

National Report - Greenland

National Planning, the Government of Greenland & Asiaq - Greenland Survey

Presenter:

Bo Naamansen

General Manager

Asiaq - Greenland Survey

bn@asiaq.gl



Supplementary input:

Thomas Gaarde Madsen

Head of National Planning

The Government of Greenland

thga@nanog.gl



News on Government ...

Election for the National Parliament on April 24th 2018
National Planning & Asiaq united again.



The Maritime:

The Ministry of Housing and Infrastructure

The Base Data Program:

The Ministry of Education, Culture, Church and Foreign Affairs

Ressort:

The Ministry of Mineral Resources, Labour & the Interior

Minister (Naalakkersuisoq):

Vittus Qujaukitsoq



Reference:

DC Jørgen T. Hammeken-Holm

Always keep in mind!

Asiaq has 28 employees working on ...

Climate Stations

Hydrology Stations

Hydrology Analysis & Research

Monitoring & Research

- GEM: Zackenberg, Nuuk Basic & Disko Basic

Various Tasks

- Land Surveys
- UAV & aerial photography
- Near-shore bathymetry
- Remote Sensing classifications
- SURVEYS for Large Construction projects
- Etc.

Mapping & GIS ...

RESEARCH, COMMERCIAL & GOVERNMENT

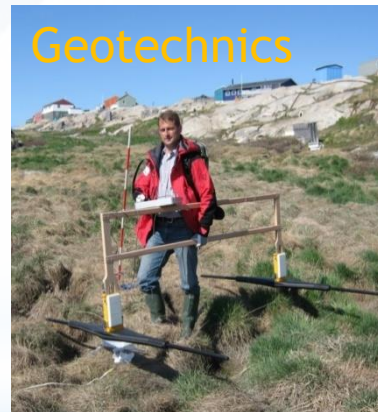
M1000 Climate Station, E of Nuuk



Land surveys



Geotechnics

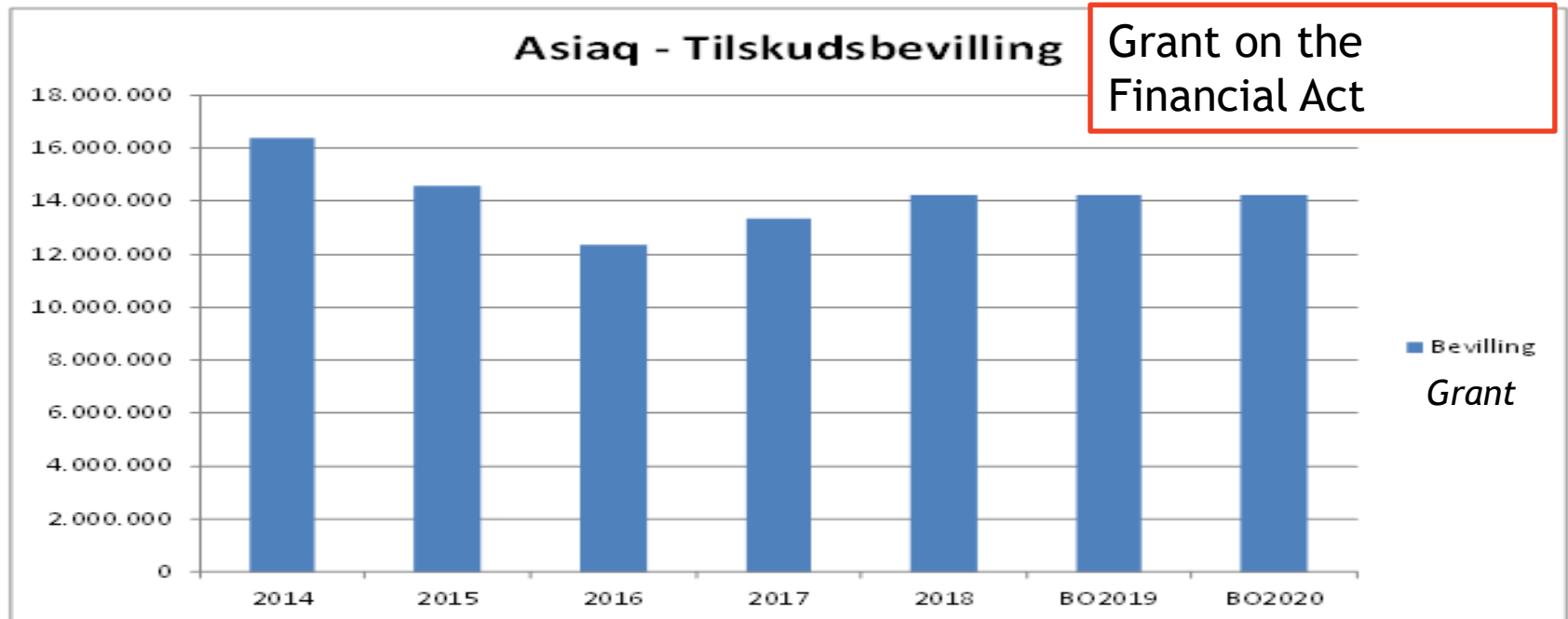


Lake bathymetry



Asiaq: Key Figures on Economy

År	2014	2015	2016	2017	2018	BO2019	BO2020
Bevilling	16.405.000	14.574.000	12.333.000	13.372.000	14.241.000	14.241.000	14.241.000



2017: NunaGIS

2018: NunaGIS & frikøb af GK

2017

Net Turnover 17.590.000 DKK

-Not including the Grant from the Government

- National Strategy for Geodata
- Technical & topographical Maps
- NunaGIS
- The Base Data Program
- The Maritime



Mapping & GIS - Hot Topics

The National Strategy for Geodata -from potentials to strategy (SDI)



