

Remeasurement
of the Finnish First Order Gravity
Network with the A10-020 of the IGIK
(Warsaw) was started in 2009.
The time span is 47 years. Is there a
capability for detecting PGR?

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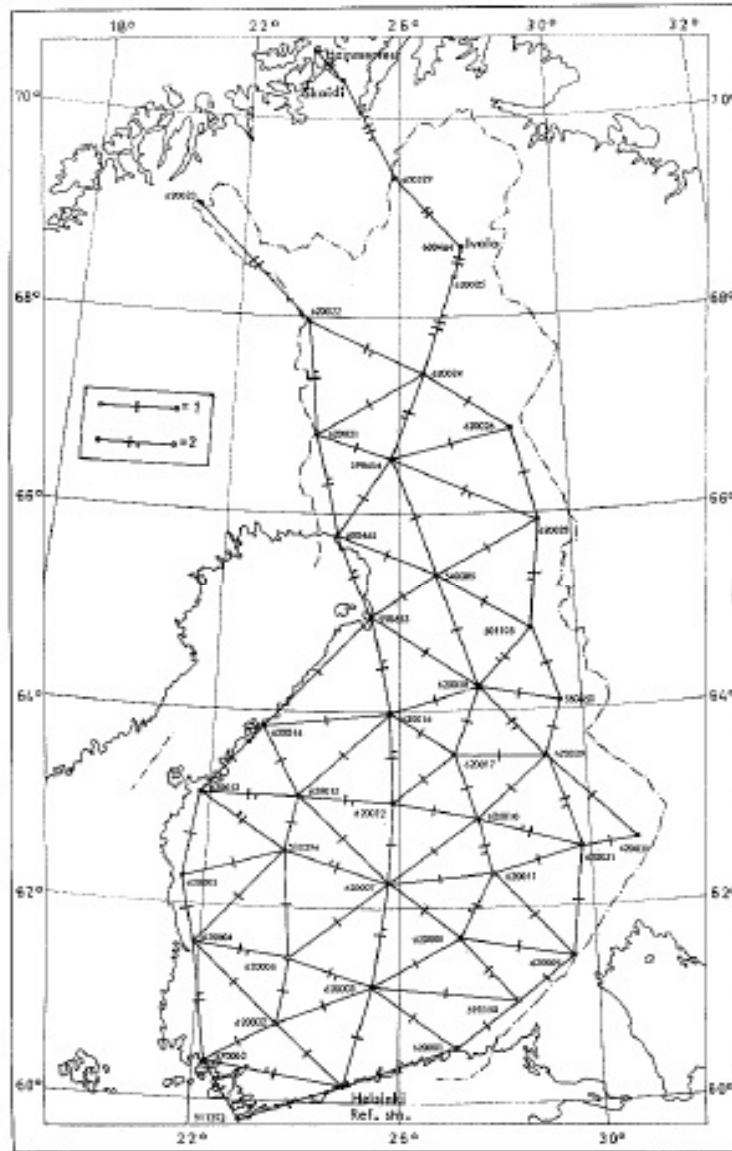


Fig. 1. The first order gravity net of Finland. 1 = double measurement, 2 = triple measurement

First Order Gravity
Net (FOGN)
measured in 1962-
1963

Publ. Finn. Geod
Inst. (1964)

Purpose of the FOGN

- reference sites for gravity mapping by the FGI and others (mostly by geologists)
- outdoors, accessible at any time without prior arrangements
- easy to find even in winter with plenty of snow
- reasonably-permanent stations in monumental buildings, mostly on church stairs; bedrock is rare
- local gravity changes come mostly from reconstruction of steps, e.g. to allow wheelchair access
- otherwise the local stability of the gravity values (about 0.01 mgal) is sufficient for the purposes of the FOGN
- note: no geodynamical ambitions
- they belong to the zero order net of absolute stations and the Fennoscandian Land Uplift Gravity Lines

Forssa church (control measurement in 1988)



