Institute report 2008: Chalmers
Department of Space Geodesy and Geodynamics
Onsala Space Observatory

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Gunnar Elgered	(Head of Department)
Rüdiger Haas	(Senior researcher, head of GEO-group)
Jan Johansson	(Adjoint Prof., SP Borås)
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Institute report 2008: Chalmers Department of Space Geodesy and Geodynamics Onsala Space Observatory

- GNSS
- VLBI
- InSAR
- Gravimetry

GNSS Tide Gauge

Measuring sea surface height using GNSS-signals

During 2008 we started a project to measure sea level and its variations using GNSS-signals. We plan to install two GNSS-antennas at the coast at the Onsala Space Observatory, one looking upward and another one looking downward towards the sea surface. The upward looking antenna receives the directly incoming GNSS-signals while the downwards looking antenna receives the signals that are reflected on the sea surface. The analysis of phase measurements performed with the corresponding GNSS-receivers will give results for the sea surface height and its variation. Figure 4 shows a test installation of the two GNSS-antennas at the coast at Onsala.

Right-circular
polarised antenna

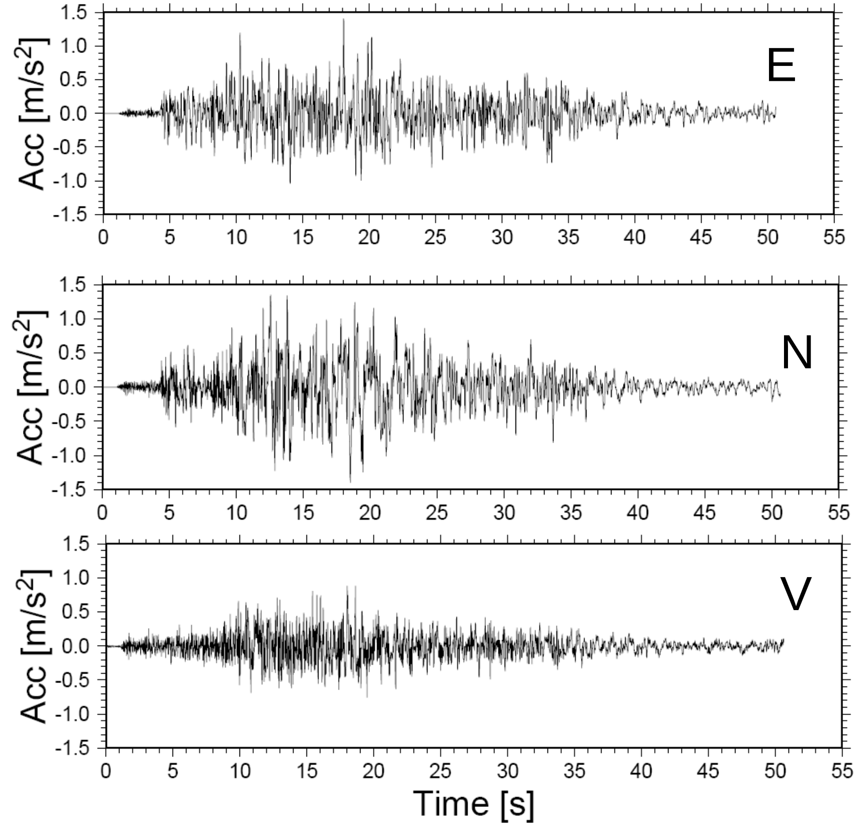
Left-circular
polarised antenna

GNSS seismometry

- **GNSS-measurements of simulated seismic events**

  During 2008 we performed several hundred simulations of seismic events with an industrial robot. A GNSS antenna was mounted on top of the robot (see Figure 23) and its movements were measured with a high-rate GNSS receiver. The analysis The RMS-differences between the commanded robot positions and determined coordinates, derived from GNSS-measurements with 20 Hz sampling and differential analysis on a 60 km long baseline, are on the order of 4–5 millimetres for the horizontal and about 9 mm for the vertical position.

