Calibration results of different type spring gravimeters from the repeated measurements of Estonian calibration lines

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Gravity range in Estonia about 200 mGal ($2 \cdot 10^{-3}$ m/s^2)

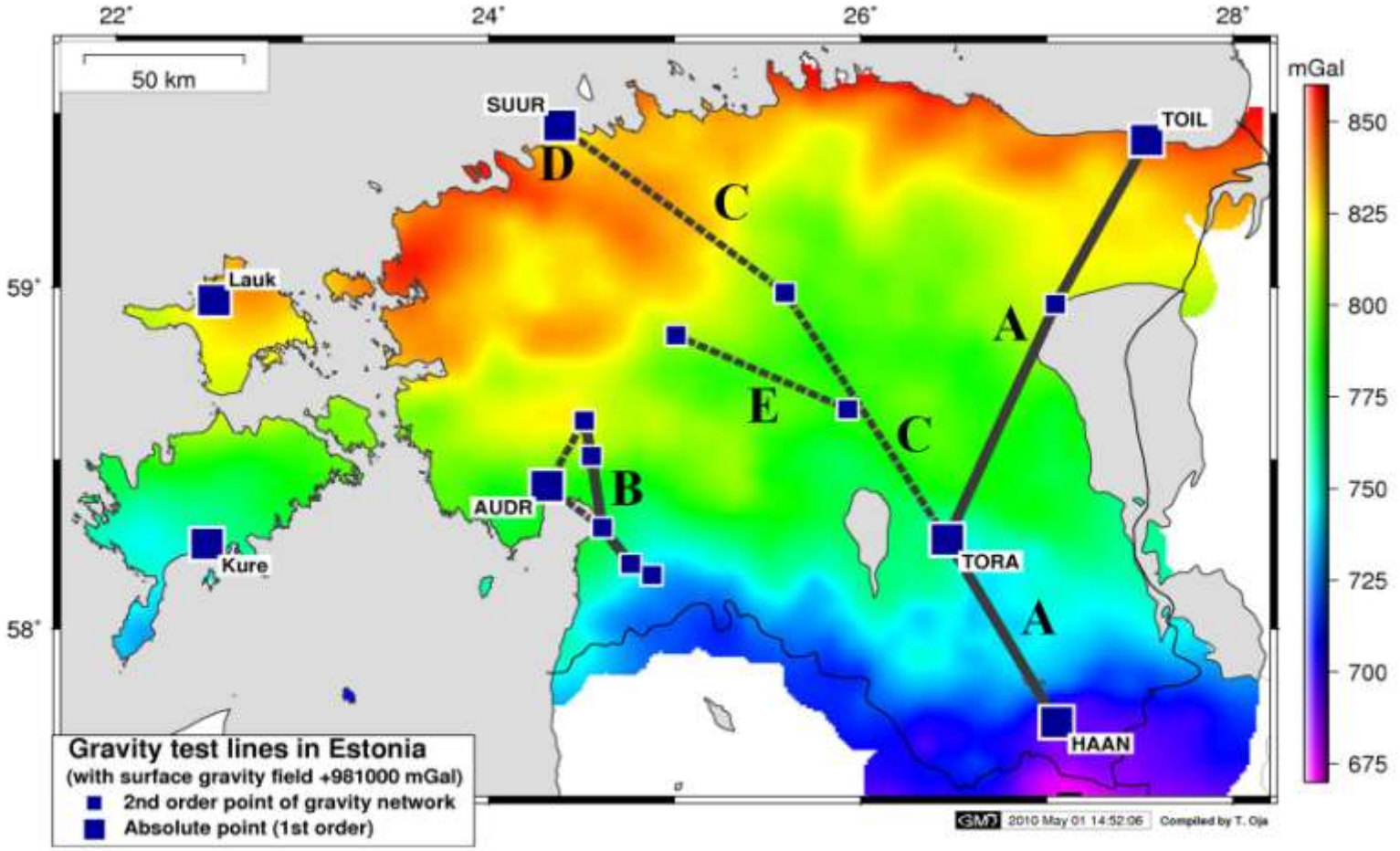
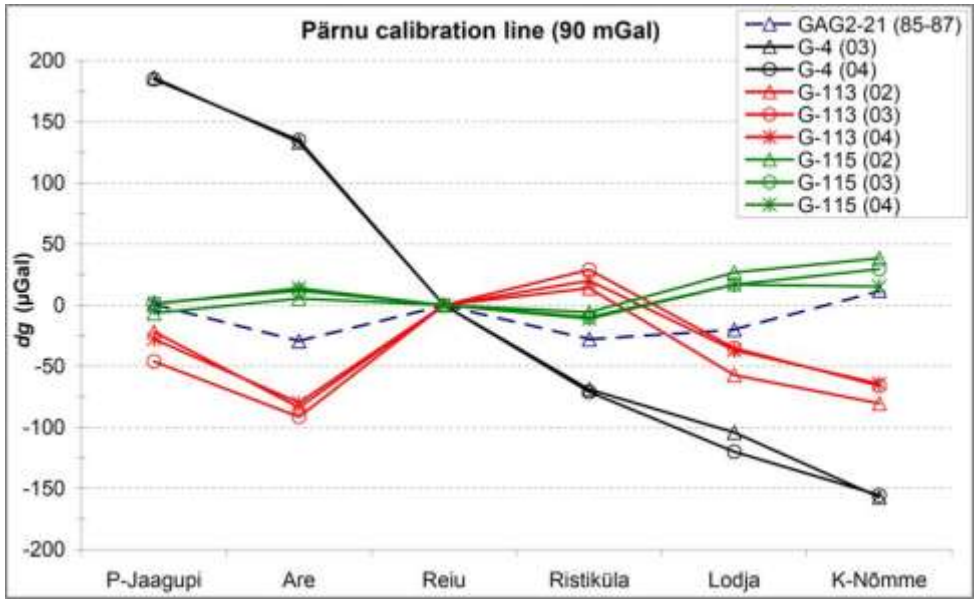
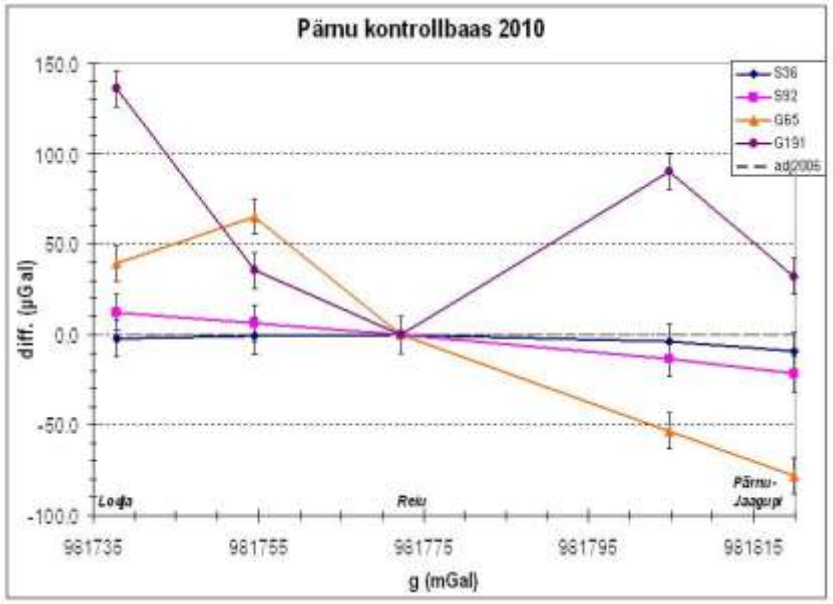


