



NORDISKA KOMMISSIONEN FÖR GEODESI

Nordic Geodetic Commission

Working Group for Geoid Determination

Minute of the April 2008 meeting of the **Working Group for Geoid Determination**, Nordic Geodetic Commission.

At Norwegian Mapping and Cadastre Authority, April 07-08, 2008.

Should we add Participants??

Opening

Welcome and opening of the meeting by Chairman Dag Solheim. Ove Omang was appointed as the secretary. The agenda was approved.

Status, NKG gravity data, NKG models and computations, EGM008, GOCE

1. Presidium

DS reported from the last meeting at the Presidium.

2. NGOS

DS informed about the request for information from NGOS:

1. Who is our contact persons

2. Our current products

3. Status of these; meta-data, etc,

1. DS: May we provide info about gravity data? GS: Data is easy to provide, but meta-data is difficult, could provide report, or the info we have.

2. DS: All(Dag?) should send information about or gravity data to GS or DS.

3. GOCE

DS informed that GOCE is delayed due to a failure of a Russian Proton rocket. New launch data is probably early fall.

4. NKG gravity data base

GS informed about a new gravity dataset received from Færøya island. One large ASCII-file, with huge amounts of data. It added 60-70% to our existing database. The dataset consisted of relative values only. It was a big job to clean it, and it was compared to altimetry data to help the cleaning process.

5. EGM08, NKG models and computation methods

RF gave an overview of the NKG models and computation methods, the GOCINA project, EGM08, X-over adjustment of marine and airborne data, and the new dataset around Faerøya Island.

1. There will be a challenge to get to 1 cm geoid. There are many geoids at the cm-level (GPS/Levelling, quasigeoid, Geoid, MSL, ...). Also of importance is what year!

2. Short presentation of EGM08, Degree/order 2160, 5'; Released mid-april 2008.

Produced by NGA, USA. Based on satellite data from GRACE, CHAMP ..., and satellite radar altimetry to fill the oceans.

1. GS/RF: New EGM08 will give better local geoid, new NKG geoid using EGM08 should be considered.

2. GS has been part of the evaluation group of EGM08. Test with preliminary model PGM2007A/B. Compared to GPS/levelling data sets from Nordic countries. Discussion on some large errors in the Trysil area. What is the reason; problems with the norwegian height system. It is a levelling problem. New EGM much better than EGM96 and at the same level as NKG2004!
3. JÅ: Presented GPS/levelling comparison from sweden and it's fit to PGM2007A is quite good in large part of Sweden. Overall fit of 5 cm for Sweden. A common height/geoid correction surface for whole nordic/baltic area.
4. RF: The GOCINA geoid is better than PGM2160A, and over Greenland a new airbourne survey will be flow again. There is something wrong with the US airborne over Greenland.
5. DS: NGS, US will fly a 0. order gravity over whole US.
6. A general discussion about problems in mountainous areas in PGM2160. Is it a height problem or is it a problem how they generated PGM2160? JÅ it is not seen in the gravimetric model, but in the global one!

6. Access to data (gravity and DTM)

1. Status today given by Dag
 1. Lot of data-providers. Easy if NKG could have a central role, where computers could get data from NKG; but that is not possible.
 2. Every member of WG may have to aply to data from each data-providers,
 3. The dream of logging on to a Danish server and get access to gravity data and work from home is probaly not possible.
 4. Not only gravity data also DTMs are not available.
 5. Finland: no free DTM data. Comercial product. However, secondary products are free, i.e. terrain correction.
 6. RF: Norway should handle people and access inside Norway.
 7. DS afraid that we have given to many people access to data? Which was not the intend of the data distributers.
 8. RF: a legal documents you have to sign. Or a waiver which everbody have to sign. Similar solution to other group.
 9. Let the national bodies (SK, LMV...) do the legal part. Make a model document that can be used by each national agency and each user have to sign to their national agency.
 10. Legal agreement between the agencies?
 11. **Conclusion:** Make a small working group, which will make a suggestion to the presidium about data policy; model document, what can be done with data, what they have to do if they quit, the members are: DS, RF, M Bilker, JÅ. Report to presidium in the fall.

7. Theoretical challenges

1. DS: A problem is that same data but with different methods gives different results. Need of student to look into theory. Approximation in the present theory, but also errors in the data. Need also good comparison data.
2. MB: working on theory together with Martin Vermeer.
3. NGS informed DS about IAG study group on different computational methods. JÅ will participate in a group using a French test data set. RF gave a little info about this data set. Before we produce a new NKG geoid we should use the French data set internally in our WG group to compare methods. Do it by/during summer.
4. RF: Suggest to send PhD people to different institutes to learn. Money for visiting different geoid working groups? Dag, Rene/Gabriel, Miriam, Estoian repr Artu/Harli
5. Latvia: approx 50 students, 10-15 masters; Lithu: 90 students split into

cartography/geodesy/cadastré. Master degree: approx 30 students, 5 PhD (approx 1 phd pr year).

