



NORDISKA KOMMISSIONEN FÖR GEODESI

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MINUTES

69th NKG PRESIDIUM MEETING

Time: 21-22 March 2018. Starting at 1 pm with lunch on the 21st. Ending at 3.30 pm on the 22nd.
Place: Bella Sky, Ørestad, Copenhagen

Item 1) Opening of the meeting

Niels welcomed us all to the meeting and we all thanked SDFE and DTU Space for arranging the meeting.

Item 2) Approval of the agenda

The agenda was approved

Item 3) Approval of the Minutes from NKG Presidium meeting No 68

The minutes was approved after a minor amendment.

Item 4) NKG Web site

Thorarinn pointed out, that by encrypting the NKG's website we could improve the security of it. Go from "http" to "https". This security protocol costs from \$15 - \$250 per year. LMI will implement this and cover the cost.

LMI is working on guidelines on how to put text and documents (e.g. minutes, slides etc.) to the website. The first draft should be ready in April. LMI is still missing the data from the old homepage. Markku will send the data to LMI as soon as possible. LMI aims to have the data uploaded to the new homepage by the start of summer holidays.

Item 5) Reports from the working groups.

Positioning and Navigation

The working group is not active and will be most likely be silent till the General Assembly. Focus will be on encouraging reporting on what has been done to the General Assembly. There might be a physical meeting in May but it could also be decided that it will be as email-discussions only. Not decided yet.



Geodynamics

The working group had a meeting on March 13-15 together with Geoid and Heights. It was a good meeting with good discussions. Focus was of course on the Land Uplift Roadmap and the coming four-year period and proposed focus areas.

Concerning the road map, Matthew reported that it is in good progress and that the group believes that it will deliver necessary results before the NKG General Assembly. It is a complex roadmap with many dependencies as well as deliveries but the work is focused and under control.

Matthew also mentioned that we need to find someone to replace Matt at the General Assembly since he will not be participating.

Geoid and height systems

The WG meeting in Helsinki last week was very successful (as usual co-organized with the WG of Geodynamics). A main point was the discussion of the next four-year period and proposed focus areas. One part of the meeting focused on developments in geoid modelling and height systems with the new Estonian height system as perhaps the highlight. Martin Vermeer presented a future potential (i.e. height) measuring technique based on very accurate optical lattice clocks. The hope is that within a decade or so we have portable clocks with time transfer that will give about one cm accuracy heights. Jonas also mentioned the EGM2020 Evaluation Working Group where René and Jonas are involved. The meeting decided that Jonas and René would make this as a part of the NKG working group work, which means that they will use the NKG gravity data and GNSS/levelling and will acknowledge the participants in the WG. Please also note the upcoming event in Denmark; International Symposium on GRAVITY FIELD OF THE EARTH in Copenhagen in September (<http://www.space.dtu.dk/english/gghs2018>)

The next FAMOS project will most likely be called STM-FAMOS (Sea Traffic Management – FAMOS). Positioning are suggested to be one of the four “pillars” in the new project, so the geodetic part will most probably be included in the future as well.

Short summary on the status in the projects:

NKG2015 geoid

- The new NKG2015 geoid model was released at October 6, 2016
- Silja Märdla et al. published two papers concentrating on two different aspects of the NKG2015 geoid project:
 - ✓ Märdla S, Ågren J, Strykowski G, Oja T, Ellmann A, Forsberg R, Bilker-Koivula M, Omang O, Parseliunas E, Liepins I, Kaminskis J (2017) From discrete gravity survey data to a high-resolution gravity field representation in the Nordic-Baltic region. Marine Geodesy DOI 10.1080/01490419.2017.1326428
 - ✓ Märdla S, Ellmann A, Ågren J, Sjöberg L E (2017) Regional geoid computation by Least Squares Modified Hotine's formula with Additive Corrections. Journal of Geodesy.



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- The main publication will be written during the spring/summer 2018 with Jonas as main author (some delay here, plan to start in middle of April 2018, submission early autumn). DTU Space will submit a new computation centre solution before May 15, 2018 (DEADLINE).
- Much geoid related work is otherwise being done in FAMOS Activity 2,
 - ✓ 6 new marine gravimetry campaigns were performed in 2017. At least 6 planned for 2018.
 - ✓ New Swedish marine gravimeter (ZLS). Initial delivery test campaign successfully conducted + one full piggy-back campaign in 2017. 4 campaigns planned for 2018 including one of them airborne.
 - ✓ Etc... (very much is going on, for instance FAMOS databases, interim geoid computations using different methods, real time GNSS, satellite altimetry and tide gauges)
 - ✓ New subproject STM-FAMOS in the pipeline for 2019-2020).

