Nordic Geodetic Commission, Working Group for Geodynamics
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National Report for Finland

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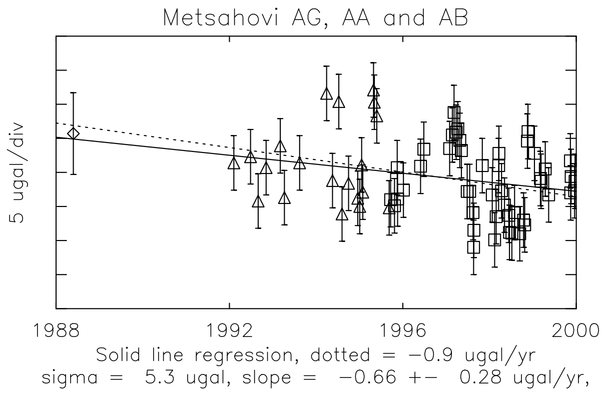
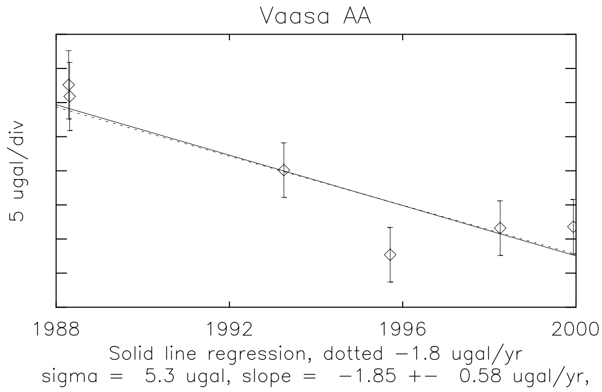
This report covers activities by the Finnish Geodetic Institute (FGI) roughly since the previous WG meeting in March 1999 in Gävle.

1. Absolute gravimetry

Regular absolute measurements in Metsähovi with the JILAg-5 have been continued, typically once or twice per month.

In December 1999 absolute gravity was observed at the GPS stations Virolahti, Joensuu, and Vaasa (Vaasa AB), and at the old Vaasa site in town (Vaasa AA) which has been occupied by the JILAg-5 since 1988. Figure 1 shows the time series of absolute measurements in Metsähovi, Vaasa and Sodankylä with the JILAg-5.





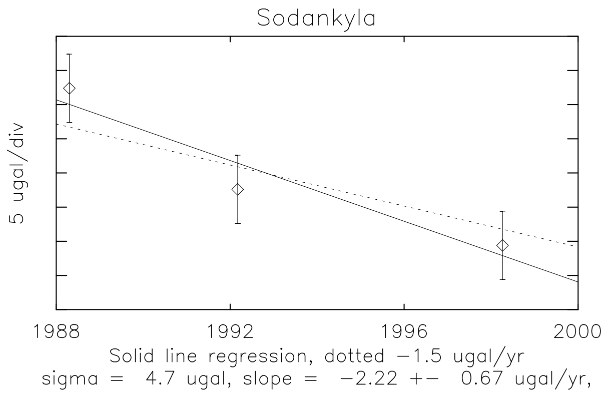


Figure 1. Absolute measurements in Metsähovi, Vaasa and Sodankylä with the JILAg-5 since 1988. All errors are one-sigma. The error bars (4…6 µgal) are based on a-priori estimates.. Model slopes (dotted lines) are computed assuming a gravity change of -0.2 µgal per mm of (absolute) uplift.

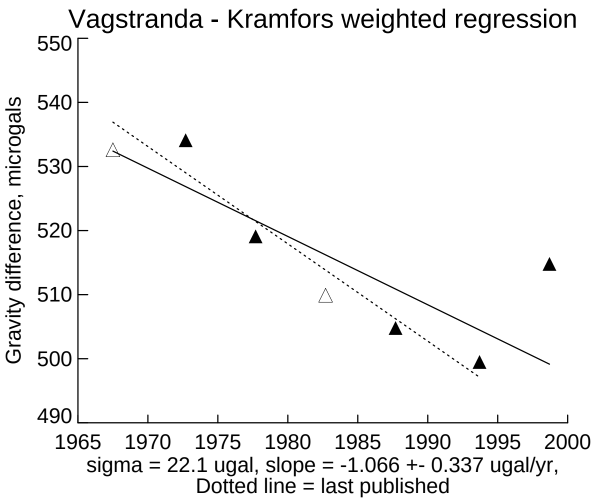
In the second UNIGRACE (Unification of gravity systems of Central and Eastern European Countries) campaign, the following stations were occupied in September-October 2000: Krokowa, Jozefosław (Poland); Cluj, Belis, Constanța (Romania); Wettzell (Germany), and the non-UNIGRACE station Borowa Góra (Poland).

