



NORDISKA KOMMISSIONEN FÖR GEODESI

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MINUTES

75th NKG PRESIDIUM MEETING

Time: 2-3 April 2019
Place: 2nd April; AstaZero (<http://www.astazero.com/>)
3rd April; RI.SE (<https://www.ri.se/en>)
Quality Hotel Grand, Borås

Note 1: There will be a presentation of and visit to AstaZero during the afternoon on the 2nd April.
Note 2: there will be a presentation of and visit to RI.SE during the 3rd April.





Item 1) Opening of the meeting (Markku)

Markku opened the meeting and welcomed us all.

Item 2) Approval of the agenda (All)

We agreed on the agenda with the change to also include a discussion on the review of the by-laws.

Item 3) Approval of the Minutes from NKG Presidium meeting No 74 (Dec, 2018) (All)

The meeting notes were accepted with the change that the header of the minutes and agenda needs to be updated with Markku as new chair of the Presidium.

Action: Mikael to update the header.

Item 4) Report from Coordinating Board (Per-Erik)

Per-Erik presented ideas on the terms of reference for the coordinating board. The start of the work of the coordinating board was delayed because he has been waiting for a decision on his own position at Kartverket. His situation is now decided, and he will continue as Head of the Geodesy Division. A decision that the Presidium welcomed very much, and we are looking forward to the good cooperation with Per-Erik and Kartverket.

Per-Erik reminded the Presidium on the resolution from the General Assembly in 2018 and he suggested, and the meeting developed them further, the tasks for the Coordinating Board to be as follows;

- Maintain a project model and associated templates
- Help the project managers to follow the agreed formats and assist in an early phase.
- Receive and quality assure project proposals
- Propose projects to the Presidium and follow up on deliverables in ongoing projects
- Maintain a NKG project portfolio
- Meetings approximately every month – dependent on the portfolio content, based upon provided status report from the project managers.
- Members: Chair, project owners and project managers.

The meeting discussed the tasks and how the NKG Presidium and the Coordinating board should work together to make NKG more efficient and relevant in the future. We noted the challenge on defining a project and which projects should be discussed in the coordinating board.

Action: We agreed on the tasks for the coordinating board

Action: The meeting decided that this should be tested and, if necessary, developed.

The meeting discussed the project Dynamic Reference Frame. Since the General Assembly it was noted decrease in the activities of the project basically because the project needs decisions from



the Presidium on the main priorities. There are though some outreach activities in near future to present findings up to now, like a peer reviewed publication and a presentation in the Symposium of the European Geophysical Association.

The project group has suggested a new project with the proposed work packages are DRF-P1 to DRF-P5.

DRF-P1: Deformation models (M1-M7)

DRF-P2: Outreach (M1-M6)

DRF-P3: Positioning services in DRF (WG Positioning services)

DRF-P4: Full scale test in the TAPAS area (M1-M4)

DRF-P5: Reference Frame Realization (WG Reference Frame)

The project group suggestion is basically two parts and that is

- continuation of the more geodetical part with e.g. velocity fields. A discussion about the project's prioritization took place and we noted e.g. that the InSAR part was already postponed by the working groups.
- including and understanding the user needs in cooperation with the stakeholders.

It was noted that several working groups have started working group activities related to the suggested work packages from the project group. The reference frame working group started planning, prioritizing and incorporating DRF-related tasks for the ongoing 4-year-period at their annual WGRF meeting

The meeting also noted the need to have the stakeholders in focus and involved and that a new project should be described. Based on feedback from the working group meetings that just had been held the Presidium meeting, the Presidium had a lengthy discussion on the future of the project and decided on the following actions:

Action: The DRF should be prioritized by focusing on the P1-M1, P2-M2 and P1-M2. The DRF project is asked to come back with a time table and needed man power to the next coordinating board. This should then be presented at the next presidium meeting.

Action: A new project should be described having the stakeholders in focus and involved. This should have ongoing and coming initiatives in the various countries included. The need to the next Presidium meeting is to develop a project idea with expected outcome, project members and time table. This action is under responsibility of Per-Erik Opseth.

