Absolute gravimetry at UMB in 2007 – preliminary results obtained with FG5-226

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Abstract
We review the field observation campaigns with the absolute gravimeter FG5-226 in Norway, Luxembourg, and Sweden in 2007. Instrument comparisons were made at Trysil, Norway (with FG5-233), Walferdange, Luxembourg (an international comparison of several instruments), and Onsala, Sweden (with FG5-220). First epoch observations were collected at a site on Andøya Rocket Range to complement the mountain site at the Alomar observatory. Follow-up observations were made at Andøya Alomar, Bodø Asylhaugen, Honningsvåg, Hønefoss, Kiruna, Onsala, Stavanger, Trysil, Trondheim, Østersund, and Ås. The standard deviations are typically ±2µGal. Insufficient modeling of ocean tide loading affects the preliminary error estimates of some coastal sites.

Introduction

FG5-226 has continued the time series from 2006 throughout 2007 for both Trysil and Ås in preparation for comparison with time series results with GRACE, and to investigate seasonal effects on gravity results. Field campaigns were carried out in Norway and Sweden in May-July. Due to contractual diffculties with a third partner, The Norwegian Mapping Auhtority denied access to the gravity laboratory in Tromsø. The planned observations were thus not carried out. FG5-226 was compared to FG5-220 at Onsala in May and to FG5-233 at Trysil in August. Verification measurements were made at Ås before and after the campaigns. FG5-226 participated in the international comparison of gravimeters organised at Walferdange, Luxembourg in November.

Observational campaigns

Table 1 lists the observing dates and other information for each site. The campaign in June and July included stations separated by about one day of driving, except from Trondheim to Andøya and Tromsø to Honningsvåg where the instrument and the van was shipped by the coastal liner.

Supplementing ground water measurements were made at Bodø, Trysil, and Stavanger. Most sites lack ground water wells altogether. The coastal sites are near tide gauges.

Table 1. Observing log

Date	Site	Observers	Remarks
2007 Jan 19-20	Ås	KB	
2007 Jan 23-25	Trysil-AC	KB	
2007 Feb 05	Ås	KB	
2007 Feb 08	Ås	KB	
2007 Feb 27-28	Trysil-AC	KB	
2007 Mar 06	Ås	JGOG	
2007 Mar 28	Trysil-AC	KB	
2007 Apr 23-26	Ås	KB	EQs removed
2007 May 07-08	Onsala-AN	JGOG	Simultaneously
2007 May 08-09	Onsala-AS	JGOG	with FG5-220
2007 May 12	Ås	KB, BRP	
2007 May 31	Trysil-AC	KB	
2007 Jun 04	Ås	DIL	
2007 Jun 15-18	Hønefoss-AC	OCDO, BRP	
2007 Jun 19-21	Trondheim-AA	OCDO	
2007 Jun 25-28	Andøya-Alomar	DIL	
2007 Jun 28-31	Andøya-RR	DIL	New station
2007 Jul 01	Tromsø	DIL	admission denied
2007 Jul 05-08	Honningsvåg	KB	
2007 Jul 09-11	Kiruna	KB	
2007 Jul 13-15	Bodø New	KB	
2007 Jul 17-19	Østersund	OØ, BRP	
2007 Jul 19	Trysil-AC	OØ, BRP	
2007 Jul 31-Au 1	Trysil-AC	BRP	Simultaneously
2007 Aug 01-02	Trysil-AB	BRP	with FG5-233
2007 Aug 08-09	Ås	KB	
2007 Aug 20-23	Stavanger-AA	BRP	
2007 Sep 09-10	Trysil-AC	KB	
2007 Nov 06-07	Walferdange-C4	BRP, JGOG	International
2007 Nov 07-08	Walferdange-A5	BRP, JGOG	comparison
2007 Nov 08-09	Walferdange-B2	BRP, JGOG	with several
2007 Nov 09-10	Walferdange-B4	BRP, JGOG	FG5-instruments
2007 Nov 29-31	Trysil-AC	KB	
2007 Dec 12-13	Ås	KB	

Preliminary results

Each site occupation generated between 1000 and 4000 observations (Table 2). Each occupation consisted of 2-3 runs, mostly of duration 24 hours. Hourly or half-hourly data sets consisted of 50 or 100 drops.

Table 2. Preliminary results

Site	**Date**	**No. of obs**	**precision [µGal]**	**Remarks**
Ås	2007 Jan 19-20	2140	± 3.3	
Trysil-AC	2007 Jan 23-25	2046	± 1.8	
Ås	2007 Feb 05	1195	± 2.9	
Ås	2007 Feb 08	1189	± 3.3	
Trysil-AC	2007 Feb 27-28	1196	± 2.2	
Ås	2007 Mar 06	1197	± 2.3	
Trysil-AC	2007 Mar 28	1183	± 2.9	
Ås	2007 Apr 24-26	1491	± 2.2	
Onsala-AN	2007 May 07-08	1044	± 2.7	
Onsala-AS	2007 May 08-09	1047	± 2.3	
Ås	2007 May 12	749	± 2.3	
Trysil-AC	2007 May 31	1237	±2.2	
Ås	2007 Jun 04	1194	± 2.8	
Hønefoss-AC	2007 Jun 15-18	3494	± 2.9	
Trondheim-AA	2007 Jun 19-21	2392	± 3.3	OTL
Andøya Alomar	2007 Jun 25-28	6390	± 1.9	
Andøya-RR	2007 Jun 28-31	7312	± 4.1	OTL
Tromsø	2007 Jul 01			Admission denied
Honningsvåg	2007 Jul 05-08	7203	± 5.4	OTL
Kiruna	2007 Jul 09-11	2389	± 2.4	
Bodø Asylhaug	2007 Jul 13-15	2928	± 3.3	
Østersund	2007 Jul 17-19	1698	± 2.3	
Trysil-AC	2007 Jul 19	892	± 1.6	
Trysil-AC	2007 Jul 31-Au 1	1746	± 1.8	
Trysil-AB	2007 Aug 01-02	2346	± 2.6	
Ås	2007 Aug 08-09	2395	± 1.6	
Stavanger-AA	2007 Aug 20-23	3393	± 2.1	
Trysil-AC	2007 Sep 09-10	1184	± 1.9	
Walferdange-C4	2007 Nov 06-07	1169	± 1.7	
Walferdange-A5	2007 Nov 07-08	1168	± 1.1	
Walferdange-B2	2007 Nov 08-09	1195	± 1.0	
Walferdange-B4	2007 Nov 09-10	1894	± 1.7	
Trysil-AC	2007 Nov 29-31	3706	± 5.4	
Ås	2007 Dec 12-13	2085	± 2.5	

The rms-scatter around the mean is typically ±1-3 µGal. This value reflects the instrumental noise at the site and the effects of subjective operator alignments between each run. Occational time series have rms-values of ± 3-5 µGal. They are often due to insufficient modelling of ocean tide loading at coastal sites. This is directly identifiable from the observed time series.

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