Acceleration (seism. observations)



Simulate Michoacán (Mexico) earthquake Sep 19, 1985, M_w=8.0

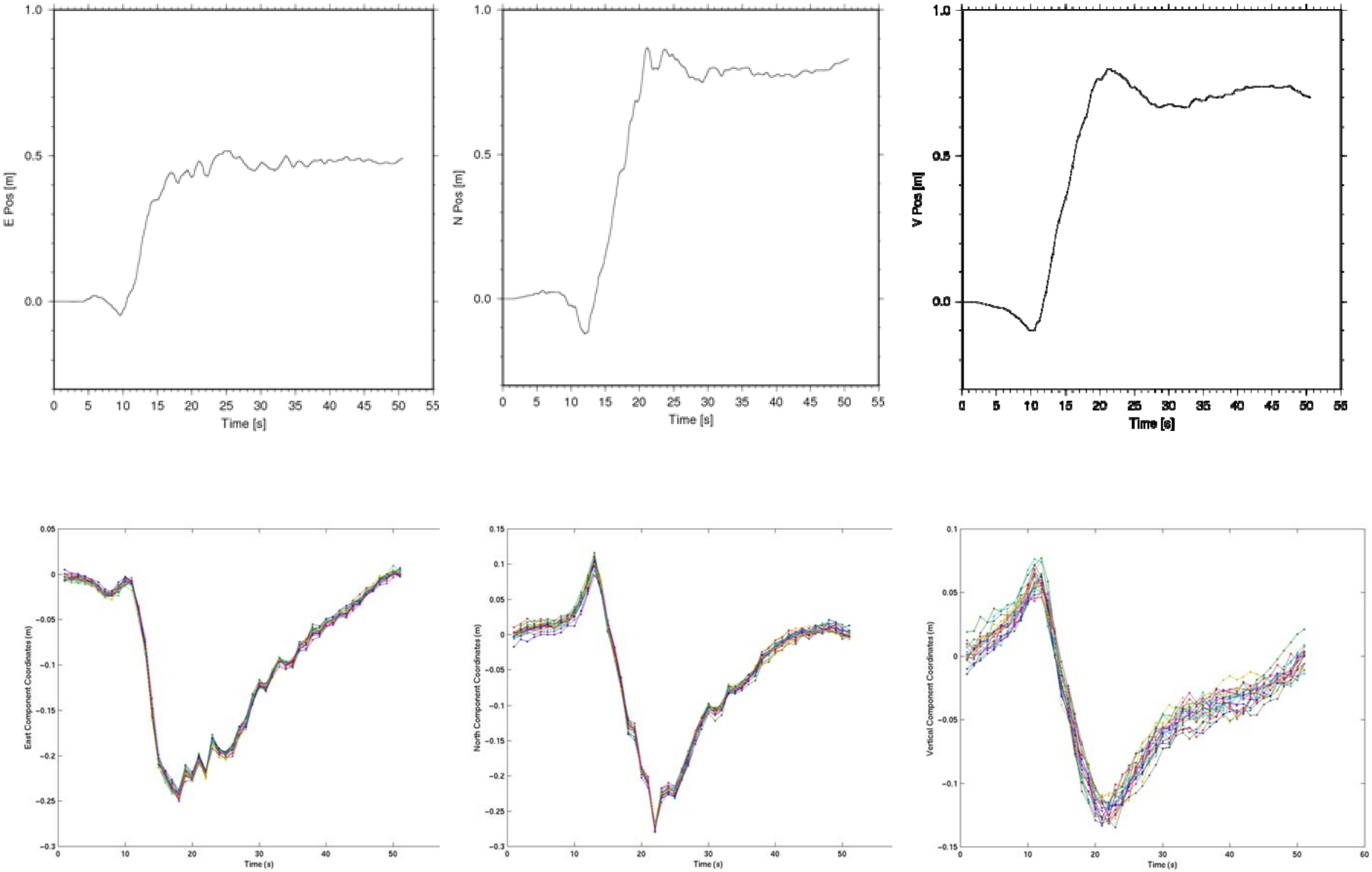
Parameter	Michoacán	empirical
Subsurface rupture length	180 km	200 km
Rupture area	9000 km^2	10 000 km^2
Displacement	~6.5 m	0.8 ... 3 m