Land uplift modelling

- The new land uplift models NKG2016LU_abs and NKG2016LU_lev were released at June 30, 2016.
- The work with empirical land uplift modelling is now a little bit delayed compared to the roadmap (mainly due to Jonas). But there is still good chance to be finished to the General Assembly:
 - ✓ Estimation of uncertainties of the empirical model and of NKG2016LU_abs/lev (2017-09).
Work is in progress mainly by Olav, but also Jonas lately. They now debate how to best estimate the uncertainties, hopefully we will finish soon.
 - ✓ Publication of NKG2016LU (submission 2018-03)
Olav Vestøl and Holger Steffen has written a first draft of the paper. Jonas is now working on his parts (combination of empirical and GIA models). They also have to agree on a method to estimate uncertainties before it can be submitted.

Reference frames

The next Working group meeting will be held in Oslo in April 19-20, 2018. Summary of the activities are;

- NKG AC (project):
 - Operational solutions continuously, repro and time series analysis progressed
 - Skype meeting in January 29, 2018, another Skype meeting today
 - Publication: Lahtinen et al. (accepted): First Results of the Nordic and Baltic GNSS Analysis Centre, Journal of Geodetic Science.
- ITRS-ETRS89 transformations (project):
 - BIFROST/NKG2016GIA_prel0906 alignment tests
- PROJ.4 (study group):
 - Kick-off meeting in Copenhagen in November 2017



A more detailed summary is as follows;

Status report NKG GNSS AC

Operational part

- Operational solutions are produced on a weekly basis as usual (since summer 2014)
- 8 national LAC (all Nordic and Baltic countries) and NKG EPN subnetwork:
 - daily solutions,
 - weekly solutions
- 2 combination centres:
 - combined solutions (NKL with ADDNEQ and NKF with CATREF)
 - delay: 5-10 weeks

Repro

- all LACs have contributed (8 countries and NKG EPN)
- all daily and weekly solutions have been combined with ADDNEQ and CATREF
- a test analysis has been performed on 40 stations by 4 LACs (EST, FGI, ISS, LM_). The purpose was to select a main solution type out of the 4 solution types (NKF03, NKF10, NKL03, NKL10) and to develop guidelines for our Tsview analysis.
 - No clear best solution type, but a main solution type was selected anyway → NKF03
 - Guidelines were elaborated within this smaller group.

Test analysis with Tsview

- In general, very small differences between the solution types, larger between NKF and NKL than between 3° and 10 °
- NKF has slightly smaller estimated standard deviations in height
- NKL and 3° have smaller differences on twin stations (8 pairs)
- Smaller differences between NKF and NKL for 3°
- No reliable conclusion on BEST SOLUTION TYPE!

Repro: next steps

- A Benchmark test (11 stations) has been prepared and sent out to all LACs, who will perform the test to get consistency between the LACs. Should be finished to next WG-meeting April 19-20.
- Next steps:
 - national times series analysis with Tsview (end June 2018)
 - More reliable uncertainties with Hector
 - Combined coordinates and velocity solution (probably not before NKG GA)
 - Time schedule and details will be defined at the WG-meeting in April.

ITRS-ETRS89 transformations “production line”

- NKG2008 transformation (-2016)
- New 2D+1D land uplift model NKG_RF17vel (-2018)
 - Horizontal: BIFROST + NKG2016GIA_prel0906, see next slide



- Vertical: NKG2016LU_abs
- Updating the NKG2008 transformation (2018-)
 - Incorporating NKG_RF17vel to the transformation scheme (replacing NKG_RF03vel)
 - New ITRS coordinates for parameter estimation (replacing NKG2008 campaign) – from NKG GNSS AC repro
 - Updated/improved NKG transformation
- Incorporating the transformation to transformation software/services (e.g. PROJ.4) → a tool for semi-dynamic and dynamic reference frames!!!