- The report "Geodata in Greenland" published 2015
- Based on involvement of users, stakeholders and experts
- **The foundation of the new national strategy for geodata**



National Strategy for Geodata 2018 – 2021

Vision + 3 development principles + 5 strategic goals + 25 initiatives

Vision: Greenland has a modern infrastructure for geodata, that supports a citizen-oriented sustainable development by digitally connecting people and land – geographically, culturally and socially

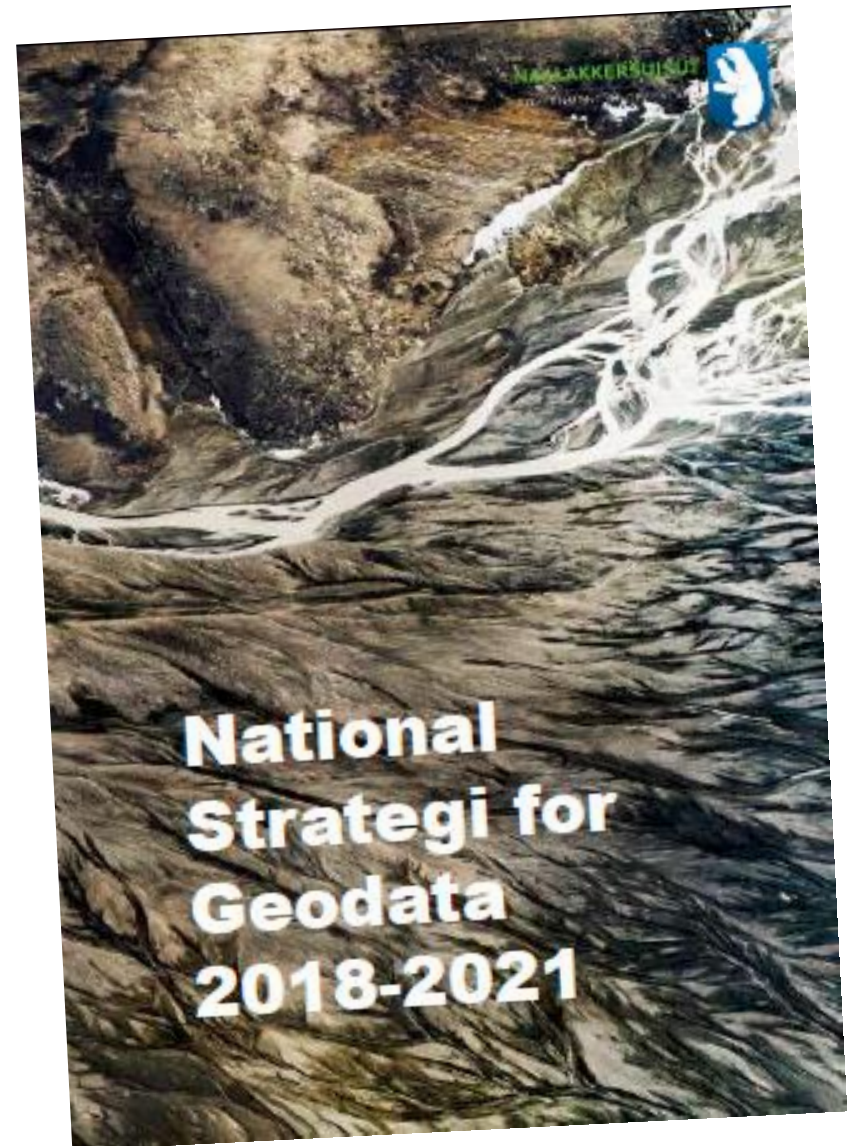
3 Common principles: a) Coherence, b) A-user-centered approach, and c) Openness

5 Strategic goals where geodata is seen as a tool for the creation of 1) better decision-making, 2) growth (private sector), 3) digitization (public sector), 4) learning and 5) sustainable development and future independence



National Strategy for Geodata

- Public hearing - early winter 2018
- ... to be approved by the new Naalakkersuisut.
- Sets the framework and foundation for the next three years on GIS and geodata.
- Contains illustrative examples on GIS supporting societal needs and promoting a sustainable development.
- Available in greenlandic, danish and english



Sustainable Development Goals 2030

Agenda

A more holistic approach?

-we do try!



Greenland more active involvement in the ASDI

New topographical map of Greenland



Evaluation and user feedback



- The National Planning Department has been responsible for conducting an impact measurement of the pilot project, new topographical maps in Greenland
- Contains a description of the project, the four pilot areas, and a systematic review of the societal needs of new maps in Greenland by relevant sectors, as well as a pre- and post-measurement of users' assessment of value of the new topographic maps



Asiaq Strategy - Geodata

Aspiration for Asiaq

- To be the preferred Greenlandic center for data, knowledge and skills that sets the quality standard for spatial information on the physical environment for business, the public sector, research and society in general.



Selected objectives

- Constant development of a reliable, intuitive and easily accessible digital infrastructure for geodata
- Financing of free spatial data - fx in relation to new legislation

- An increased share of commercial income and externally funded research activity
- Less dependence on - and exact definition of - government funded tasks

Who is mapping Greenland?