Figure 1. Observed gravity field over the surface of Estonia. Several gravity calibration and test lines are shown, more details about them can be found from text.

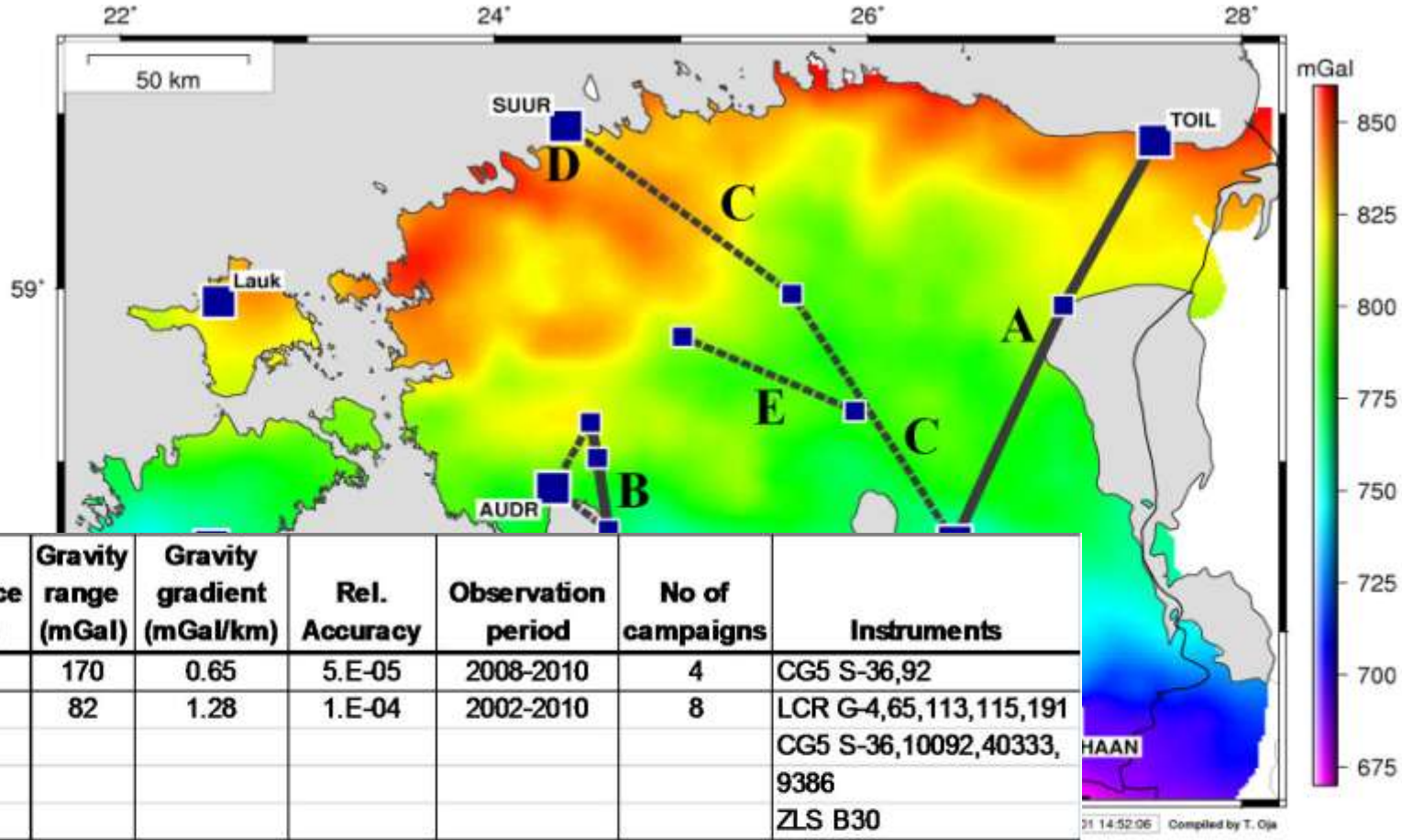
Thus the calibration accuracy of relative gravimeters used in Estonia should be:

- equal or better than $5 \cdot 10^{-5}$ (50 ppm) for gravity network measurements (2nd order) and geodynamical, hydrological etc studies (uncertainties $u \leq \pm 0.010$ µGal)
- about $2 \cdot 10^{-4}$ (100 ppm) for the network densification and geodetic, geological gravity surveys (~ ±0.040 µGal).
- But in reality…





Calibration and test lines in Estonia



Line	Distance (km)	Gravity range (mGal)	Gravity gradient (mGal/km)	Rel. Accuracy	Observation period	No of campaigns	Instruments
A	260	170	0.65	5.E-05	2008-2010	4	CG5 S-36,92
B	64	82	1.28	1.E-04	2002-2010	8	LCR G-4,65,113,115,191
							CG5 S-36,10092,40333,
							9386
							ZLS B30
C	230	64	0.28	1.E-04	2001-2002,	5	LCR G-4,113,115
					2006-2008		CG5 S-36,92
D	16*	5	0.31*	4.E-04	2002-2009	7	LCR G-4,113,115
							CG5 S-36,92
E	70	18	0.26	6.E-04	2001-2007	7	LCR G-4,113,115
							CG5 S-36,92