FOGN present status I

- measured 1962-63 by Aimo Kiviniemi, Worden Master 227
- present zero and scale derived from a readjustment into IGSN71 by T. Honkasalo in 1971
- epoch 1963.0, mean tide system (from IGSN71)
- original estimate for accuracy of gravity differences 0.03...0.06 mgal (one-sigma)
- control measurement in 1988 by Kiviniemi
- performed in large loops, 2xLCR-G (G-55, G-600)
- rms for discrepancies (1988-1963) of gravity differences without correction for land uplift was 0.035 mgal (JM)
- values of preserved stations were not revised in 1988

Re-measurement of the FOGN

- Future uses of the FOGN shall be the same as the old uses: reference for gravity survey
- in other words, no geodynamical task added
- old stations will be kept but remeasured 2009-2010 with A10
- co-operation with IGiK Warsaw
- A10-0020 of IGiK operated by Marcin Sekowski in Finland in July 2009
- 19 FOGN sites occupied
- 29 remain for 2010

Forssa 2009

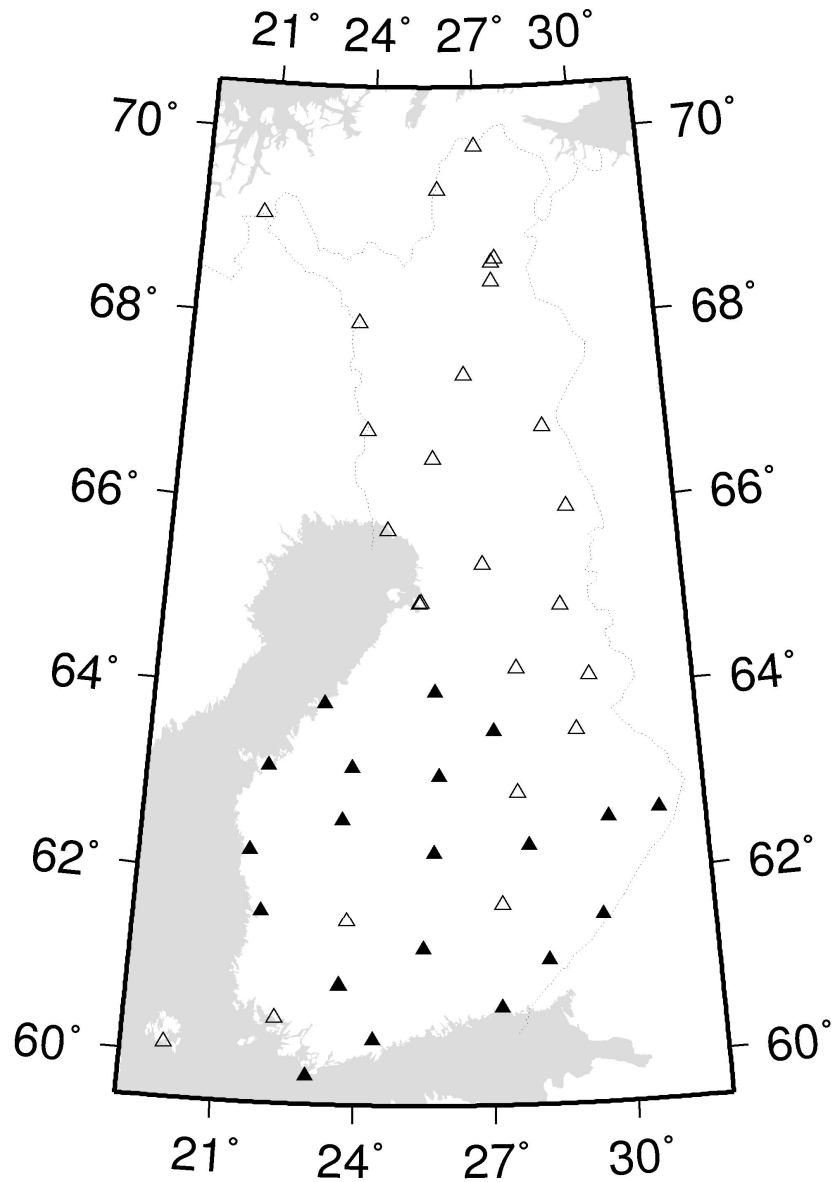


Forssa 2009

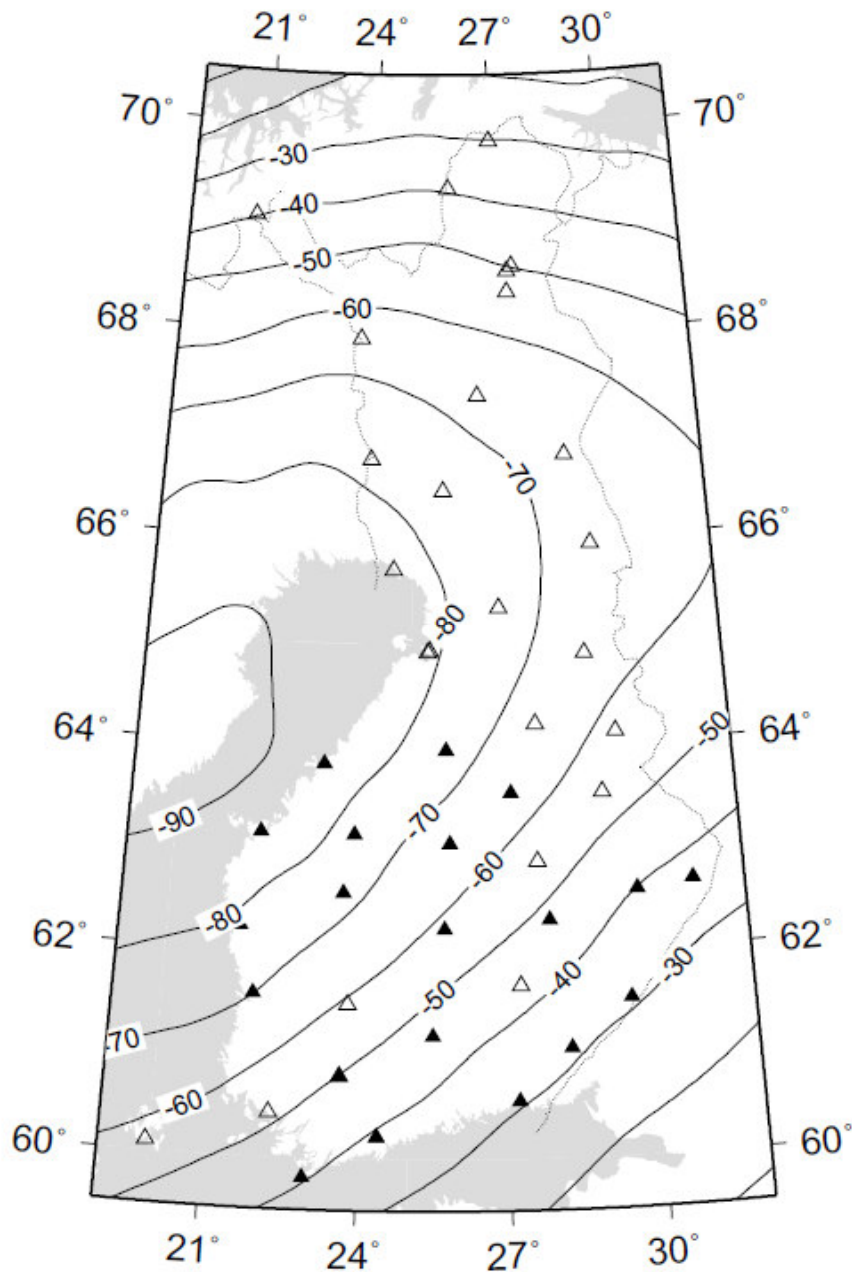


A10-020 work 2009

- Single setup was $8 \times 120 = 960$ drops, 1 second drop interval, duration 24 min
- Station occupation consists of two independent setups in different orientations (180 deg rotation)
- Test campaign in Metsähovi
- Calibration of two-mode laser and rubidium oscillator at MIKES (National Metrology Institute in Finland)
- 19 FOGN sites occupied
- rms of all setup differences (I-II) 5 ugal
- 10 comparisons to FG5 values, mean diff 1 ugal, stdev 4 ugal
- 15 points had the original FOGN or the 1988 replacement preserved
- abs. measurement on 10 points was within 0.3 m distance of 1962 point