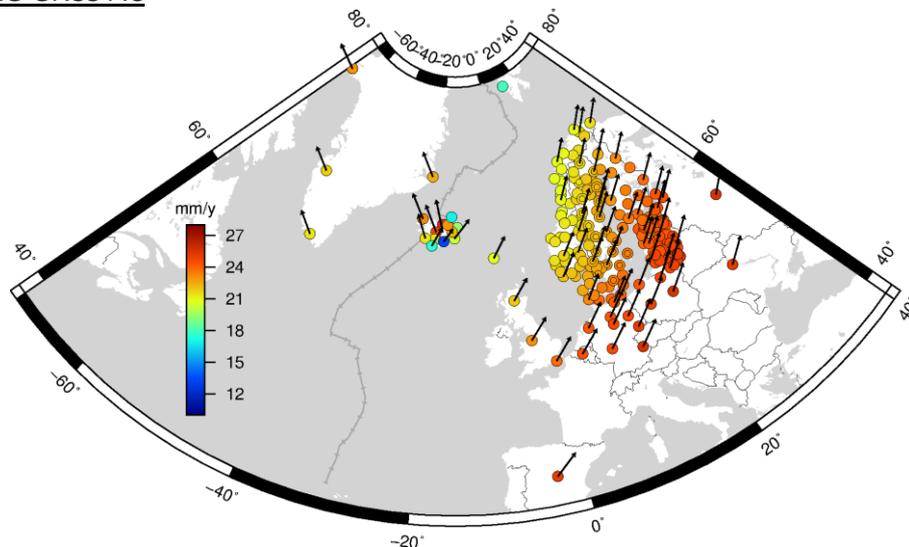


Item 5) Report from Working Groups (Pasi, Dagny, Holger, Anna)

a) Reference Frames (report given by Pasi Häkli)

The WGRF held its annual meeting in Copenhagen March 25-26, 2019. The agenda included scientific/technical presentations, National reports, and overall planning for the coming years. The meeting also discussed the two ongoing projects NKG GNSS Analysis Centre and NKG Transformations. The working group does not have further project proposals at the moment. The meeting also spent time on discussing activities that should be coordinated with the DRF program/project. New possible development tasks were presented in DRF-P5 (preliminary) and was prioritized in the WGRF meeting (and discussed at this Presidium meeting)

Project NKG GNSS AC



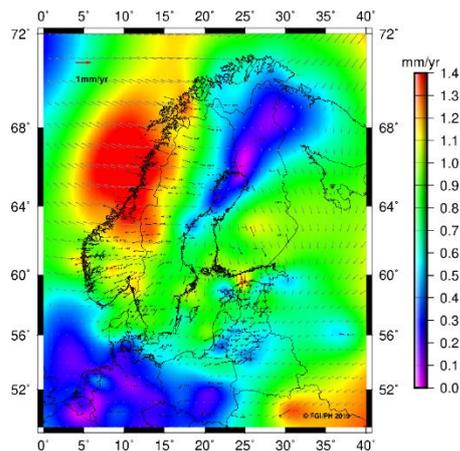
NKG AC operational processing (service) produces operational solutions continuously. The NKG AC repro1 (project) includes data GW 887-1934 (Jan. 2017) and 252 stations with more than 3 years of data (up to 20 years). The Repro and time series analysis are completed with the final solution 2019-02-05. The solution was done using CATREF (crd+vel) and Hector (vel. uncertainties with WN+FL). All this resulted in updated "NKG" coordinates, velocities and their uncertainties and is summarized in a paper that is submitted to GPS solutions.

The working group meeting discussed DRF-P5 listed topics and the need to prioritize and suggested the following;

1. Implementation of Galileo and RINEX3 in operational processing
2. Contribution to EUREF and EPN activities
3. Cumulative solutions based on Repro1 and operational solutions



Project NKG transformations



The new NKG_RF17vel land uplift model has been waiting for the final NKG coordinates, velocities and uncertainties. A preliminary model was presented at the WGRF meeting based on collocation of NKG AC and BIFROST GNSS velocities and NKG2016GIA_prel0907 model. It still needs still some cleaning and feedback is requested from all countries.

Regarding updated NKG transformation, a preliminary transformation was presented at the WGRF meeting which uses the model NKG_RF17vel_prel20190323 and ITRF2014 coordinates from the NKG repro1 (replaces NKG2008 campaign). The working group is waiting for the final model and some cleaning (large residuals), and feedback from all countries was requested. The next steps regarding the work item is to finalize the NKG_RF17vel velocities, check solution numbers of the ITRF2014 coordinates, check residuals and do possible rejections before the final NKG transformation can be determined and implemented to PROJ. After finalizing the transformation, more focus will be on PROJ. The PROJ activities are closely related to the transformation aspect of the WGRF terms of reference, by providing an implementation platform that is useful for geodesists and applicable for end users. Taking an active role in the PROJ community is a natural part of the WGRF activities. The PROJ Study Group, under the auspices of WGRF, has finalized its work. In summary, the working group has studied PROJ and found it useful for collaboration and dissemination of geodetic transformations and suggest continuing the work as a part of the NKG transformation project.