Status report ITRS-ETRS89 transformations

Next steps towards a new (horizontal) land uplift model NKG_RF17vel (vertical component: NKG2016LU_abs) – alignment of NKG2016GIA_prel0906 velocities to the BIFROST GNSS velocities:

1. Helmert fit (incl. uncertainties of both velocities)
2. Least squares collocation
3. Comparison of 1) and 2) and selection of final horizontal velocity model
4. Uncertainty estimation (preferably similarly to the vertical NKG2016LU model if possible; this was still under discussion this week)
5. Draft of the publication (including documentation of: NKG2016GIA_prel0906, fit/alignment and uncertainties)

PROJ.4 study group

Kick-off meeting in Copenhagen in November 2017 included discussion on

- Background and introduction to PROJ.4
- Presentations and discussion of transformations in Nordic countries
- Some conclusions:
 - DK and IS will go for PROJ.4
 - SE, FI, NO: some necessary tools still missing
 - Benchmarking project needed
 - Discussion on file formats for geophysical dynamical models needed

PROJ.4 version 5.0.0 released in March 1, 2018. Includes tools to perform the NKG transformation – separate NKG parameter file available for this

Dynamic Reference Frame Iceland project – status report.

The project is mostly in line with the time lines and will be completed to the NKG-GA 2018. Next meeting 4-5 April, Reykjavik. Main focus;

- A RTK service with dynamic coordinates
- Continuous deformation model
- Organization of the long term NKG-DRF activity

Discussion about and the use of InSar and the project.

Item 6) NKG strategy and future working groups



The background material has now been discussed also in all working groups. The presidium discussed the future in general terms on how to ensure that NKG is relevant also in the future and what are the strengths of NKG. We noted that NKG is very important when it comes to sharing knowledge, sharing results but also running joint projects and operations as e.g. the Nordic gravity database, GNSS analysis centres, dynamic reference frame-project, geoid project and more. However, we also note, and some of this is done with different priorities in the different countries, meaning that some projects run very late. This is especially the case for complex projects that require substantial contributions from all the involved countries, like for instance in the NKG2015 geoid model project. We also note that through the UN resolution our boards of management show a bigger interest in geodesy.

Concerning the last part, we mean that our managers, both individual but also through the Nordic cooperation, are asking us for information as well as putting higher expectations on us. We have been at the latest Stor-chefs-meetings and reported on our progress. It is also noted that within the Presidium different views exist on how we should make use of the interest of the Director Generals, from simply informing them about our progress to asking the DGs for their permission (including priority) to assure that we can continue and start new projects.

When discussing the reports from the discussions in the different working group we note;

- From Geoid and height systems: Keep future height system and geoid together as a group, as today. Two of the proposed focus areas are very suitable for the group (future height system and geoid). The current group is in general happy with these focus areas but would possibly prefer that they were combined into one focus area. They are also keen to continue the group. The group believes that milestones should be named tasks instead and they do miss land uplift modelling in the description.
- From Geodynamics: The group report that their activities and research should be more prominent and more clearly represented in the focus areas. The current focus areas are currently very user oriented. The land uplift workshop 2016 was a success to coordinate working group activities and they suggest that something similar be organised as soon as possible after the General Assembly. The working group would like to continue as a group. Three of the suggested focus areas are relevant to the WG, but the WG also suggests a new focus area that better reflects “geodynamic” contributions and activities. The name “Geodynamics and Earth observation” was proposed. The presidium agreed to add this focus area.
- From Reference Frames: This group has not had a physical meeting yet but has discussed this through internet. Unfortunately, not many have yet replied but it will be discussed at the working group meeting next month. The group believes that the present structure is fine. The NKG GNSS AC should be considered as a “permanent service”. Have specifically looked at the DRF-focus area and have some thoughts as well as needed clarifications. When we write calculation centre in milestone 3 we actually do mean analysis centre.
- Focus area “Dynamic Reference Frame”: this should at a minimum be a project within NKG. Discussion concerned if it should be a project ordered by the DGs. The group did not reach a common agreement of what this really means. However, we need to start to define needed



resources and costs as well for the DRF project. This project will need deliveries from all the working groups. Søren believes that we need to include the cost- / benefit analysis among the milestones to understand what the implementation of DRF may mean

- Focus area “The Nordic contribution to GGRF”; This is perhaps not a WG since it is a cooperation between three observatories. A closer cooperation is needed but it is not clear if we need a working group on this or not. Perhaps we should rather see this as a permanent agenda point to future presidium meeting?
- Focus area “Future Positioning Services”; This is a new area and it is needed. This could probably be a working group, but it was also suggested that it could be a project ordered by our Director Generals. We could include more in the project than just the positioning services as e.g. the demand of high quality maps and how the mapping authorities could utilize them.
- The Presidium discussed on geodetic observations, meta data, data policies etc and that these should also be included in the strategy.