Asiaq - Maps & Geodata

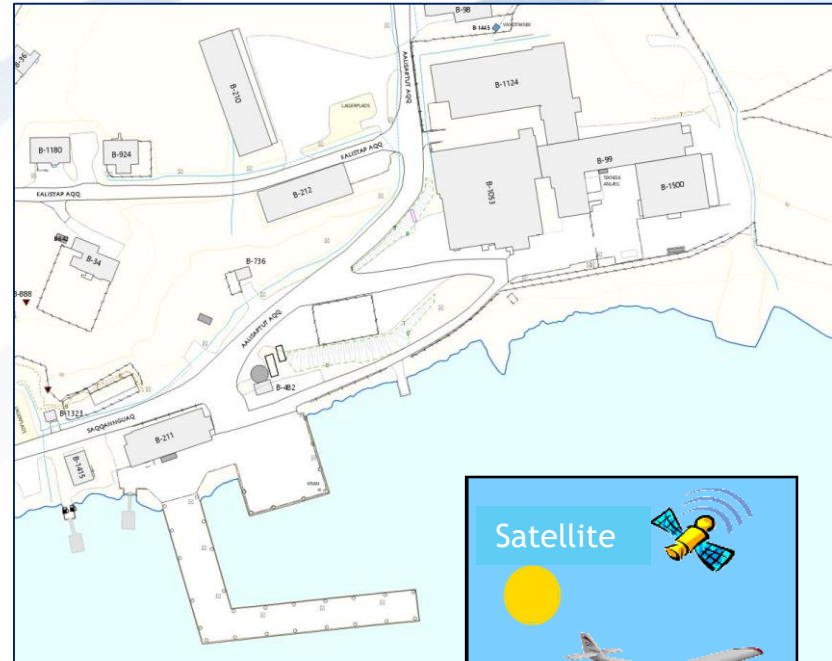
- Technical maps of cities & settlements
- Reference network
- Hydrological maps
- Supplementary mapping in the open country

SDFE supplies Greenland w/ topographic maps

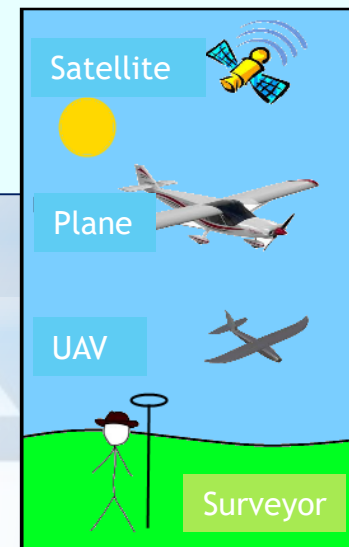
- Project 'Topographic mapping of Greenland' (APM)

GEUS: geological maps

GST (Aalborg): navigational charts



... and numerous
research based
Mapping
Initiatives!



Mapping Initiatives

Supporting SDFE: topographic mapping of Greenland

- Pilot finished with fine results
- Waiting for the green light: mapping Greenland in its entirety

Technical maps

- Adaption: Migrating from CAD to Geodatabase
- Availability:
 - * The technical map is now free data
 - * Available on FTP today
 - * Building an intelligent map supplier
 - * Seamless integration etc.

Mapping with UAV and Remote Sensing tools and data

- Coastal Mapping
- Near-shore bathymetry
- Utilizing the ArcticDEM

Background

ArcticDEM is an NGA-NSF public-private initiative to automatically produce a 2 meter posting, high quality, digital surface model (DSM) of the Arctic using optical stereo imagery, high-performance computing, and open source photogrammetry software for the two-year term of the U.S. chairmanship of the Arctic Council, from April 2015 to April 2017. ArcticDEM data is constructed from hundreds of thousands of in-track, high-resolution, optical imagery acquired between 2009 and 2017 summer seasons by the DigitalGlobe constellation of satellites and licensed through the NGA NextView contact. This map was created from a version of ArcticDEM downscaled to 200 m resolution with data gaps filled by the Aster DEM Version 2. The shaded relief image was exaggerated to enhance the texture of the topography.

Funding

National Science Foundation awards 1614673, 1810976, 1542736, 1559691, 1043681, 1541332, 0753663, 1548562, 1238993 and NASA award NNX10AN61G.

Computer time provided through a Blue Waters Innovation Initiative. DEMs produced using data from DigitalGlobe, Inc.

Authorship

Claire Porter¹, Paul Morin¹, Ian Howat², Myoung-Jong Noh², Kenneth Peterman^{1,3}, Brian Bates⁴, Scott Keesey⁵, Matthew Schlenk³, Judith Gardiner⁶, Karen Tomko⁴, Michael Willis⁵, Erik Husby⁶, Steven Foga¹, Cathleen Williamson³, Gregory Bauer⁶, Jeremy Enos⁶, Galen Arnold⁶, William Kramer⁶, Peter Becker⁷, Abhijit Doshi⁷, Cristelle D'Souza⁷, Pat Cummins⁸, Fabien Laurier⁹.

Map and visualization by Brad Herried¹, Paul Morin¹. Basemap data Made with Natural Earth, Esri, National Geospatial-Intelligence Agency.

¹Polar Geospatial Center, ²Byrd Polar Research Center, ³National Geospatial-Intelligence Agency, ⁴Ohio Supercomputer Center, ⁵University of Colorado Boulder, ⁶National Center for Supercomputing Applications, ⁷Esri, ⁸White House Office of Science and Technology Policy

References

Noh, M.J., I.M. Howat, 2015: Automated stereo-photogrammetric DEM generation at high latitudes: Surface Extraction from TIN-Based Search Minimization (SETSM) validation and demonstration over glaciated regions, *GIScience and Remote Sensing*, doi:10.1080/15481603.2015.1008621.

Noh, M. J., I.M. Howat, 2017: Surface Extraction from TIN based Search-space Minimization (SETSM) algorithm, *International Society for Photogrammetry and Remote Sensing (ISPRS) Journal of Photogrammetry and Remote Sensing*, Vol. 129, pp. 55-76.

Noh, M. J., I. M. Howat, 2018: Automatic relative RPC image model bias compensation through hierarchical image matching for improving DEM quality, *International Society for Photogrammetry and Remote Sensing (ISPRS) Journal of Photogrammetry and Remote Sensing*, Vol. 136, pp. 120-133.