6. RF: Suggest a new NKG activity to look into theory and the computer programs during the summer. Would like to invite people from other groups, and plans to do computation of new NKG geoid in February 2009. It should include EGM08, height datum, do comparison, etc... A small group to make a comparison and do the computation.

8. **The new NKG geoid model**

1. Should use the same datum of height and gravity. Use the European datum. It should be just a datum shift to the global datum.
2. Levelling should be on the same epoch. Heiner Denkers European geoid model has height datum problems, so it is worth the effort to make a new NKG model. New levelling data is available from Latvia, Lithuania, and also new data from Poland.
3. Move GPS data into the same Frame. Use a common campaign.

9. **National Reports**

1. **Iceland;** Gudmundur Valsson

300 GPS/levelling points; every 6-8 km. GPS observation times vary from 90 min – 40 hours. Using NKG96 geoid with local fit to GPS levelling. Std dev approx 5 cm. Land uplift of 20 cm in 10 years. Absolute gravity in 2007 by FGI. New national datum in 2008. First version of height datum in 2009. Laser scanning of all glaciers in 2008 and 2009.

2. **Finland;** Miriam Bilker-Koivula

N2000 height system finished in 2007. Fin2005N00 geoid (based on NKG) model estimated Sept 2007. Projects running are in gravity field modeling, HYDROGRAV – grace+ground gravity data + hydrological modelling, Satellite orbit inversion and temp grav variation in Finland, precise multitude-sensor geoid modelling.

Meeting Day 2

10. **Scientific presentations**

1. Jonas Ågren; **New swedish geoid models**

1. Last geoid model: SWEN05_RH2000/ SWEN05_RH70
2. RH2000 geoid main model based on NKG2004 adopted to SWEREF99 and RH2000, correction for land uplift and diffs in tide systems.
3. RH70 geoid computation from RH2000 using a very accurately model of height system diff between RH2000 and RH70. Model based on 50000 benchmarks.
4. Accuracy: 15-20 mm in areas with dense GPS/levelling data. Compared to SWEPOS (24), Sweref99 (171), and RIX95 (1300). GPS/levelling residuals in Jämtland (Trondheim area) around 5-10 cm. Method is LSQ modification of Stokes formula. DEM 100mx100m. Global model is GGM02C with EGM96 from 201 to 360. Switch between global and local data: degree 85. Combined atmospheric correction 2-4 mm. Ellipsoidal correction 0-5 cm. Compared to GPS/levelling, 195 station, gives standard deviation of 2.0 cm, with max/min values of -7.4 to 7.0 cm. New model SWEN08_RH2000 and RH70. Laser scanning of the whole Sweden to get a good and detailed DTM model.

2. Miriam Bilker-Koivula; **Choosing a new geoid model for Finland**

1. New geoid model for GPS/levelling to height system N2000. NKG2004 + approx 50 EUVN-DA GPS/levelling points. Surface fitting using either polynomial fitting or covariance functions with GRAVSOFIT. Final fit: mean + Collocation (200 km, 0.02). New geoid model: FIN2005N00. Cross-validation ~28 mm. No new model for the N60 height system. Use the old model FIN2000.
7. Ove Omang; **What part of GGM to use**
 1. Short presentation about GGMs and how large part of it should be used should be used and the importance of the a very precise GPS/levelling data set.
11. **Discussion on the importance of a good height system.**

Problem with different ellipsoidal systems in the nordic countries. A small start is to share EUVN-DA GPS stations to make those into a common reference frame. Recompute the ellipsoidal height should be done by each national agency. Or the work by the position group. In Sweden it could be done (JÅ). Transformation (7-par) from local to nordic frame may be enough.

Concusion: We ask for EUVN-DA data and 1-2 cm consistency. Use it for checking geoid models against these data. Data should also be from Baltic states. No problem with data from Baltic states. LT: possible to remeasure the EUVN-DA stations.
12. **National Reports, cont.**
 1. Denmark; Gabriel Strykowski
 1. DKGEOID04: new height system DVR90. NKG04 was fitted. Fitted to 400 GPS/levelling points. Greenland geoid GGEOID04 is based on gocina geoid. Fitted to MSL in towns. Marine Surveys (Fareoes, Galathea).
 2. Estonia; Priit Pihlak,
 1. 4 new absolute gravity points, and 3 old AG.
 2. GNSS: 5 stations, collocated with AG. New GNSS stations planned this year.
 3. 404 GPS/levelling points, 114 in 1 and 2 order net, 290 densification points.
 3. Lituania
 4. Latvia

End of Meeting