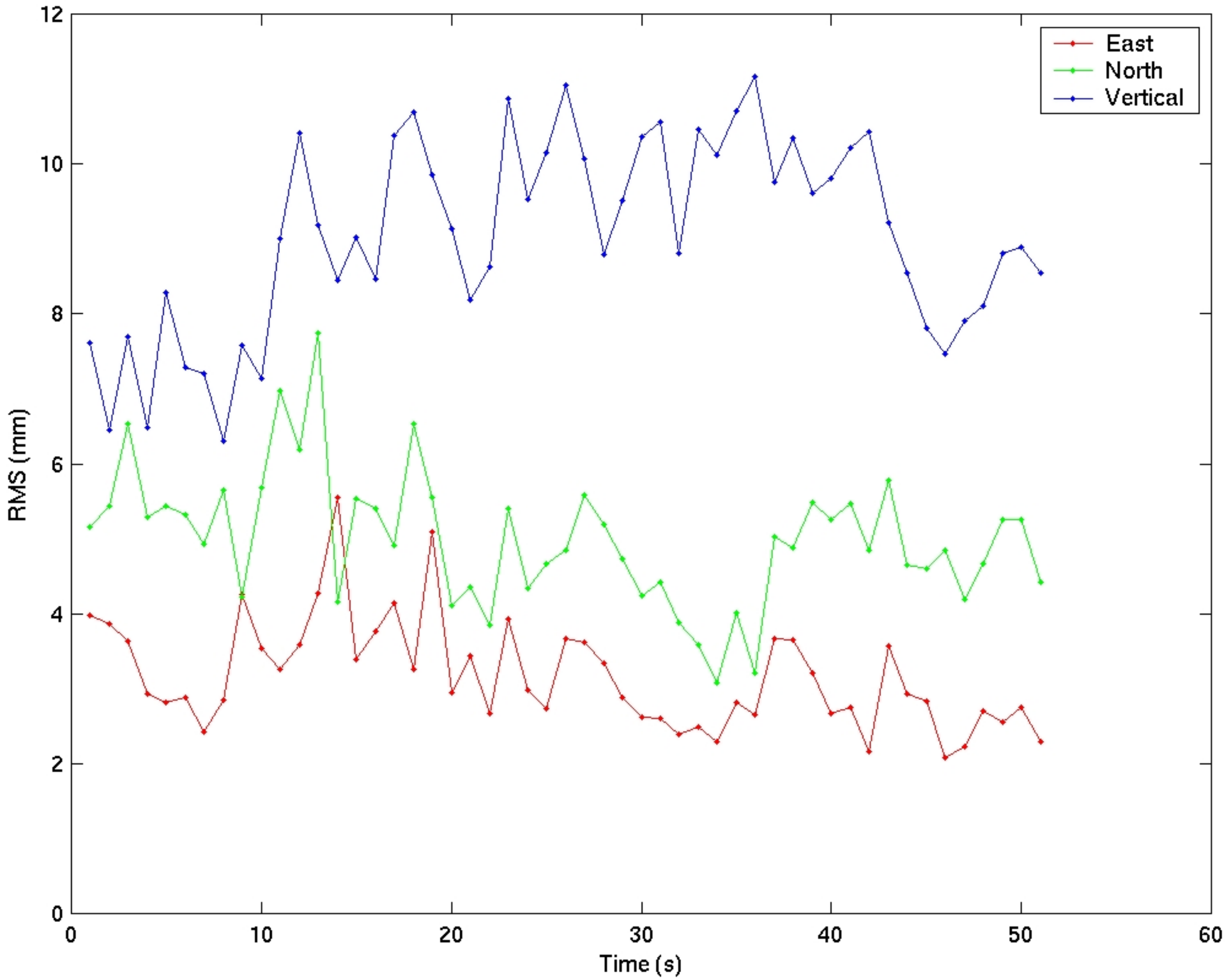
Note that the robot movements

- are scaled with a factor -0.5
  - since its range is limited
  - why the minus is not clear

