



Nordiska kommissionen för Geodesi Nordic Geodetic Commission

Working Group for Geodynamics and Earth Observations

Minutes of the 47th meeting of the Working Group for Geodynamics and Earth Observations, within the Nordic Geodetic Commission

The hybrid WGGEO meeting was hosted by Aalto University in collaboration with the Finnish Geospatial Research Institute (FGI) from 14 to 15 March 2023. It was organized together with the hybrid meeting of the Working Group of Height and Geoid (WGHG) from 15 to 16 March 2023. Both meetings were held at the Aalto University Campus in Otaniemi, Espoo, Finland. The meetings followed a SAR workshop, where the focus was on SAR applications in geodesy. National reports for both meetings were given at the WGGEO meeting.

Participants (47, 35 in person (p), 12 online (o), *Guests in italics*):

<i>Argentina</i>	<i>Federico Ibarra (o)</i>
Denmark	Nicolaj Hansen (p), Joanna Balasis-Levinsen (p), Aslak Meister (p), Gabriel Strykowski (p)
Estonia	Nicole Delpeche-Ellmann (o), Karin Kollo (o), Tõnis Oja (p), Saeed Rajabi Kiasari (p), Andres Rüdja (o), Sander Varbla (p)
Finland	Pasi Häkli (p), Mirjam Bilker-Koivula (p), Jussi Hedemäki (p), Fatameh Khorrani (p), Hannu Koivula (p), Jaakko Mäkinen (p), Maaria Nordman (p), Havu Pellikka (p), Markku Poutanen (p), Arttu Raja-Halli (p), Hannu Ruotsalainen (p), Veikko Saaranen (p), Timo Saari (p)
<i>Germany</i>	<i>Thomas Gruber (p), Joachim Schwabe (o)</i>
<i>Greece</i>	<i>Konstantinos Fasoulis (o)</i>
Iceland	Guðmundur Valsson (p)
Latvia	Madara Znotiņa (p), Vents Zuševics (p)
Norway	John Dehls (p), Halfdan Pascal Kierulf (p), Ove Christian Dahl Omang (p), Matthew J.R. Simpson (p), Olav Vestøl (p)
<i>Poland</i>	<i>Przemyslaw Dykowski (o)</i>
Sweden	Anders Alfredsson (p), Mohammad Bagherbandi (p), Andreas Engfeldt (p), Nureldin Gido (o), Maxime Mouyen (p), Faramarz Nilfouroushan (p), Tobias Nilsson (o), Per-Anders Olsson (o), Chrishan Puwakpitiya Gedara (o), Holger Steffen (Chair) (p), Rebekka Steffen (o)

1. Introduction

The chair welcomed all participants to the meeting.

The updated agenda, version 13 March 2022, was approved.

The participants of the meeting were invited to comment on the minutes from the previous 46th hybrid meeting hosted by Lantmäteriet in Gävle, 14 and 15 March 2022. There were no comments to the minutes. The chair therefore uploaded the Minutes to the WG's website: <https://www.nordicgeodeticcommission.com/working-group-of-geodynamics/reports-and-documents/>

Sander Varbla (Estonia) was appointed as secretary. The chair noted once more that the secretary duty should be shared among the countries. Actually, it was Lithuania's turn this time, but no one from Lithuania was present physically nor online. So, next year, the secretary will be selected amongst Lithuanian colleagues. In 2025, it will be Latvia's turn.

The Chair introduced WGCEO's vision and goals, as well as its milestones for the 2022–2026 period. Regarding the latter, time for discussion has been added to the agenda. Input from the NKG presidium was also introduced. It is noted that NKG celebrates 70 years and BIFROST 30 years. The EUREF meeting will be held in Gothenburg end of May. The Presidium decided to have the Science Week in Iceland in week 11, 2024. The NKG Summer School is scheduled tbd in 2025, and the next NKG General Assembly tbd in 2026. The Presidium wishes that both WGCEO and WGHG continue to follow InSAR developments and serve as host for a forum of InSAR experts in the NKG area. We shall also actively support our new WG GNSS Positioning. Finally, a major point of discussion for this meeting is the NKG awards proposal.

2. Geodynamics

- Matthew J. R. Simpson: "Updating sea level advice for Norway following IPCC AR6"

For coastal protection, there is a need for accurate predictions and future projections of sea level, its extremes (storm surges) and waves. Related products must be developed for disseminating this knowledge to users, such as stakeholders, municipalities, policymakers, and coastal communities. An essential component of such developments is a two-way discussion between the scientists and those end users. With these goals in mind, IPCC projections tailored for Norway are in preparation.