b) Future Height Systems and Geoid (report given by Dagny Lysaker)

The working group meeting included presentations on marine gravity data and geoid, FAMOS and Common reference datum for nautical charts (Baltic Sea Chart Datum 2000). A session discussed IHRS/IHRF where IHRS is a GNSS + geoid-based height system, while levelling is only in local height systems. It uses mean-tide system and the first version of the system (IHRF2019) will be presented at the IUGG in July 2019. IHRF2019 is based on a selection of 165 stations with high precision coordinates, velocity, geopotential and change in geopotential value. Ny-Ålesund, Onsala



and Metsähovi among the selected stations. The working group meeting also included discussions on:

- Final wrap-up before delivery of the NKG2015 gravity database (minus Polish and German data) to NGA (for EGM2020)
- NKG gravity database including update with brand new Lithuanian data and relation between the FAMOS and NKG gravity databases
- EVRF2019

The updated version includes new data since 2007. It is normal height in zero-tide system, also mean tide system. Each country has been asked by EUREF to sign an agreement about how data should be published and NKG's suggestion is that the countries should share all data. The deadline for replying is May 1st.

The working group discussed its focus for the coming period and noted the following;

- New geoid model
 - keep on collecting and cleaning gravity data
 - are we at the edge of what our methods can deliver?
 - keep the database updated
 - merge FAMOS into NKG.
- Error field of geoid
 - Error propagation in geoid determination
 - Use of cross validation will give an estimate of the error.
- Apparent land uplift model
 - raise of the mean sea level
 - possible many users of an apparent modelling
 - water level is the most uncertain
- Empirical land uplift modelling
 - New data give reason for a new updated modelling
 - Russian, German and Polish levelling data.
- IHRF
 - realization of the IHRF is without levelling, while our local height system is based on levelling.
 - Add a smooth residual surface to match the IHRF
 - We will need good GNSS/levelling and gravity data.
- Future national height systems



c) Geodynamics and Earth Observations (Holger Steffen reported)



The working group held its meeting in March in Denmark and Holger reported on its findings. The meeting spent lots of time on introducing InSAR with 3 invited presentations and concluded that at the moment no specific NKG action is needed but we continue next year and keep contact to the InSAR community. InSAR has been used for scientific studies in the Nordic and Baltic countries. Many countries are building national InSAR structures and implement services (e.g. Norway, Denmark, Germany). Discussion concerned what type of geodetic infrastructure is needed for homogenous InSAR products and services? This included a discussion on

- how important are the InSAR – GNSS stations local ties?
- are transponders or reflectors needed at all? If so, transponders or reflectors or both?
- Maintenance and operational issues of reflectors and transponders?
- How many transponders or reflectors, how dense, where (strategic locations of GNSS – InSAR ties?!)
- Long term stability of the “reference point” of transponders?

The meeting also discussed the NKG2022GIA model that will be developed within NKG activity. It was also noted that the working group will continue with AG measurements and Nordic cooperation. There will be a Nordic comparison in Onsala before September 2022. The working group is planning to publish three publications regarding the relative gravity lines. Lastly, it was noted that the group will change to mailing lists.

d) Future positioning services and applications (Anna Jensen reported)

The working group is yet to organise its first meeting. Anna reported that this will happen shortly and ask countries to nominate contact persons.

Among the milestones she noted the following two;

- i) White paper on future positioning services in 2019. To be presented to DG



ii) Joint project with car industry to define future demands on the geodetic infrastructure

Among the tasks are to

- define a framework for analysis of the societal benefit of the current and potential outcome in future positioning services for each country/Nordic countries (socioeconomic analysis)
- Define need for national geodetic infrastructure and services on national/Nordic level to support innovative and safe use of future positioning services
- Recommend regulatory tasks and responsibilities that is needed and relevant to be handled by national mapping authorities or similar institutions

When the milestones are completed she could foresee,

- Research competences on GNSS within the NKG region, identify lacking knowledge, and suggestions for research projects
- Platform for testing and verifying Galileo + a joint project with the car industry on future demands to geodetic infrastructure
- Concluding output:
 - Need for geodetic infrastructure to support future GNSS services
 - Recommendation for future regulation and responsibilities for NMAs in relation to GNSS services

Item 6) National Reports (All)

Denmark;

DTU Space reported that two departments (Geodynamic (Rene Forsberg) and Geodesy (Per Knudsen) departments) are merged to one department and a position is now open. Also, other positions are open since several key persons have moved to other positions. TAPAS is built and has been tested. They note 15 smaller users of TAPAS so far. SDFE is taking over the responsibility of GNET. Lastly, Niels noted two new professors (Abbas on Arctic geodesy, Ole in Altimetry).