- have been ramped so that

  end point = start point
  - In order to avoid heavy accelerations

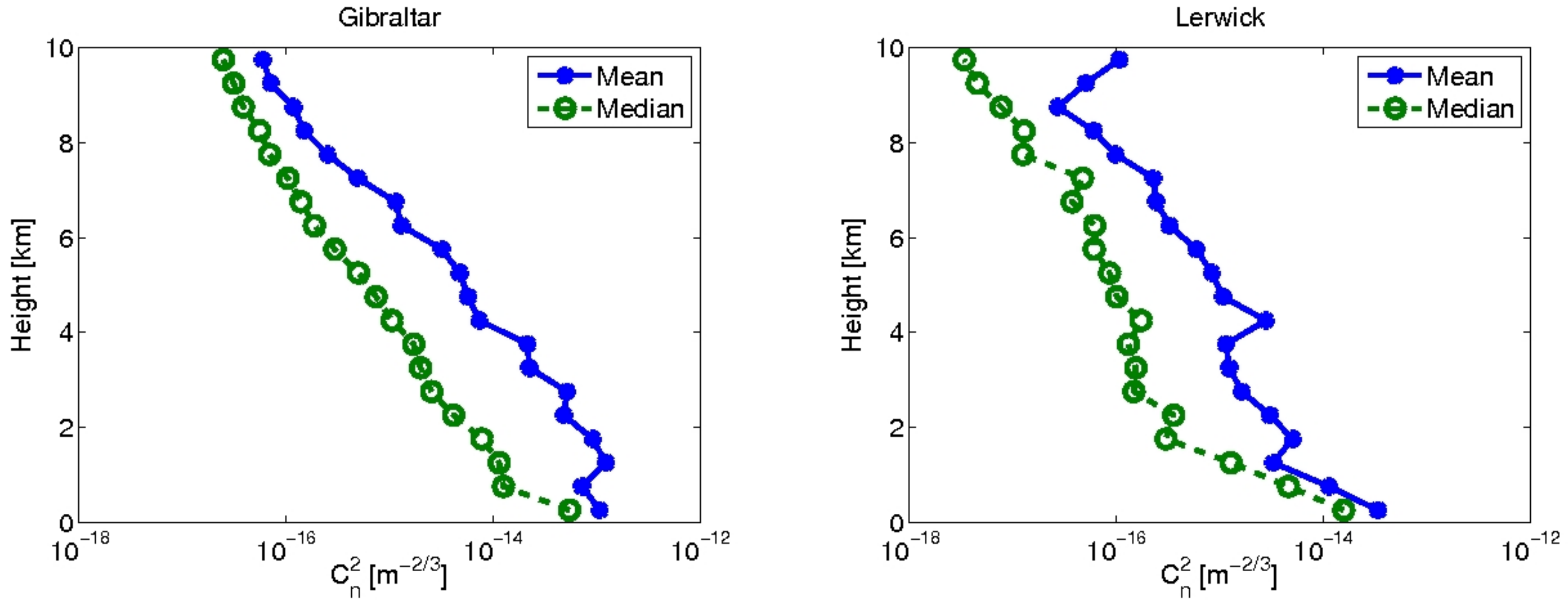

E Pos [m]
Time [s]
N Pos [m]
Time [s]
V Pos [m]
Time [s]
East Component Coordinates (m)
Time (s)
North Component Coordinates (m)
Time (s)
Vertical Component Coordinates (m)
Time (s)