Data Description

Data processing was accomplished using the Blue Waters supercomputer using the open source photogrammetry software SETSM by Noh et al. (2015, 2017, 2018). Each individual DEM was vertically registered to satellite altimetry measurements from Cryosat-2 resulting in absolute uncertainties of less than 1 m over most of its area and relative uncertainties of decimeters.


ArcticDEM may provide corrections for a wide range of remote sensing processing activities, such as image orthorectification and interferometry, and provide constraints for geodynamic and ice flow modeling, mapping of grounding lines, and surface processes. REMA also provides a powerful new resource for field logistics planning.

ArcticDEM The Polar Geospatial Center, Minnesota

Official release:
Sept. 1st 2018



27-08-2018

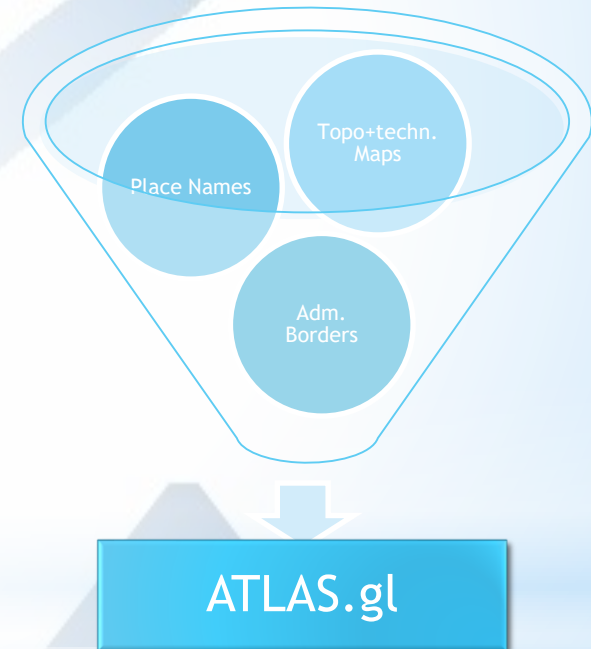
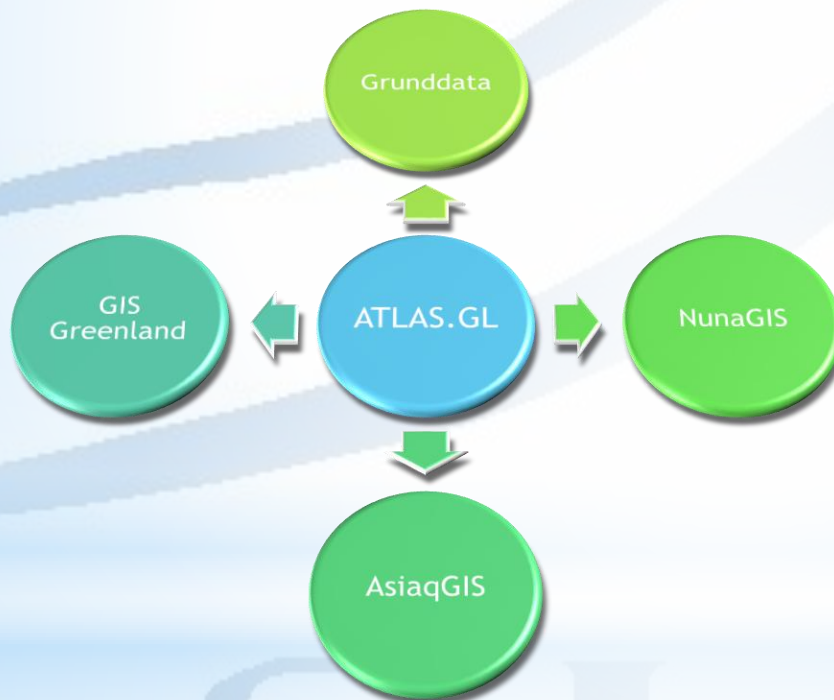