SDFE: Søren reported on TAPAS and that the platform meets the requirements. 5G is also coming to the area as well. He reported that SDFE is rethinking about the height system in Denmark and sees challenges in keeping the network maintained. They are developing all permanent stations with active transponders and in the future it is hoped that these will replace the current need.

Estonia;

Artu reported that the FAMOS project was a success from their point of view. He noted also the coming project Geodetic InSAR and its focus on unification of the height systems. A kick-off meeting will be held in Tallinn in two-week time. Artu also discussed GNSS CORS and its services that the three commercial services in Estonia are not too keen on free services. The EUREF meeting will be held in Tallinn in 22-24 May with a PROJ tutorial before.

Finland;



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Lantmäteriverket/FGI reported that the parliament is interested in releasing spatial data in Finland and the work on a Spatial data policy that is available on-line. There is also work going on concerning an open high accuracy service and the strategy to ensure a single reference system in conjunction with the European framework. FGI has also recruited several new key people (especially in the Department of Navigation) but at the same time also note that many people have moved to the industry. The renovation of Metsähovi with e.g. new VLBI-telescope is developing well. The receiver will arrive during the summer / autumn. Same is happening with the SLR. Metsähovi is now part of the GGOS Space Network. Reports from Aalto University is that Maaria Nordman has been appointed as an associate professor in geoinformatics. It is a joint professorship of Aalto and Lantmäteriverket.

Latvia;

The Land Board reported that Finland is coming to Latvia to measure seven absolute gravity points later this year. Latvia is finalising five permanent stations to be included to the EPN. They are in the process of changing to Euref2014 in 2021. Latvia has also one point in IHRF. Ivars reported about the work concerning the connection between SLR and tide gauge. Also included in the department's responsibilities are Geomagnetic activities where they are involved in military training.

From Riga University, Janis reported that they graduate around 20 master students every year. The department is also involved in Laser scanning projects as documentation of churches. There is a cooperation between three Baltic universities called Geonet. Riga university is Centre of Excellence for BIM advancements in the Baltic area, which is a cooperation between three universities. Lastly, Janis noted that Riga University is very much involved in several symposiums during 2019.

Norway;

From Ås University we heard that they had challenges a few years ago with few students but currently they receive around 30 new students every year. Half of these continues to complete masters which is a good number. Unfortunately, at Trondheim university the reorganisation has meant that the geodesy department is severely reduced.

Kartverket reported that budget restraints have resulted in a reduced number of staff. Basically, the challenge has been that they have not being able to hire new staff. Per-Eriks position as head of the Geodesy Division is now decided which all of us at the meeting welcomed. The Division though has minor changes as it now also includes International services. Kartverket released a National geospatial strategy in November 2018. We noted that the strategies in Finland and Norway do cover the same focus. Ongoing main activities includes Ny-Ålesund, sea level scenarios, GNSS development (with an increased focus to the user end side), the development to change from Euref to ITRF and the need to improve the quality of the height system. Per-Erik discussed the challenge to meet the increased number of Satref users and at the same time ensure the services and the system to handle the new situation. Sweden reported on the same development and challenges. The Core GNSS network of Satref is also going to be to be densified along non-electrified railways and this means approximately 200 more stations. The VLBI analysis centre is using the Where-



software, a software that is freely available. Concerning the sea level scenarios, these are now available as an open service on kartverket.no. The Norwegian tide gauges are operated by Kartverket. Per-Erik continued by discussing Copernicus and InSAR and the need to combine InSAR models with GNSS observations and models. This includes using altimetry data from Copernicus. Concerning GNSS developments, there are projects together with the Norwegian research council (autonomous cars and GNSS as well as integrity) as well as own financed (socioeconomic analysis of a free CPOS service and free access to GNSS raw data).

Sweden;

KTH reported that the position as professor in Geodesy will be open during spring. A positive sign for Swedish geodesy. At the same time, a new geodesy master level education is about to start at the University of Gävle. From Lantmäteriet we have already noted this as Jonas Ågren will change from Lantmäteriet to University of Gävle in August.