East
North
Vertical
RMS (mm)
Time (s)
0
2
4
6
8
10
12
0
10
20
30
40
50
60

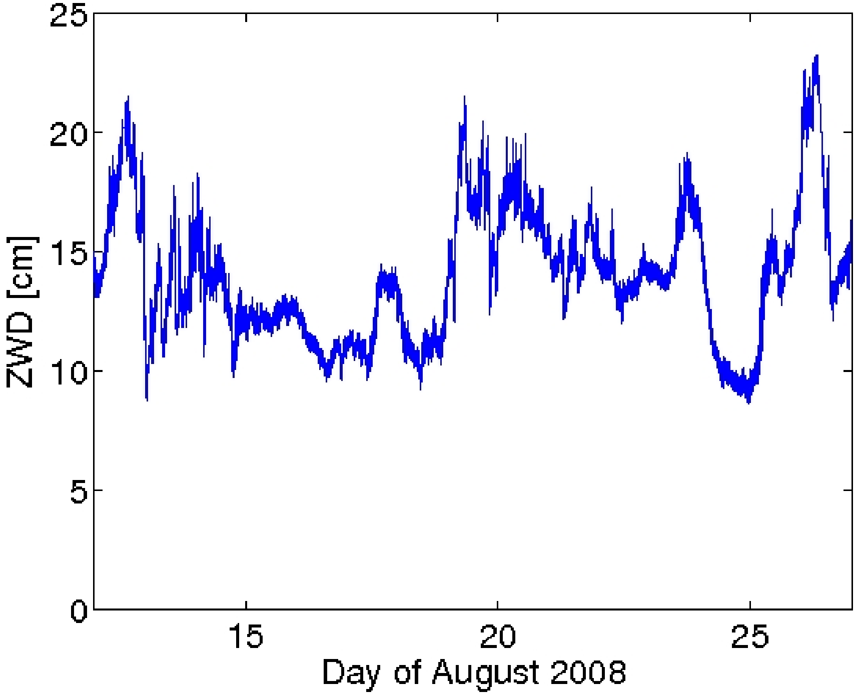
VLBI

- **Simulations of atmospheric propagation delays using turbulence models**

  We contribute to the development of VLBI2010, the next generation geodetic Very Long Baseline Interferometry (VLBI) system, with simulations of atmospheric propagation delays. These simulations are based on turbulence models and aim at producing realistic delays that can be used to systematically study different VLBI2010 designs. The parameters C_n that describe atmospheric