- Mohammad Bagherbandi: "A study on the quality of GNSS signals for extracting the sea level height and tidal frequencies utilizing the GNSS-R approach"

GNSS reflectometry has proven itself as a viable alternative for determining sea surface heights (i.e., GNSS signals that reflect from the sea surface are employed to derive sea surface heights) to conventional methods. The approach could be a good substitute for tide gauge measurements in areas where tide gauge stations are unavailable. Since the study focused on estimating tidal frequencies, it was concluded that sea surface heights determined by GNSS reflectometry are sufficient for tidal modelling.

- Halfdan P. Kierulf: "Towards a loading service for Arctic glacier changes"

A somewhat accelerating uplift can be observed in the Arctic regions due to the increased melting of glaciers. The uplift signal induced by glacial melting is also prominent in more distant regions. For instance, the melting of Greenland affects most of the Northern hemisphere.

- Rebekka Steffen & Holger Steffen: “GIA modelling with a compressible Earth”

Comparing the GIA modelling differences using an incompressible or compressible model of the Earth, it was determined that compressibility is necessary for some areas. However, it should be noted that using the compressible model results in much longer computation times. During the subsequent discussion, it was emphasized that publications should clearly state whether GIA modelling uses an incompressible or compressible Earth model. Such an essential statement is often missing in publications. The used approach is unclear for the reader then.

Discussion

- Holger Steffen et al.: “BIFROST2022 & NKG202XLU – status March 2023”

The Chair presented a status update (March 2023) of BIFROST2022 and NKG202XLU. A concern was raised regarding the inconsistent use of cut-off elevation angle for processing GNSS data with different software (3 degrees using Bernese as opposed to 7 degrees with other software). This decision was explained as necessary due to issues with older data (during the early 2000s) of some long-observing GNSS stations. Otherwise, there was no opposition, questions, or further discussion points from the audience.

- Holger Steffen et al.: “NKG2022GIA activity status March 2023”

The Chair presented a status update (March 2023) of NKG2022GIA. LM received new computers. The new software is running smoothly and the first model with sea-level equation implemented is running. Nonetheless, computation time per model may be ca. 1 month. There was no opposition, questions, or further discussion points from the audience.

3. Gravimetry

- Maxime Mouyen: “Local spatio-temporal gravity variations at Onsala: metrological aspects and first results”

The identification of local hydrological processes is aimed at using relative gravity surveys by determining gravity variations over time. The current results require further investigations for clarification: They showed that the used CG5 instrument performs better during winter. However, it was mentioned during the subsequent discussion that some other CG5 instruments show better performance during the summer instead. The audience raised the question regarding possible problems with the used instrument (e.g., based on the calibration results).

- Jaakko Mäkinen, Mirjam Bilker-Koivula, Marcin Sękowski, Przemysław Dykowski, Jaakko Kuokkanen, Jyri Näränen, Hannu Ruotsalainen, Arttu Raja-Halli and Heikki Virtanen: “Datum of the First Order Gravity Net of Finland derived from A10-020 measurements and trendlines of FG5(X)-221 time series”

An overview of absolute gravity surveys and examination of trends in absolute gravity measurements was presented with relevance to the First Order Gravity Network of Finland, required for practical use.

- Mirjam Bilker-Koivula, Andreas Engfeldt & Maxime Mouyen: “The Nordic Comparison of Absolute Gravimeters NKG-CAG-2022”

All the measurements of absolute gravimeters must be comparable. Relatedly, a measurement campaign was conducted, the first results of which were presented. Since the results are preliminary, future work was carefully outlined.

Discussion

- Andreas Engfeldt: “Nordic AG database update”

It was stated that new data has yet to be received. It was emphasized that data submissions are expected; parties with available data are called to submit their data to Andreas Engfeldt (andreas.engfeldt@lm.se) before the next meeting.

- Jaakko Mäkinen & Andreas Engfeldt: “Status of the land uplift gravity lines publications”

Jaakko Mäkinen stated that there is progress.

4. Academics

- Maaria Nordman: “Work life skills of students”

An overview of the Aalto University alumni’s post-graduation status (geoinformatics master’s program) was presented. It appears that the expectations of teachers, students and employers agree relatively well.

5. National reports

Denmark (presented by Aslak Meister, SDFI & Gabriel Strykowski, DTU Space)

- A new GNSS-CORS has been established (GREJ), and an old one has been removed (SMID).
- Overview of the installation of electronic and passive SAR corner reflectors.
- Investigations of InSAR for determining deformations.
- A new strategy has been published to ensure the accessibility and accuracy of the geodetic infrastructure.
- Outline of the activities regarding gravity surveys and geoid modelling.