It was decided that Denmark should prepare a one-page on ‘Future positioning service’ and Norway a one-page on ‘Dynamic reference frames’. The two one-pager should be submitted to the Lillechefmøde for discussion and based on their contribution and comments NKG should prepare a project document for submission at Storchefmøde. As little time for preparation it was agreed that the comments would be prioritised.

Item 7) NKG General Assembly 2018

Markku gave us an update on the preparations. The dates are decided (September 3-6) as well as location (Pasila). A Local organising committee as well as a scientific committee are in place and has started its work. A web site is also up and running even though the information is still limited. The presidium was also asked to send in our thoughts of key note speakers to Markku. When discussing this we thought that linking key note speakers to our future focus areas would be appropriate as well as having some international speakers

Item 8) European Navigation Conference 2018

Jan presented on the status about the preparations to the conference. The program is almost ready and will be published as soon as possible. All are of course invited and can be registered using a discount fee. On May 14 there will be pre-meetings and icebreaker reception. Panel discussions, key note talks as “regular” parallel sessions will be held during May 15-17. More information can be found on enc2018.eu. Also, good to know, is that IEEE are involved.

Item 9) Baltic engagement in NKG

We have been approached by colleagues in our Baltic countries asking for increasing involvement in NKG. They are already contributing a lot to our working groups. We decided that we in the future (after NKG General Assembly in Finland) will start inviting them also to the NKG Presidium meetings as observers.

Item 10) Status on UN-GGIM Subcommittee on Geodesy and UN GGIM Europe: Geodesy



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From Per-Erik's presentation at the meeting regarding UNGGIM Subcommittee on Geodesy (SCoG) we note the following;

The new United Nations Subcommittee on Geodesy was inaugurated in Mexico City in November in the margins of the 2017 UN-GGIM High Level Forum. 19 Member States and organizations participated in the meeting. Report is available at http://ggim.un.org/documents/SC-Geodesy_Mexico2017.pdf. Norway (Laila) stepped down as co-chair while Australia (Gary) is continuing one year. Alexey Trifonov from the Russian Federation is the newly elected co-chair. Norway is team lead of the governance focus group (Laila) and the outreach and communication focus group (Anne). Sweden (Mikael) is team lead of the education training and capacity building group. Australia (Gary) is team lead for the geodetic infrastructure focus group and Canada (Mike Craymer) is group lead for the policy, standard and convention group. The focus groups are working on the details in the implementation plan and the governance group is working on the position paper to define the appropriate governance mechanism for the GGRF.

The governance group has agreed to pursue in this direction: Work towards recommending the Committee of Experts to:

1. request the subcommittee to formulate a convention designed to implement roadmap recommendation c) in the section of Geodetic Infrastructure (Recommendation c; *Member States, working within a coordinated science plan developed by the IAG, commit to maintaining current investments in the existing geodetic observatories, as well as data, analysis, and product centres, in order to ensure sustainable provision of services*)
2. endorse the revised terms of reference for the subcommittee of geodesy (if we conclude that the ToR needs to be revised or rules of procedure added)
3. investigate possible options to establish a professional operations organization for GGRF and or whether or not an existing geodetic organization can evolve to become the operations organizations needed (and how this can be done)

SCoG is discussing the necessity to have an open and overhead convention that they can add several protocols to; protocol for data sharing; maintaining national infrastructure (or a part of it); education training and capacity building, etc. A convention is an agreement oversight by the UN that nations can agree to and sign (if they want to). A nation can also choose to sign only one or a few of the protocols under a convention. Only a small number of nations needs to agree on the convention in the beginning, and other nations can join as time goes. The goal is to have all nations sign. More protocols can also be added as time goes.

The governance group has agreed to consider how/if revising the ToR and establish rules of procedure can strengthen the subcommittee itself. The position paper must discuss why we would like to change what (in the ToR) – what will be the benefit of changing the ToR and what do we want to achieve by it. The plan is to prepare a draft ToR for the 8th session as part of the position paper. The revised ToR should make the subcommittee able to work more efficiently.



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The UN cannot run an operations organization. The SCoG need to think about how and if it is possible to use and/or transform existing organization to serve our purpose (ie. IERS and others). The subcommittee must try to find a way to get GGRF operations sustainable globally, so that there exist an entity that can deal with more than the SCoG can do. This analysis may be too comprehensive for the governance focus group to do as part of this position paper. Adding the discussion regarding the need for such an entity should be considered.