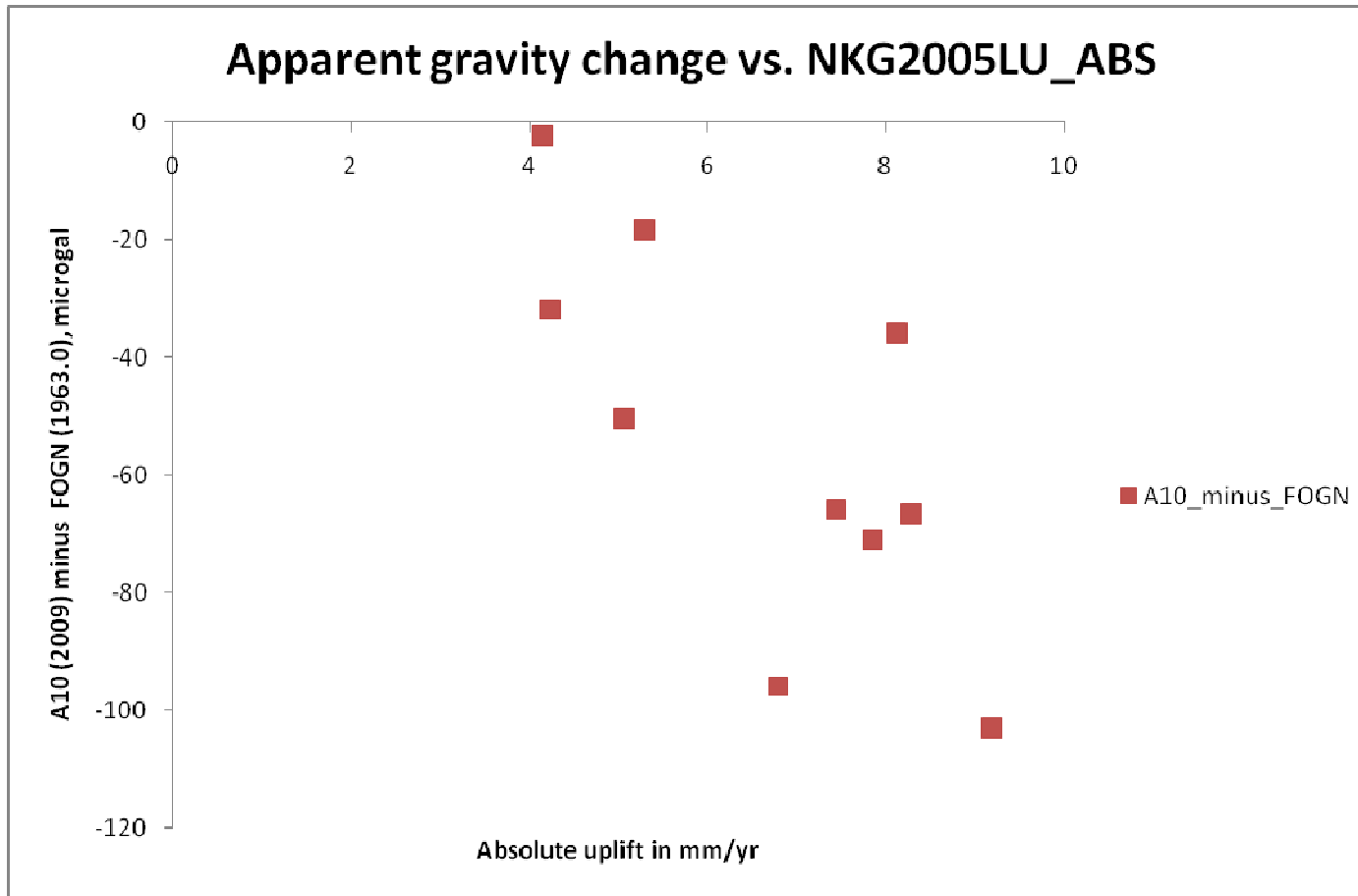


Solid 2009, 19 sites
Open 2010, 29 sites