Arctic DEM examples

Iceland & GHB Fjord, Nuuk

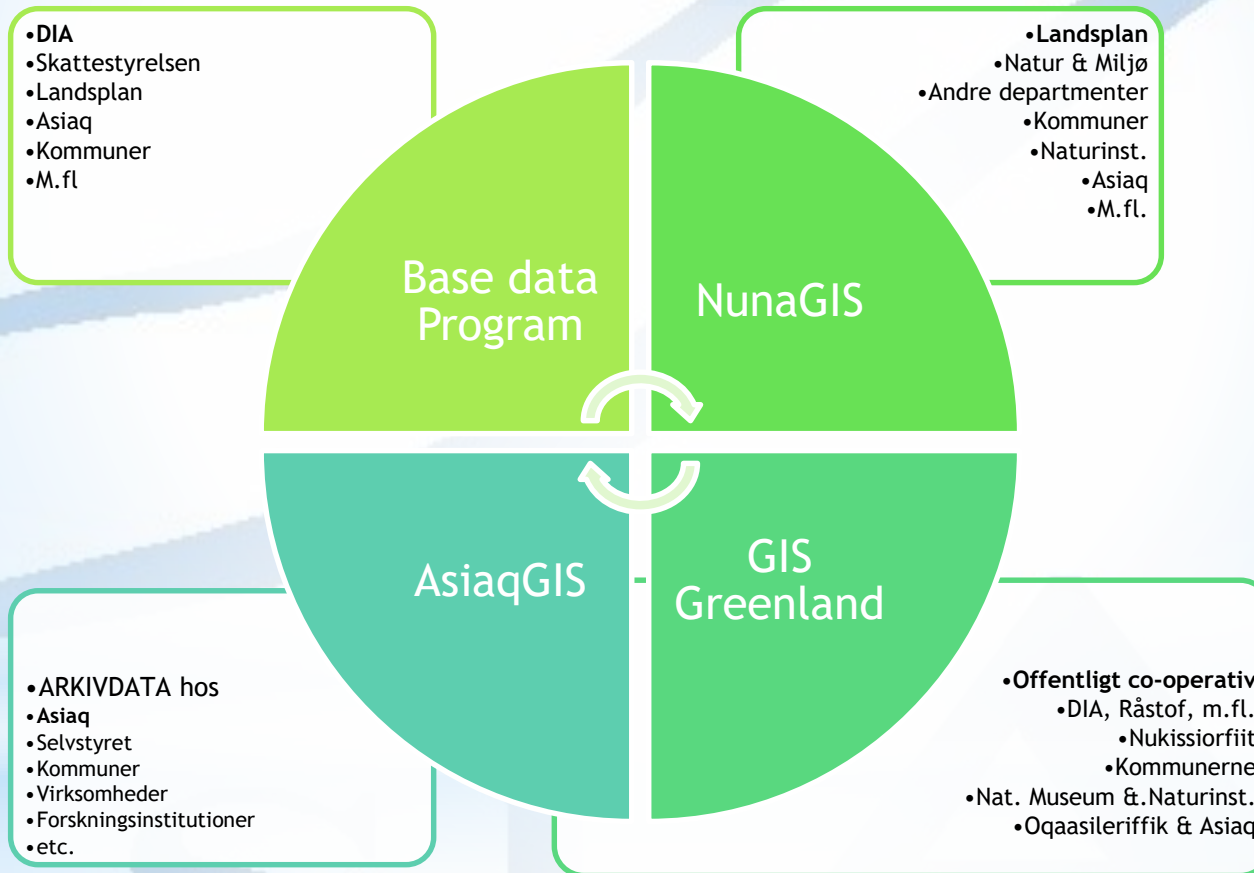
GIS basic infrastructure

The Map Supplier of Greenland (ATLAS.gl):



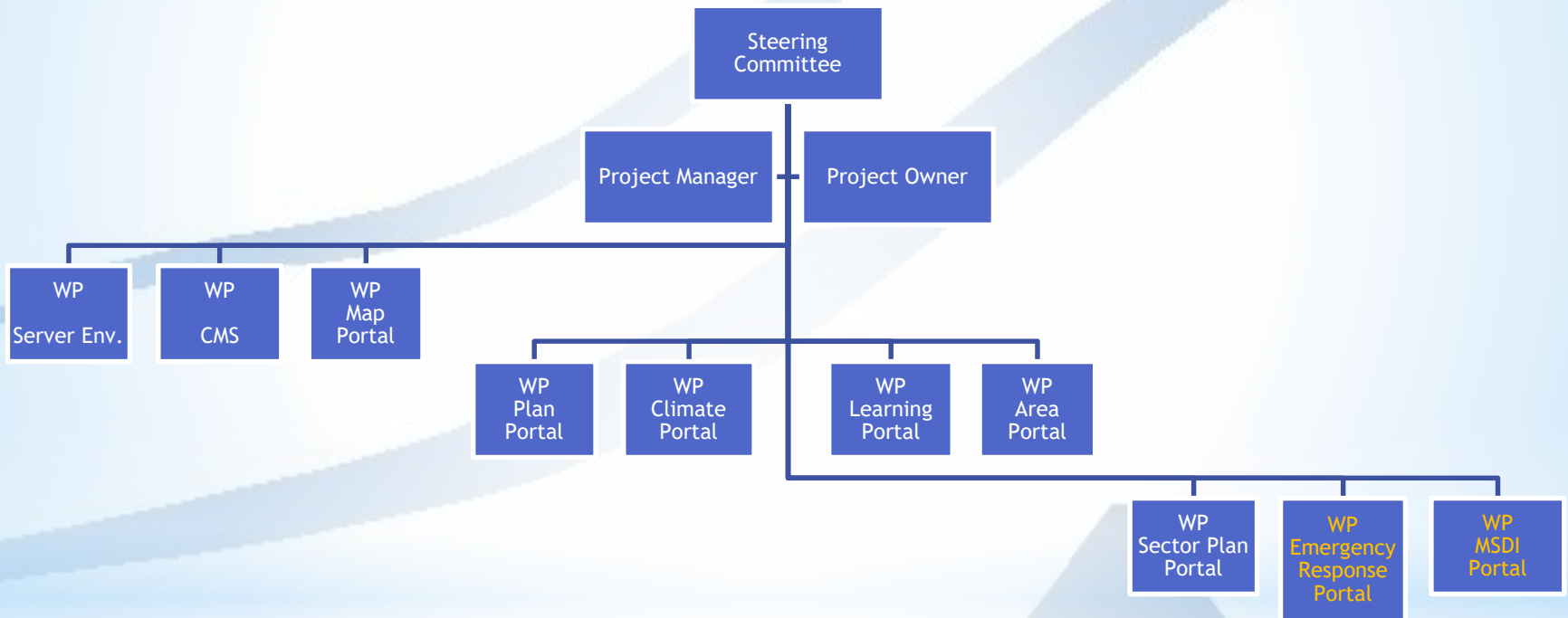
GIS initiatives

Geospatal projects: stakeholders & owners



NunaGIS

The New NunaGIS platform:



Area portal coordinated w/ the Base Data Program

- **Yellow: not financed**

The Base Data Programme of Greenland

- *Sumiffik* (where): Georeferencing Base Data
 - Adresses (new in Greenland!)
 - CPR and CVR
 - Building information
 - Area allotments
 - Real Estate
- Governance, technical solutions and legislation
 - "The Soldiers of Tordenskjold"
- Sub Contractors: COWI, Magenta & Geoinfo (All DK)

GIS & History

A large part of the infrastructure development in the last 65 yrs lies in the basement of Asiaq. From the Greenland Technical Organisation of the past to Asiaq - Greenland Survey of today. We are investigating possibilities (partners, funding, man power; technical solutions etc.)