Lantmäteriet reported that their work is very much focused on achieving the goals and activities noted in the strategy that was released late 2018. This includes a new report on the maintenance of the national geodetic networks. Lantmäteriet also released a new gravity system, RG 2000, during 2018. Documentation is under way. Swepos is continuously developing even if the building of new stations is expected to be less than previous years. However, a new major infrastructure project with a new railway between Umeå and Skellefteå is starting this year that will require some 18 new SWEPOS stations. The number of new users is very high meaning that the IT-infrastructure needs to be given special interest including trying to 100 % availability of SWEPOS services. The focus on marine gravity measurements will continue with several dedicated missions during 2019. The Geodetic archive and library is now restructured and documented. Lastly, Holger reported on the GIA-summer school to held in August in Gävle with a very high number (160) of applications for the 40 available seats.

Item 7) By-laws

At NKG General Assembly it was decided that the by-laws should be reviewed with updates, if needed, to be implemented at the next General Assembly in 2022. They have been translated to English. The presidium needs to start the work and we do so by deciding a group to prepare a discussion at the next Presidium meeting.

Action: Each member country to send name of their representative to NKG secretary before the 1st of May.

Action: The smaller group prepare a discussion at the next Presidium meeting

Item 8) Cooperation with Russia

The Working groups reported that they would need geodetic observations also from Russia to develop the next GIA models. We note the challenge of getting official permission from Russia including organisation and people to be able to use data in our products. The main challenge is to understand who to contact. We note that Finland does have regularly contacts with Russia.



Action: Finland to ask Arvo to get contact details to a suitable contact person in Russia.

Item 9) UNGGIM Subcommittee on Geodesy, UNGGIM:Europe GRF and their impact on NKG

A status report was given concerning the development of UNGGIM:Europe GRF (Official meeting on Tuesday the coming week) and UNGGIM Subcommittee on Geodesy (In official SCoG meeting on Wednesday coming week). We note that Finland, Sweden and Norway are very much involved.

Item 10) EUREF and IAG

Markku reported from EUREF Governing Board where focus is on the EUREF Symposium 2019 to be held in Tallinn (Estonia) in May as well as ensuring new candidates for the positions as EUREF chair (Markku to resign) and Chair EUREF GB (Ambrus will resign). The Governing Board will suggest a candidate for the EUREF chair to be supported by the EUREF meeting and later then appointed by IAG. The chair of the GB is decided by the GB. Markku is a candidate for IAG General Secretary. The strategy of EUREF is under development and will be presented for approval at the EUREF meeting in May. Regarding EVRF2019, EUREF will release EVRF2019 and asks countries if they are happy to publish their heights or not. We recommend the countries to be open with their information, but this is a decision by each country.

Item 11) GGOS Affiliate

The meeting continued the discussion that started at the previous meeting. The presidium is not clear what it means to be a GGOS affiliate and would like to see a more structured and prepared discussion. The Presidium still does not understand the pros and cons. There is an IUGG meeting in July in Canada where we expect several reports on GGOS: We decided that we do not do anything before that and use that opportunity, by those who participate in Canada, to discuss what NKG should consider regarding GGOS and being an affiliate member

Item 12) Science Week 2020 (Iceland)

Several working groups have noted the benefit of having joint meetings and suggest that NKG should organise a science week during 2020. Iceland is suggested as a meeting place and has accepted to host the meeting.

Action: The Presidium is positive in organising a NKG science week in 2020 on Iceland. The working group chairs are to decide on a theme for the summer school and, together with Iceland, decide on week and place. The current proposal is week 11 but needs to be confirmed.

Note: After the meeting Iceland has reported back that they are happy organising a science week on Iceland. They suggest that SC should be working group chairs + one representative from Iceland + NKG chair (Markku). The LOC should be Icelandic members + NKG secretary (Mikael).



Item 13) Summer School 2020 (Denmark)

Anna presented ideas on the topic that could be something like *Space Geodesy for the future autonomous society*. The venue could be Legoland, Billund.

Action: Denmark to report at next Presidium meeting on the progress of the planning.

Item 14) Other Business (All)

- It is noted that Store-chefsmöte will be held 2-4 September 2019, Mariehamn, Finland. At the moment there is an agenda item concerning Geodesy with the working theme on "Challenges of dynamic coordinates". Markku will participate the meeting.

Item 15) Next meeting of the Presidium (All)

The 76th Presidium Meeting will be held on Iceland the 2-3 October.

Last five meetings including this; Sweden–Finland– Norway – Denmark – Iceland. Time to include also the Baltic countries in the loop?