Estonia (presented by Andres Rüdja)

- ESTPOS updates.
- Ongoing work regarding the national geodetic network, geodetic points’ database, and geodetic legislation.
- Väana metrological baseline updates.
- Estonian-Latvian collaboration project “GeoRefAct” results have been made available; conversion calculators can be accessed via the Estonian Land Board website.

Finland (presented by Mirjam Bilker-Koivula)

- Ongoing work and updates regarding FinnRef.
- Ongoing geoid modelling tasks.
- Overview of the installation of passive SAR corner reflectors.
- Establishment of the National Space Situation Centre.
- Overview of academic activities at Aalto University.

Iceland (presented by Guðmundur Valsson)

- Use of drone-based photogrammetry for coastline mapping in urban areas.
- Updates regarding GNSS-CORS data processing.
- Overview of ongoing and already conducted work regarding monitoring of volcanic eruptions.
- Aerial photogrammetric surveys over Iceland are to be conducted; ongoing preparatory work was presented.

Latvia (presented by Madara Znotiņa)

- Ongoing work with geodetic benchmarks.
- Levelling with relevance to the land uplift determination.
- Overview of ongoing tasks with electronic SAR corner reflectors; there are problems obtaining radio licenses from the corresponding authorities.
- Update regarding the national realization of IHRS.

Lithuania

Unfortunately, Lithuanian colleagues could not attend the meeting; hence, the Lithuanian national report was skipped.

Norway (presented by Ove Christian Dahl Omang)

- Updates regarding levelling and absolute gravity surveys.
- Chart datum modelling works.
- The ongoing expansion of the tide gauge network.
- Overview of marine and terrestrial gravity surveys.
- Plans for the geodetic infrastructure.
- Ongoing work with transformation libraries (in PROJ).

Sweden (presented by Andreas Engfeldt, LM, Maxime Mouyen, OSO & Mohammad Bagherbandi, HiG)

- Ongoing work regarding absolute gravity activities.
- Overview of conducted and planned marine and terrestrial gravity surveys.
- Geoid and geodynamic modelling-related activities.
- Ongoing work regarding SAR activities, including the installation of corner reflectors; technical report available via the Lantmäteriet website.
- An update regarding the Onsala Space Observatory. The Turkey earthquakes are clearly visible in the SG data.
- Overview of research conducted by PhD students and academic activities at the University of Gävle.

6. Business matters

The following parts are a summary of discussion on Tuesday and Wednesday as two time slots were reserved for Business matters.

NKG Awards: The Chair gave an overview of NKG bylaws and resolutions regarding the NKG awards, followed by suggestions that came already up the WGGEO meeting 2022 in Gävle. In general, the audience agreed with the proposals presented by the Chair (the two awards will be referred here as “the young scientist award” and “the long-term contributor award”). However, there also were some suggestions.

It was recommended that the award meant for a young scientist should not be given every two years but when there is a good candidate instead. It was suggested that there should be competition for the young scientist award. A question was raised: should the award be announced if there is only one candidate? It was also added that the current time limit after degree acquisition might be too short; it was recommended to extend that time limit (regarding the young scientist award).

The audience also inquired about the nomination procedure. It was agreed that self-nomination for the long-term contributor award would be inappropriate. However, perhaps this would be acceptable for the young scientist award (for further thinking)? It was suggested that there might be a need for a committee that proposes the nominations; the committee should consist of members from (all) NKG countries. It was then further recommended that the presidium should make the final decision regarding awarding. In general, it was agreed that the awards should be granted based on relevant activities to the NKG goals.

Election of officers and service representatives for the IAG Executive Committee: Regarding the election of officers and service representatives for the IAG Executive Committee (for the period 2023–2027), delegates from NKG countries should check all nominations carefully. The delegates of NKG countries are encouraged to vote in favour of NKG and promote NKG activities.

Status of the NKG website and working group mailing list: The WGGEO mailing list should be joined to receive relevant information regarding the WGGEO activities: http://www.freelists.org/list/nkg_wggeo. The NKG website is up and running. National contact persons for WGGEO are needed amongst the Estonian, Latvian and Lithuanian colleagues.

Regarding the NKG membership, as inquired by the audience – anyone from any NKG country is automatically a member of NKG. Guests from outside the NKG countries are always welcome to attend NKG working group meetings and collaborate on research activities. Regarding the last point (guests from outside), it was suggested that this information be clearly stated on the NKG website to promote research collaboration and NKG activities. Similarly, relevant contacts should be easily found for the same purpose. These last points regarding the NKG website should be forwarded to the presidium for further discussion.

7. Closing of the meeting

The next meeting in 2024 (week 11) will be held in Iceland within the frames of the NKG Science Week.

The Chair thanked the hosts and participants and closed the meeting.