turbulence are derived from high-resolution radiosonde profiles. As examples, Figure 1 and 2 give mean and median C_n profiles derived from a whole year of radiosonde profiles taken at Gibraltar and Lerwick, respectively.



Gibraltar
Mean
Median
Height [km]
0
2
4
6
8
10
10^{-18}
10^{-16}
10^{-14}
10^{-12}
C_n^2 [$m^{-2/3}$]
Lerwick
Mean
Median
Height [km]
0
2
4
6
8
10
10^{-18}
10^{-16}
10^{-14}
10^{-12}
C_n^2 [$m^{-2/3}$]



- Tropospheric wet delay from GPS during the CONT08 experiment

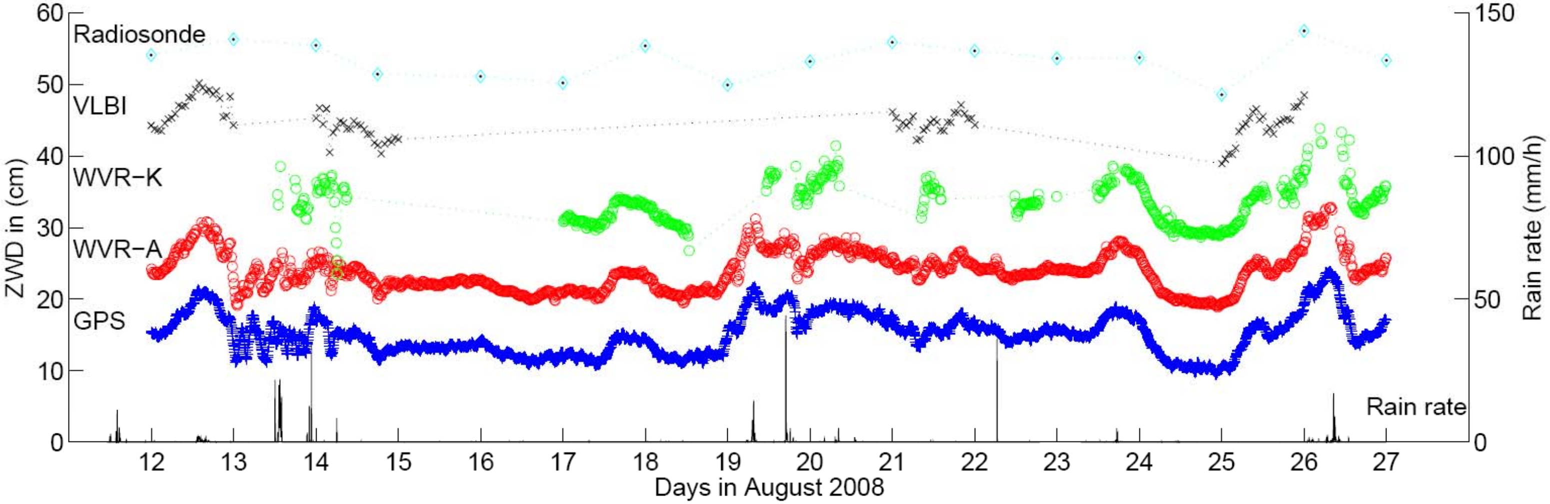
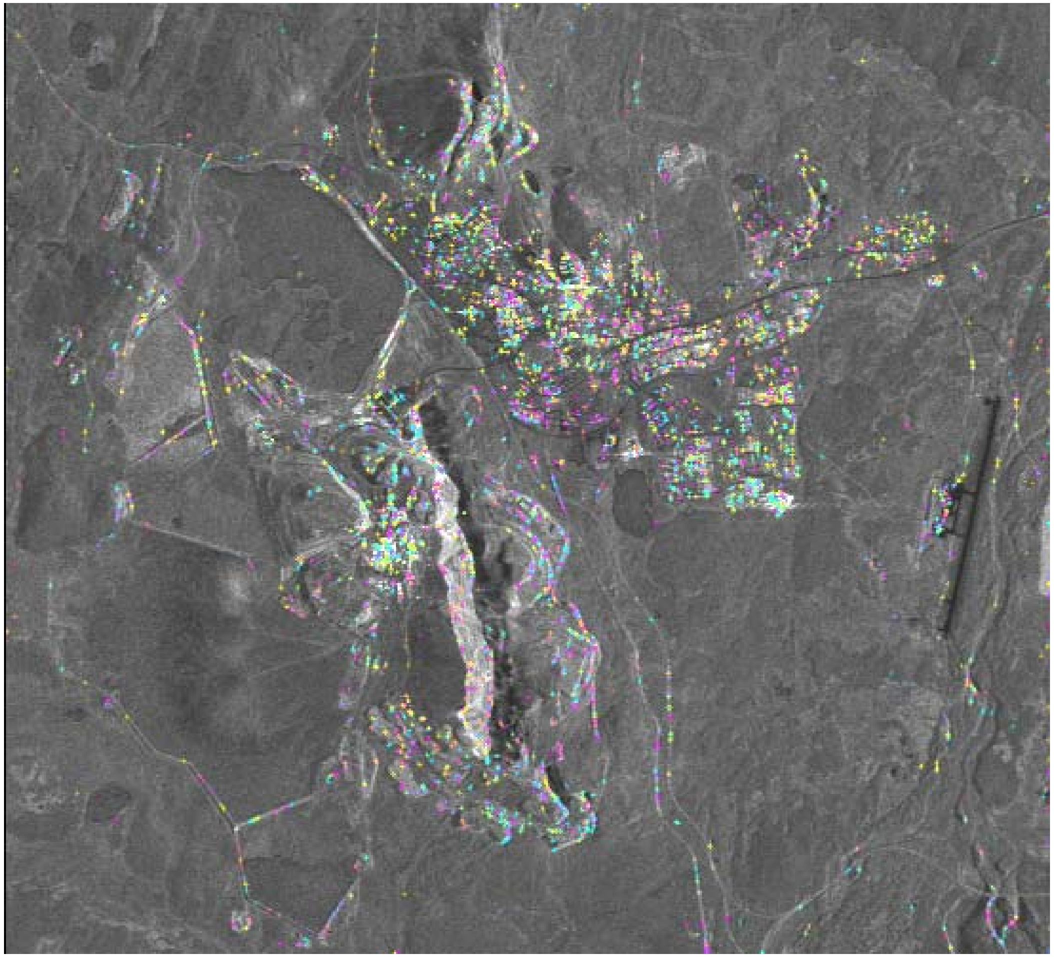


