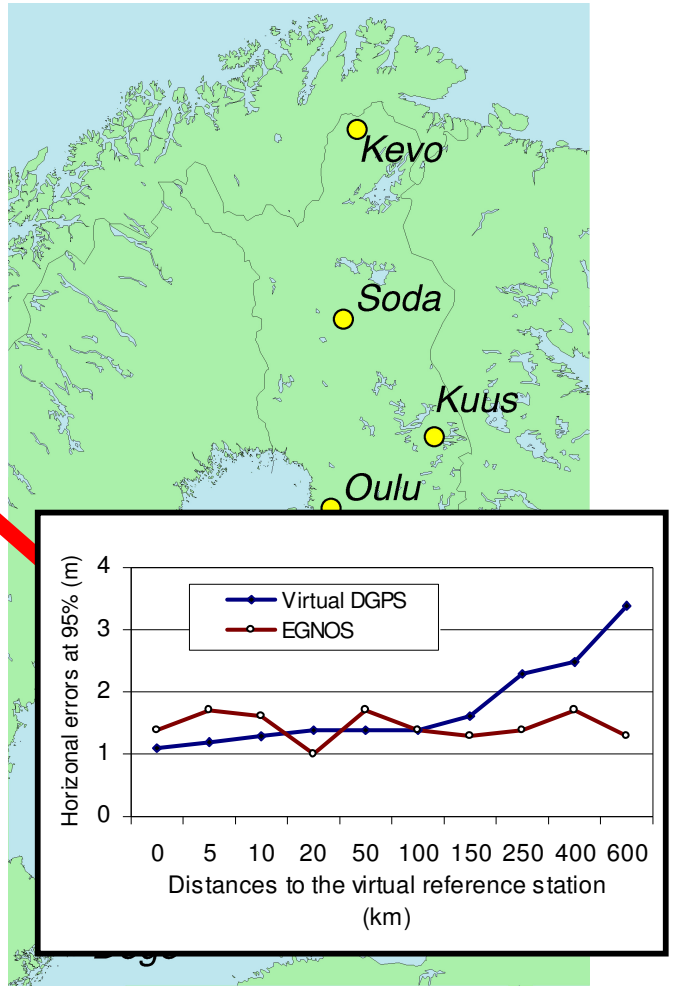
The tide correction is computed according to the zero tide.

The land uplift will be reduced to the epoch 2000.0.

Navigation

EGNOS RIMS Station

The EGNOS (European Geostationary Navigation Overlay Service) RIMS (Ranging and Integrity Monitoring Station) station at Virolahti, was fully deployed during 2004.



Virtual DGPS based on EGNOS signal

The basic concept is to convert the EGNOS signal to RTCM signals, and broadcast the converted RTCM signals over wireless Internet using Internet Radio technology.

Two test cases have been carried out with the prototype system. The test results show that the positioning accuracy of the virtual DGPS solution is about 1-2 meters at 95%,

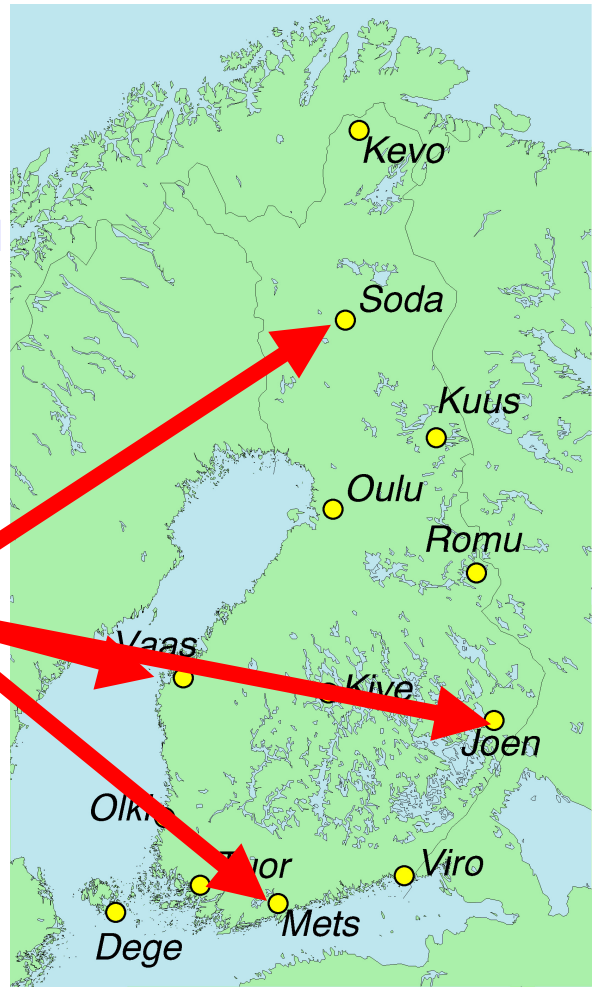
Real-time Data Communication System for FinnRef

Developing a new data communication system for the FinnRef has been ongoing since 2004.

The system employs the Virtual Private Network (VPN) solution based on IPSec tunnels over Asymmetric Digital Subscriber Line (ADSL). The IPSec tunnels connect the permanent GPS stations at the remote sites to the Local Area Network (LAN) network at the FGI.

The new data communication system was installed at four stations belonging to the EPN, viz. Metsähovi, Joensuu, Vaasa and Sodankylä, in 2004.

The installation of the system in the remaining stations of FinnRef will be completed by the end of 2005.



Metrology

The FGI is the National Standards Laboratory of acceleration of free fall and length.

Gravity
National gravity network,
Absolute and relative gravity
Recording of temporal gravity

Calibrations
Height determination instrume
EDM instruments

Nummela Standard Baseline
The new office and store building and roofed observation pillars were build up in 2004.

Metsähovi Research Station

Instrumentation:

Satellite Laser Ranging (SLR)
GPS receiver
GLONASS receiver
DORIS beacon
Superconducting gravimeter
Absolute gravimeter
Seismometer
Geodetic VLBI

SLR

During 2004 a total of 294 orbits of 18 satellites were observed.
A new laser system was got as a loan from the *SLR station of the Austrian Academy of Sciences at Graz*.

GPS & GLONASS

Station belongs to IGS, EPN and FinnRef networks and takes part to IGLOS project.

DORIS

The Doris beacon continued its operation.

Superconducting gravimeter:

Vertical motion due to loading by the atmosphere and by the Baltic Sea were studied using the observations of the superconducting gravimeter

Geodetic VLBI

The VLBI observations were started in co-operation with the Metsähovi *Radio Observatory of the Helsinki University of Technology*.