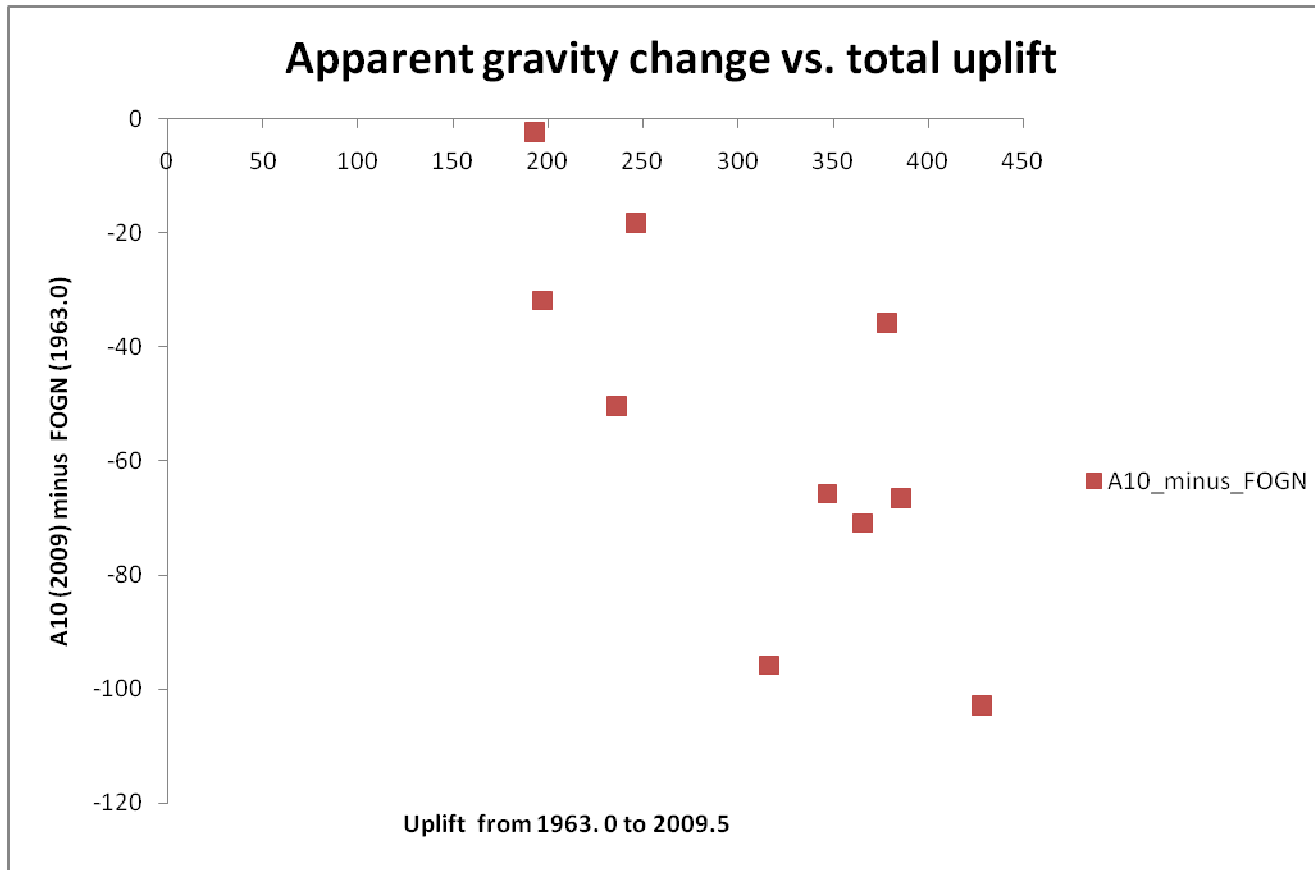
Expected gravity change
1963.0 – 2009.5
assuming