Figure 1. Time series of zenith wet delay (ZWD) and rain rate for Onsala during CONT08. Shown are ZWD-results from GPS (blue plus signs), the microwave radiometers Astrid (WVR-A, red circles) and Konrad (WVR-K, green circles), VLBI (black crosses), and radiosonde observations at Landvetter airport (cyan diamonds with black dots). To improve readability, the results are shown with offsets of +10 to +40 cm with respect to the GPS results that are shown on the correct level. Rain rate observations are displayed in black at the bottom of the figure and refer to the right scale.

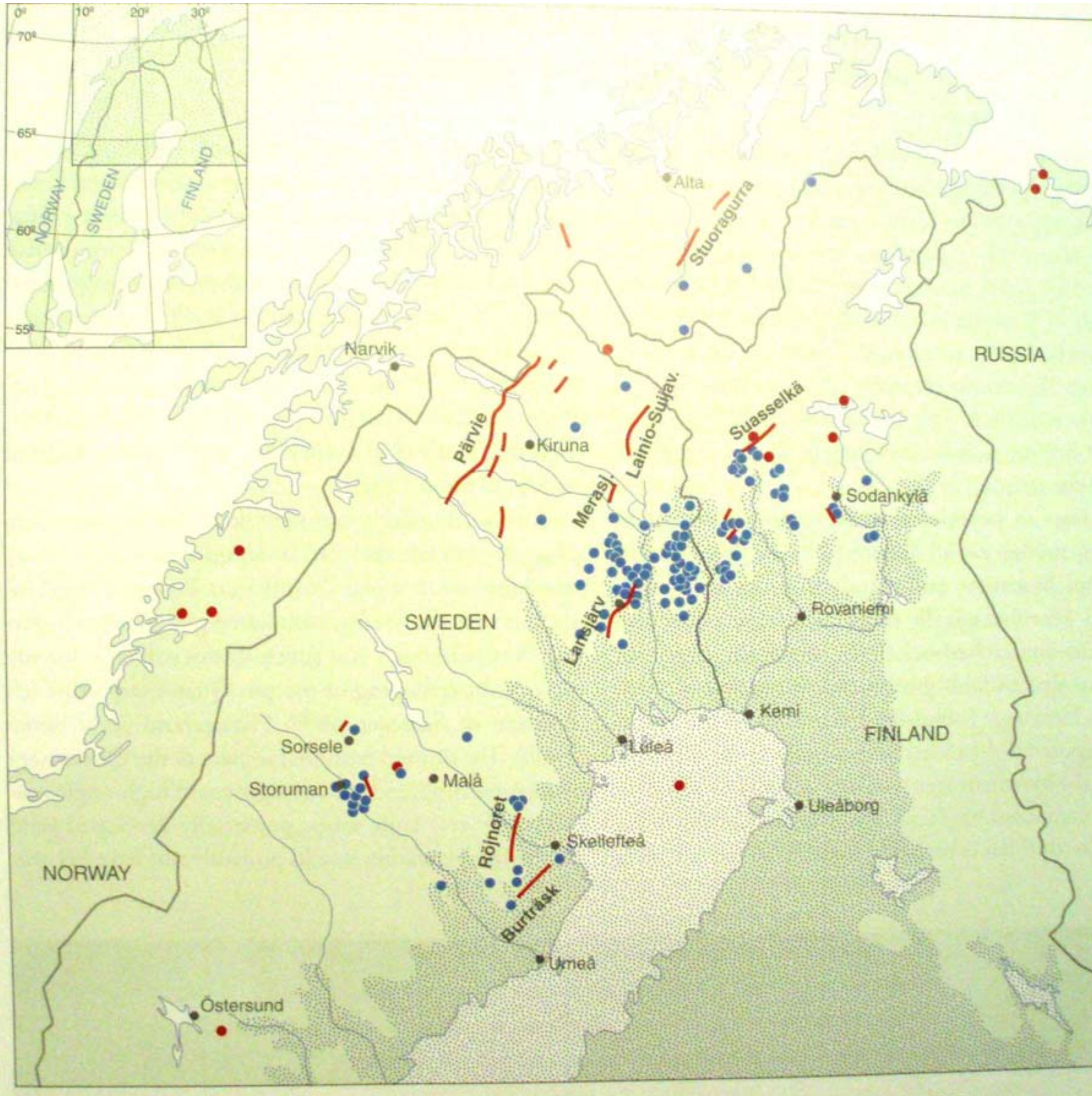
Interferometric SAR Permanent Point-Targets



Kiruna

Kiruna and Pärvie Postglacial Fault

- ERS1-ERS2 Single-Look Complex
  - 25 pairs to one master image, 1994-2005
- LMV's DEM model