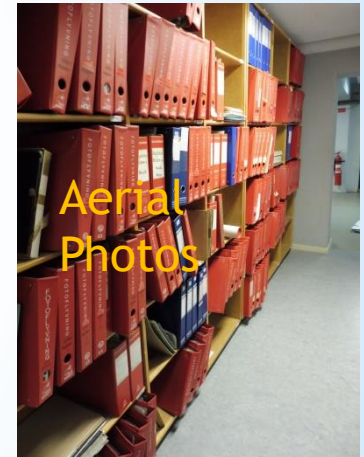
Geotechnical reports



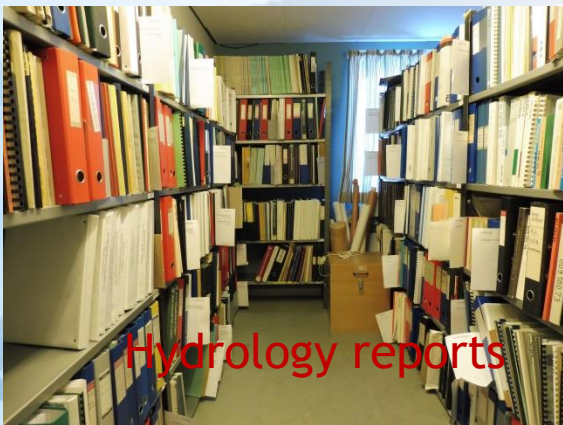
Surveys of infrastructure, Photos



F-reports



Aerial Photos



Hydrology reports



GTO Metadata



Historical maps



The Maritime

GST collaboration:

- Surveys
- Navigational charts
- R&D projects

Near-shore-bathymetri

Single beam & multi-beam

Coastal Mapping - satellite sources - Ground truthing

Laser Scanning - green lidar (UAV/plane/sat.)

Asiaq monitors the development:

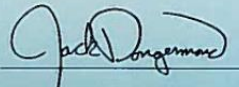
- Technology
- Strategy
- Politics!

An encouragement!

SAG AWARD SPECIAL ACHIEVEMENT IN GIS • 2018

Award Presented to

Naalakkersuisut
Nuuk, Greenland



Founder and President, Esri



Store-Chefmøde - Aug. 27.-29. 2018



San Diego, CA
July 12th 2018

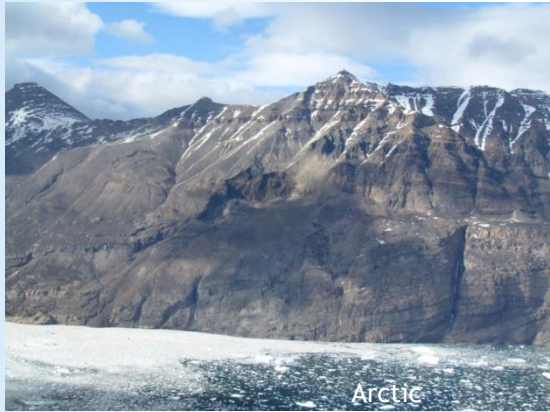
27-08-2018

- Karrat Icefjord june 2017
- Screening (GEUS)
- A learning experience:
 - New area of expertise ...?

Emergency Response

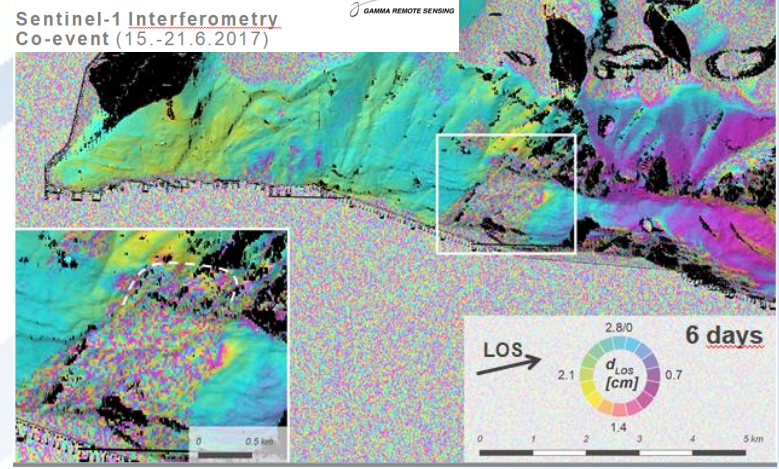
More time?