Corrected and expanded post-meeting version (November 18, 2000)

2. Land uplift gravity lines

The Finnish part of the line 65ºN was measured in both 1999 and 2000 with the LCR-gravimeters G-55, G-600, G-54, and G-290; the last two graciously loaned to us by the National Land Survey of Sweden. These measurements, the first since 1981 on that line, will be the subject of a separate presentation.

The Finnish part of the 63ºN line was measured in 1999 with the same gravimeters. The present situation in the eastern and western parts of the 63ºN line is shown in Figure 2.



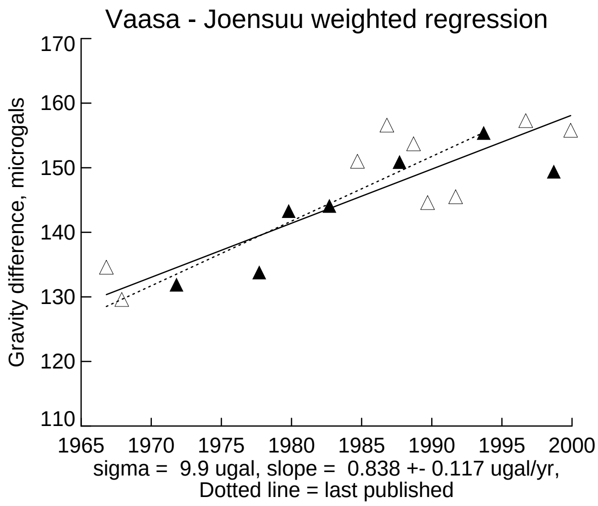


Figure 2. Status of results on the land uplift line 63ºN, western part (left) and eastern part (right). The Norwegian measurements in 1998 are missing (not known to us). Campaigns were weighted according to the number of gravimeters. Solid symbols show five or more gravimeters. Sigma is the standard error of weight unit (a single gravimeter). The absolute measurement in December 1999 between the GPS stations Vaasa and Joensuu, mentioned below, gives 174 µgal between the land uplift stations. The reason for the large discrepancy is not known.

The absolute gravity measurements at the GPS-stations Joensuu and Vaasa AB in December 1999 were connected to the land uplift sites Joensuu and Vaasa with relative ties, to obtain an absolute measurement between the latter. However, there is a large difference to the relative measurement (see legend of Figure 2).

3. Pasmajärvi postglacial fault

High precision relative measurements across the Pasmajärvi postglacial fault have been carried out in 1987, 1989, 1991, 1993, 1995. In September 2000 the measurements were repeated with the LCR-gravimeters G-55, G-600, G-54, and G-290. The results do show any change in the gravity difference. Neither were any changes of elevations detected in the re-levelling of the micro-network across the fault, in June 2000.

4. Gravity surveys

The national gravity network was densified in an area near the city of Tampere, with 550 stations in 1999 and 350 stations in 2000 at a density of 2…3 points/km^2. GPS-positioning in combination with a digital geoid height map were tested for determination of orthometric heights.

FGI supported the Nordic/Baltic airborne gravity survey over the Baltic Sea in August 1999.

5. Superconducting gravimetry

The superconducting gravimeter GWR T020 is recording in Metsähovi since August 1994, sampling gravity once per second. It participates in the Global Geodynamic Project, with data exchange and co-operation with 18 other stations.

Recently the work has focused on environmental parameters, especially the near-field hydrology. Groundwater level in two access tubes, one in fractured bedrock a few meters from the gravimeter and one in a swamp at 80 m distance are recorded. In addition, precipitation, and snow cover around and *above* the station are monitored: In an experiment in winter 1999 the snow (about 100 mm water equivalent) on the roof of the laboratory was removed, producing a perfectly modellable gravity increase of 2 µgal.

Currently the topography and thickness of the soil layers around the laboratory are being mapped, and efforts are underway to start the monitoring of soil moisture. Model calculations show that a surface density equalling a 100 mm water column applied to the patches with sediment cover produces a 1 µgal gravity effect, i.e., one fourth of the corresponding Bouguer sheet. This is a surprisingly large figure considering that the station stands on exposed bedrock in a flat topography. Empirically, hydrology-related gravity variations reach 6 µgal peak-to-peak, corresponding to a variation of two meters in the pressure head in the bedrock tube.

6. Water tube tiltmeter

The water tube tilt meter system (East-West and North-South) developed at FGI in 1977 and 1983 is being renovated.

7. Levelling, tide gauges

A preliminary study of land uplift and sea surface topography along the Estonian coasts was conducted in co-operation with the Estonian Meteorological and Hydrological Institute, in connection with the review of records from 29 Estonian tide gauges.

In the Finnish permanent GPS network FinnRef®, a good agreement was found between vertical velocity differences determined from GPS and from the three precise levellings on the other hand. At coastal stations both agreed with results from tide gauges.

8. Publications

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8. Conference papers and abstracts

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