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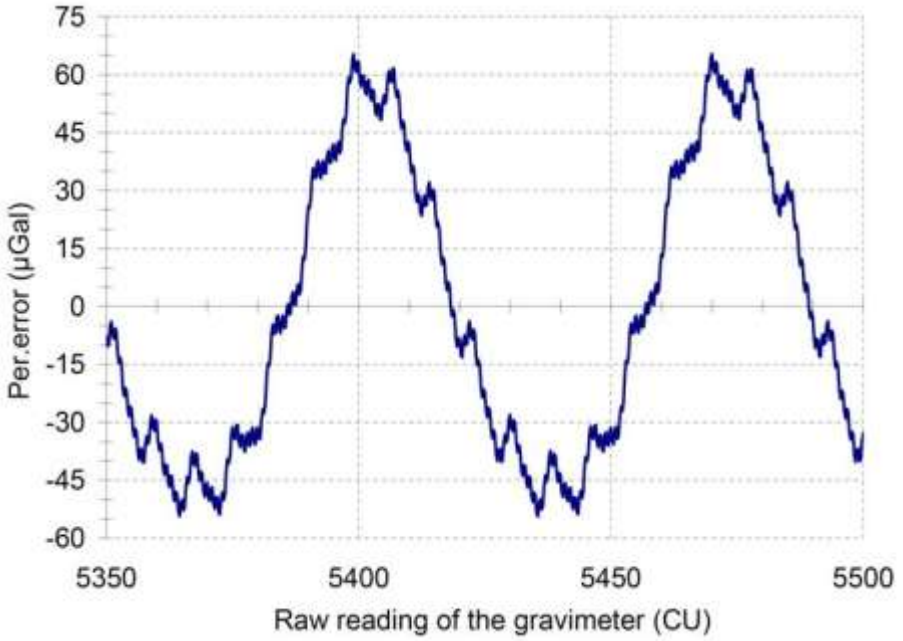
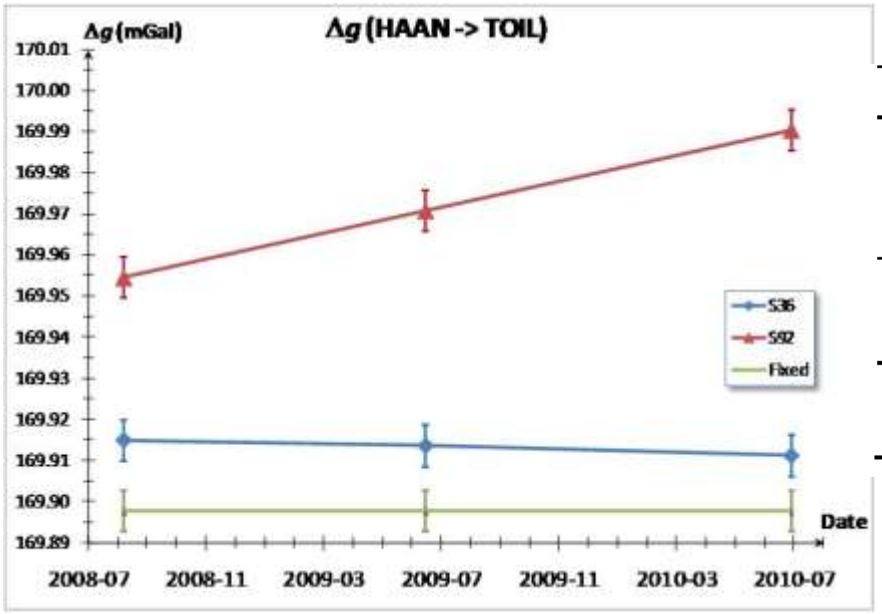
Results of calibration:

Gravimeter	G-4		G-113		G-115	
F_{Pol}, Y_1 ($\cdot 10^{-5}$)	-377.2 ± 4.9		16.4 ± 2.6		3.8 ± 2.3	
F_{Per} P (C.U.)	E (μGal)	φ(°)	E (μGal)	φ(°)	E (μGal)	φ(°)
1.0000	4.4 ±1.1	322±14	2.6 ±0.6	235±14	1.7 ±0.5	69 ±17
3.9412	- -	- -	2.3 ±0.6	196±13	- -	- -
7.8824	4.5 ±1.0	166±16	6.3 ±0.6	268 ±5	3.7 ±0.6	53 ±9
35.4706	6.0 ±1.2	79 ±14	5.8 ±0.7	7 ±6	11.1±0.6	212 ±3
70.9412	4.3 ±1.7	57 ±23	**52.5**±0.8	326 ±1	8.7 ±0.7	12 ±6





Gravimeter	G-65		G-191		S-36	S-92
F_{Pol}, Y_1 ($\cdot 10^{-5}$)	**171.4 ± 2.9**		**67.6 ± 3.7**		**9.34 ± 0.84**	**33.43 ± 0.86** (2008) **39.48 ± 0.88** (2009) **54.15 ± 0.87** (2010)
F_{Per} P (C.U.)	E (μGal)	φ(°)	E (μGal)	φ(°)		
35.4706	**21.8 ±1.2**	**306.2 ±2.8**	- -	- -		
70.9412	- -	- -	**67.3 ±1.8**	**190.1 ±1.9**		