The landslide from many sources



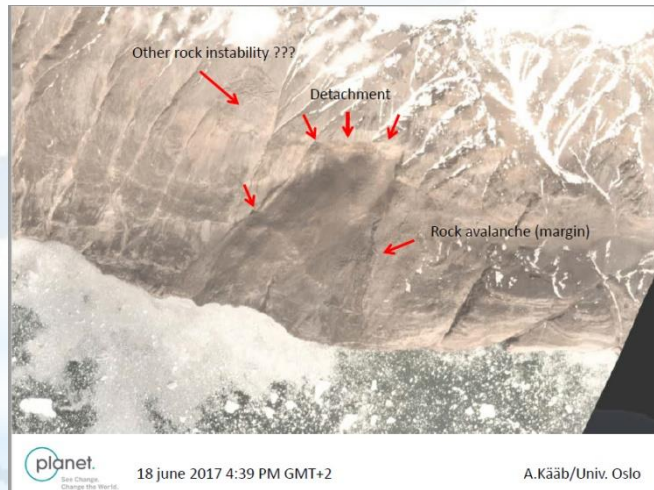
Arctic
Commando

Aerial photography

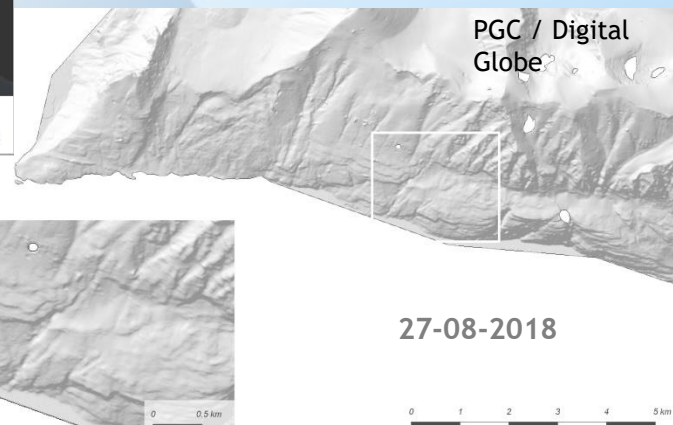


Sentinel-1

Planet Cubesat



ArcticDEM



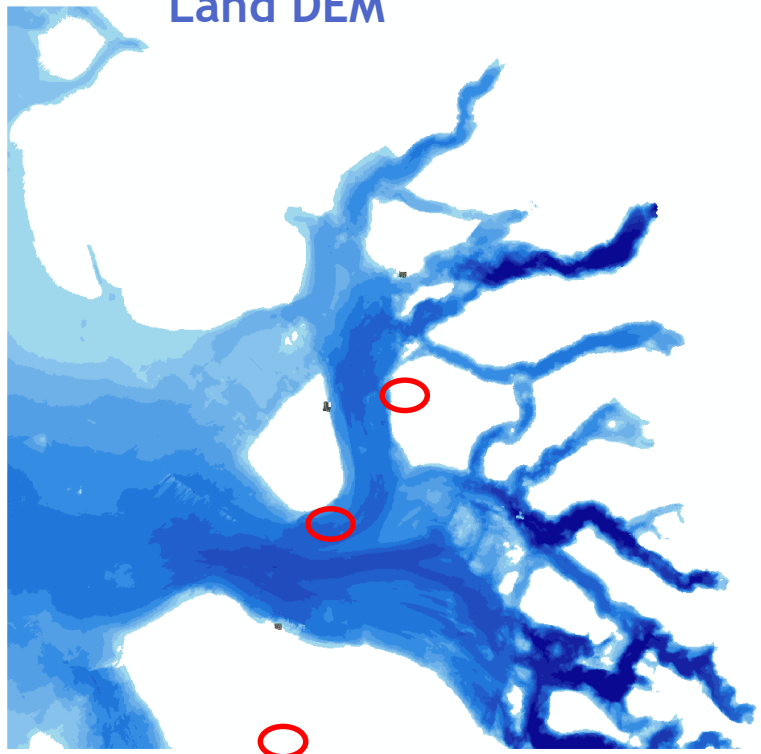
Sentinel-2



Rafael Caduf/Gamma Remote Sensing

Tsunami Modelling

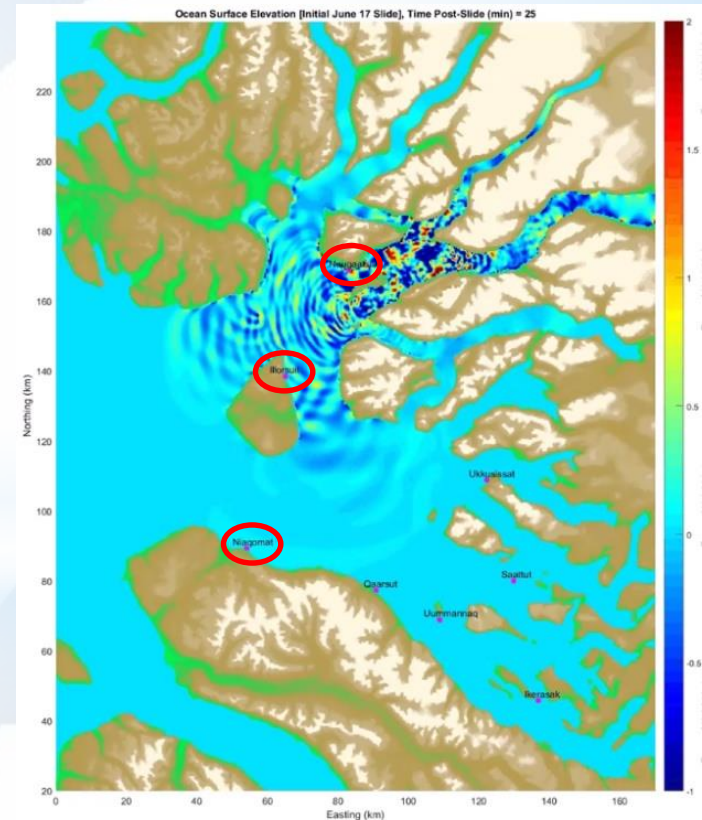
Fjord
Bathymetry &
Land DEM



Eric Rignot, Colm O'Cofaigh



Tsunami modelling



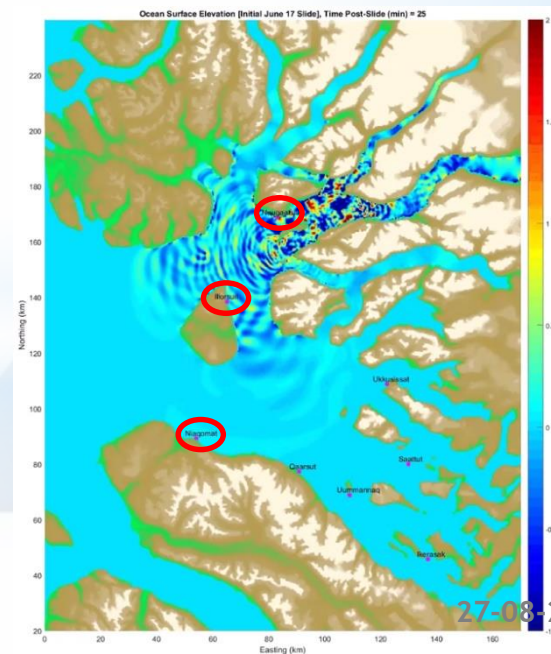
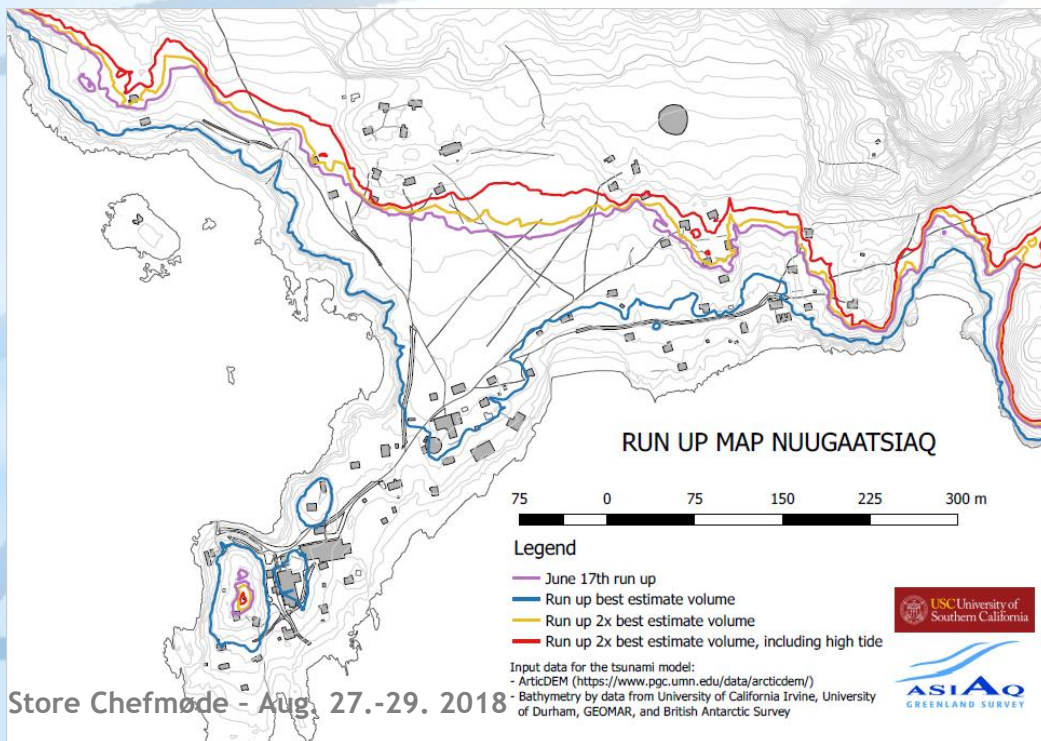
Patrick Lynett / USC

Precise maps & tsunami models

Coordinates for settlements and Uummanaq					Unstable Mass Runup	Unstable Mass Runup
EPSG: 4326			Arrival of 1st Wave Crest	June 17th Runup	Best Estimate	2X Best Estimate
	Longitude	Latitude	[minutes post-slide]	[meters above SWL*]	[meters above SWL]	[meters above SWL]
Uummanaq	52° 7' 22.4" W	70° 40' 29.3" N	32	0.8	0.4	0.8
Nuugaatsiaq	53° 12' 36.5" W	71° 32' 11.9" N	8	9.3	5.2	10.0
Illorsuit	53° 33' 58.9" W	71° 14' 32.9" N	12	2.7	1.5	2.8
Niaqomat	53° 39' 52.7" W	70° 47' 22.4" N	26	1.1	0.4	0.9

Arrival times same for all slide scenarios