From Markku's presentation on UNGGIM:Europe GRF we note the following;

Markku leads the UNGGIM:Europe GRF. The vision for the SCoG is to provide "an accurate, accessible and sustainable global geodetic reference frame to support science and society". The Subcommittee will work closely with the regional UN-GGIM geodesy working groups, the national geodetic agencies and the global geodetic community to continue the implementation of the road map towards the vision and to ensure better utilization of GGRF geospatial datasets nationally, regionally and globally. An ongoing role is in the provision of geodetic expertise to the Committee of Experts and the broader intergovernmental community, especially relating to the Sustainable Development Goals, but also to hazards, the environment, peace and security, and economic development.

The IAG Sub-commission EUREF is composed of representatives from European IAG member countries; annual symposium (plenary) and the Governing Board (GB). The organization has links to about 130 European organizations, agencies, universities from more than 35 countries – related to georeferencing, positioning, and navigation. The GB is composed of members elected by the plenary, members in charge of special tasks and ex-officio members. The focus is the governance of EUREF activities and policy. Euref provides all its products and services on the "best effort" basis and free of charge to the public.

Euref has developed the EUREF Permanent Network (EPN) for the maintenance of the European Reference Frame, as a contribution to the ITRF and as an infrastructure to support other relevant projects, e.g. European initiatives related to Galileo. The organization implements necessary projects for the long-term maintenance of the ETRS89 (European Terrestrial Reference System) and the EVRS (European Vertical Reference System). It promotes the adoption of the reference systems defined by EUREF (ETRS89 and EVRS) in the European countries and European-wide organizations involved in geo-referencing activities and it improves the Unified European Levelling Network (UELN) by extending it to all European countries, considering the perspective of a geokinematic computation.

The SCoG provides an intergovernmental forum, with equitable regional representation, for cooperation and exchange of dialogue on issues relating to the maintenance, enhancement and use of a Global Geodetic Reference Frame (GGRF). Countries representing Europe in SCoG are Belgium, Finland, France, Germany, Moldova, Norway, Russia, Spain and UK.



One of the very challenging tasks of the SCoG in developing the future work plan is to come up with a governance structure where Members States will be solicited for more actions, investments, commitments, and secure funding for geodesy. GRF-Europe group would very likely have no influence in this respect. EUREF already has connection to necessary infrastructure, and experience to supervise the reference frames in Europe as well connections on the global level. European NMAs are participating EUREF as a core part of it and EUREF has a well-organized structure, all means to follow the SCoG implementation plan and moreover, many EUREF key persons are involved with SCoG.

This was presented to UNGGIM:Europe Executive Committee in January and a follow up meeting is planned with Hansjörg Kutterer the week after this meeting.

Item 11) EUREF (Markku)

Markku reported that the EUREF Governing Board had its last meeting in Padova, Italy for two weeks ago. Focus on the agenda was on strategy discussions since the Euref GB is developing a new strategy. Ideas and opinions from all members to the strategy was discussed and skype meetings are scheduled to continue the discussions. The new strategy is to be presented at the upcoming Euref symposium in Amsterdam in June. NKG can still influence and send inputs to the strategy and Markku will send in the "NKG-strategy" to the EUREF-discussion.

Item 12) Other Business (All)

The Presidium discussed the relative gravity line and notes that still all the gravity data is still in the hands of Jakko Mäkinen. This is very concerning and needs to be sorted and made available. Unfortunately, it seems that he is the only one that can secure the observations and data but he gives this very low priority. Jarkko and Markku are asked to discuss this urgent matter with Jakko again.

Item 13) Next meeting of the Presidium (All)

We decided that we will organise a skype meeting just after Lill-chefsmöte (end of April). We also decided that we need a face-to-face meeting before summer to finalise the upcoming working groups and their focus. This meeting will be held in Norway

Current order; Iceland – Denmark – Norway – Sweden – Finland



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Present:

Denmark: Niels Andersen, DTU Space (Chair)
Sören Fauerholm Christensen, SDFE

Finland: Markku Poutanen, NLS
Jarkko Koskinen, NLS
Pasi Häkli, NLS

Iceland Thorarinn Sigurdsson, LMI

Norway: Per Erik Opseth, Kartverket
Matthew Simpson, Kartverket

Sweden: Mikael Lilje, LM (Secretary)
Jan Johansson, Chalmers
Jonas Ågren, LM