NKG2005LU_ABS
and
-0.154 $\mu\text{gal}/\text{mm}$



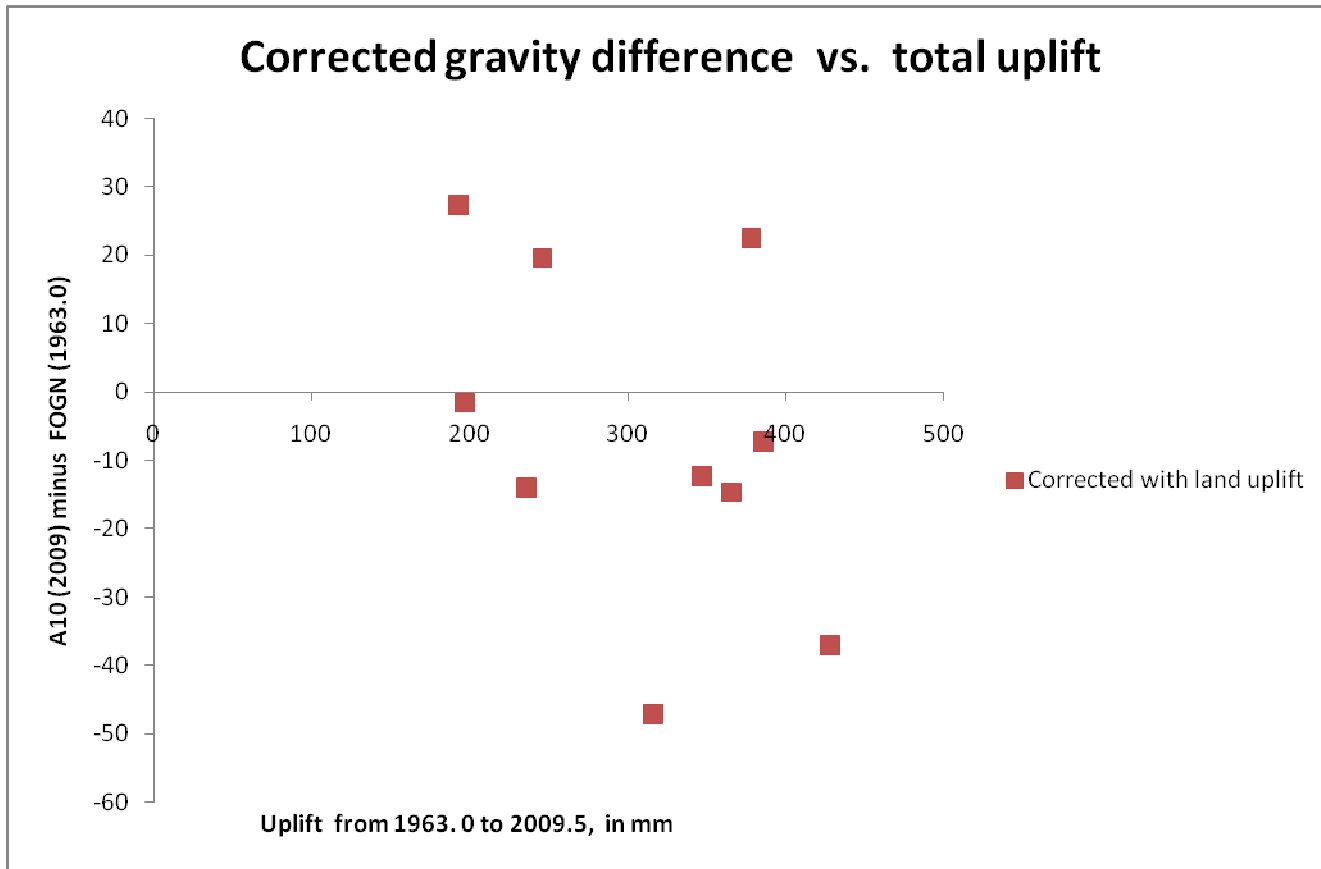
A10-020 minus FOGN in microgal
vs. NKG2005LU_ABS