* SWL = still water level, which is the tide height at the time the tsunami arrives



International & national contributions

Kirsty Langley, Eva Mätzler, Magali Barba, Colm O'Cofaigh, Henrik Langeland, Finn Løvholt, Mikkel Høegh Bojesen, Rafael Caduff, Sylfest Glimsdal, Carl Bonnevie Harbitz, Andreas Käab, Brian Kibenich, Yme Kvistedal, Patrick J. Lynett, Paul Morin, Lea Odermatt, Eric Rignot, Per Sparrevik, Andreas Wiesmann, Mike Willis, Karl Brix Zinglersen, Reginald Hermanns, John Dehls, Yngvar Larsen and GEUS working group.



UiO : University of Oslo



The sum of things

4-5 yrs ahead

Geoscience Capabilities (oil/gas; mineral expl.; large construction surveys, hydro etc.)

National Strategy for Geodata

Platforms: NunaGIS/BDP/Asiaq WebGIS

New Enterprise Agreement with ESRI (GIS Greenland)

Supporting a new topo map of Greenland

Map Supplier for the Technical Base Map and more

Financing free data: hydro/climate/geotechnics - not FFL2019

Emergency Response

**Asiaq 25 yrs
Anniversary
Oct. 28. 2018**



Thanks for listening
bna@asiaq.gl

The End

27-08-2018