Late- or postglacial fault

Landslide developed in glacial till

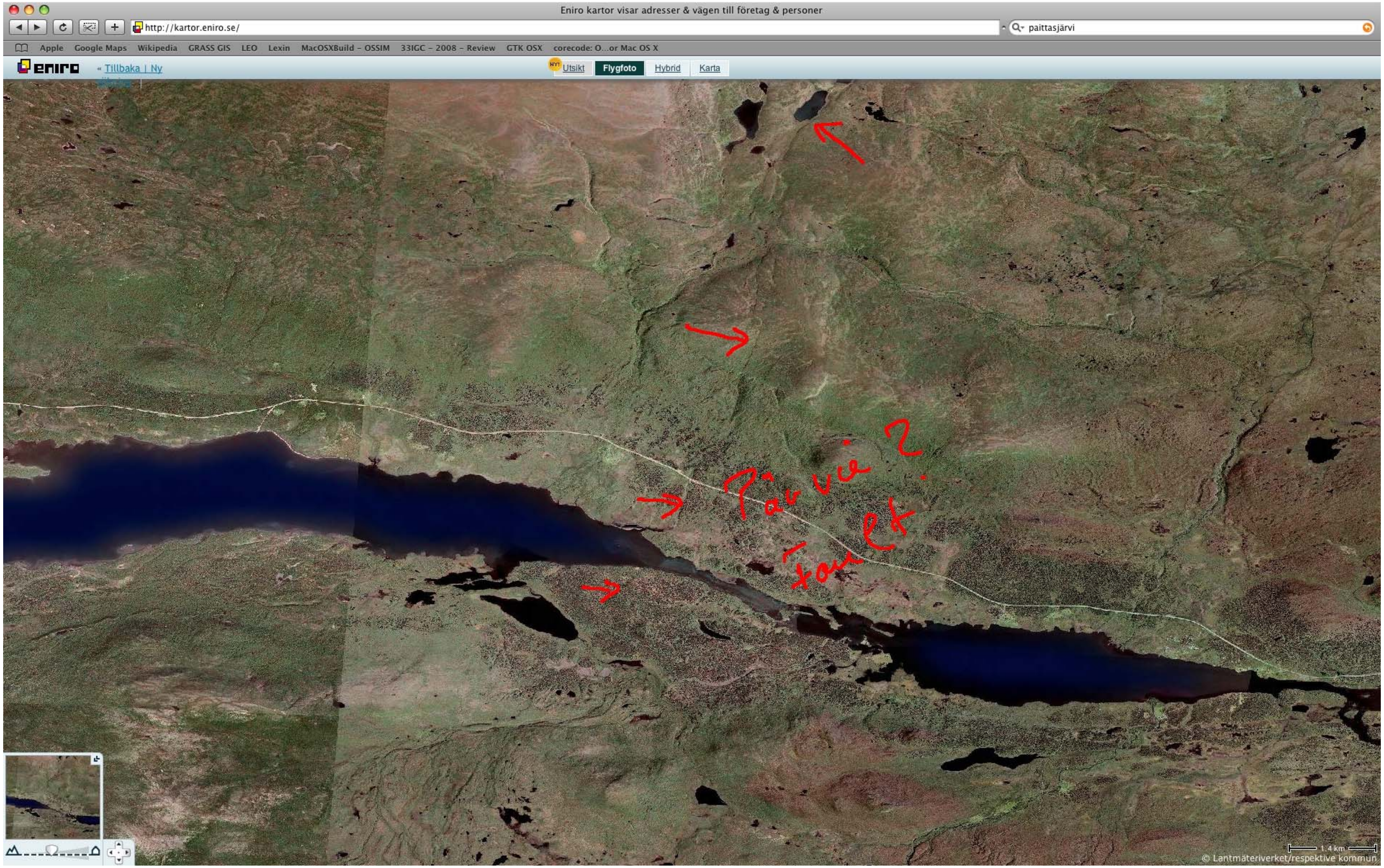
Possible late- or

Areas below highest

Fig. 11. Typical appearance of a fault scarp when developed in glacial till. The Pärvie fault at the western foot of Mt Tsåktso, some 70 km north of Kiruna. Photo: R. Lagerbäck.

Photo: Robert Lagerbäck, SGU

Lagerbäck & Sund, 2008



Eniro kartor visar adresser & vägen till företag & personer
http://kartor.eniro.se/
paittasjärvi
Apple
Google Maps
Wikipedia
GRASS GIS
LEO
Lexin
MacOSXBuild – OSSIM
33IGC – 2008 – Review
GTK OSX
corecode: O...or Mac OS X
Tillbaka | Ny
Utsikt
Flygfoto
Hybrid
Karta
Pärvie?
fault.
1.4 km
© Lantmäteriverket/respektive kommun

Gravimeter station

- SCG monument in passive-climate inner cabin
- 2 AG monuments: 2100 x 1200 + 1000 x 1200 mm
  - mechanically decoupled
  - Air draft protected
  - 1.5 m high, concrete blocks
  - No steel inforcements used
  - On bedrock
  - Rock surface honed to ascertain drainage of surface water into a controlled well
- Climatised (± 0.5 °C), no windows
  - Heat insulating apron 3 m wide
  - Heat produced in the cabin will warm the rock surface by means of air circulation


GWR
GWR
GWR
19/08/2008


Zum 72* [sic]
*
Herzlichen Glückwunsch
von
+ Ludger und Klaus
GWR
GWR
GWR
19/08/2008

Absolute-gravity monument

2100 x 1200 mm

A second monument will be built next to it

1200 x 1000 mm

Additional installations

- Ground water observing well in the bedrock near the monuments: water head and temperature
- Pumping well: water head and temperature
- Observing well in wetland at 150 m distance: water head and temperature
- 4 m vertical Invar rod to monitor seasonal thermal expansion, with rock temperature sensor
- SCG monument with 4 temperature sensors

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