FOGN tidal system corrected to zero



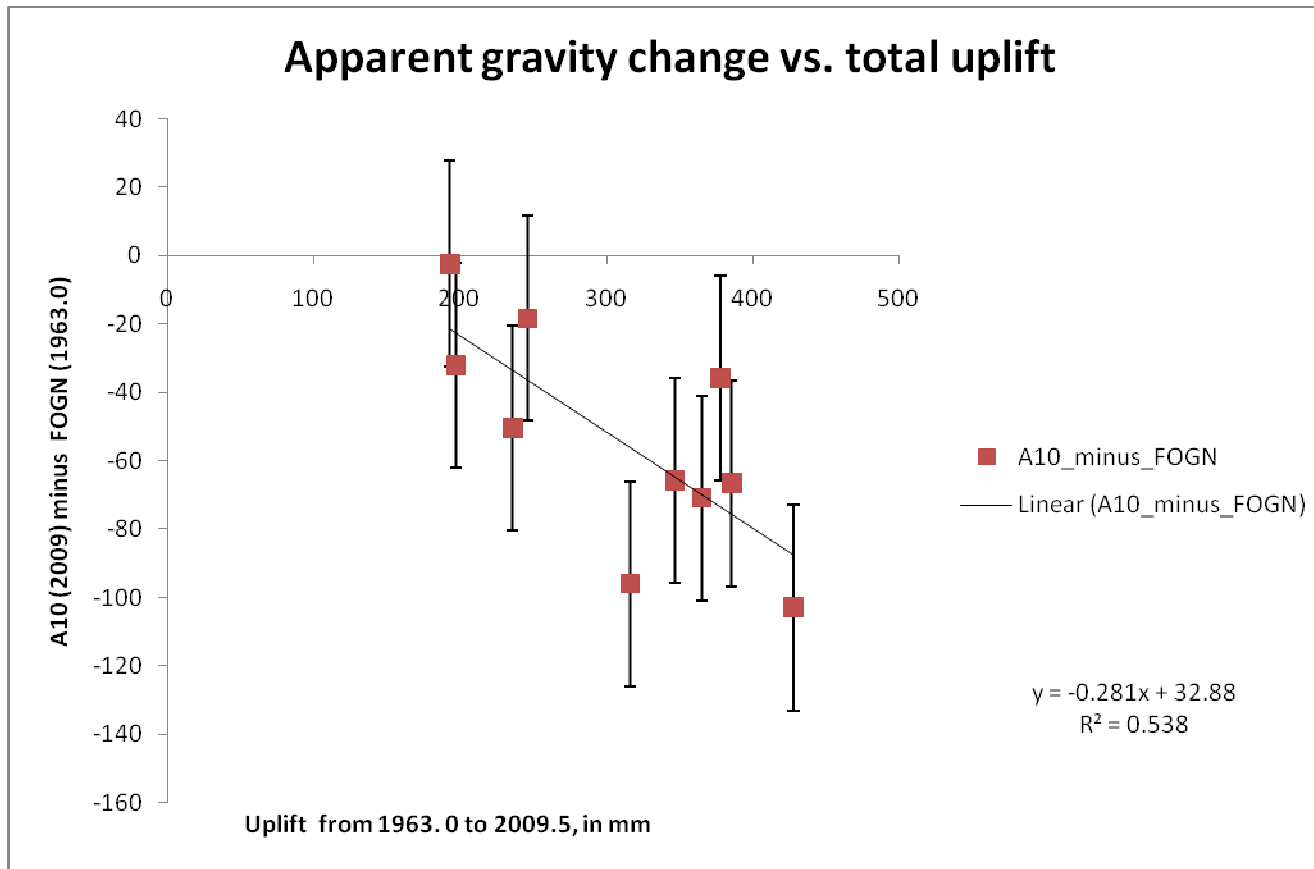
A10-020 minus FOGN in microgal
 vs. estimated total uplift 1963.0 – 2009.5 in mm
 NKG2005LU_ABS

FOGN tidal system corrected to zero



A10-020 minus FOGN in microgal
corrected with NKG2005LU_ABS and -0.154 ugal/mm

vs. estimated total uplift 1963.0 – 2009.5 in mm



A10-020 minus FOGN in microgal

vs. estimated total uplift 1963.0 – 2009.5 in mm

Future work

- 29 more FOGN stations in 2010 with A10
- connect excenters to FOGN with relative meters 2010
- include 1988 survey with 2 LCR
- include LCR-G calibration line N-S trips since 1966
- 3-level gradient measurements 2010 at all sites will join
 - Worden 1962-63 at about 0.5 m height (tripod)
 - LCR-G 1988 at about 0.12 m height (plate)
 - A10-020 at 0.717 m