



NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY
Know the Earth... Show the Way... Understand the World

NGA Brings Geospatial Intelligence to the Arctic

Dr. Rachel Bernstein

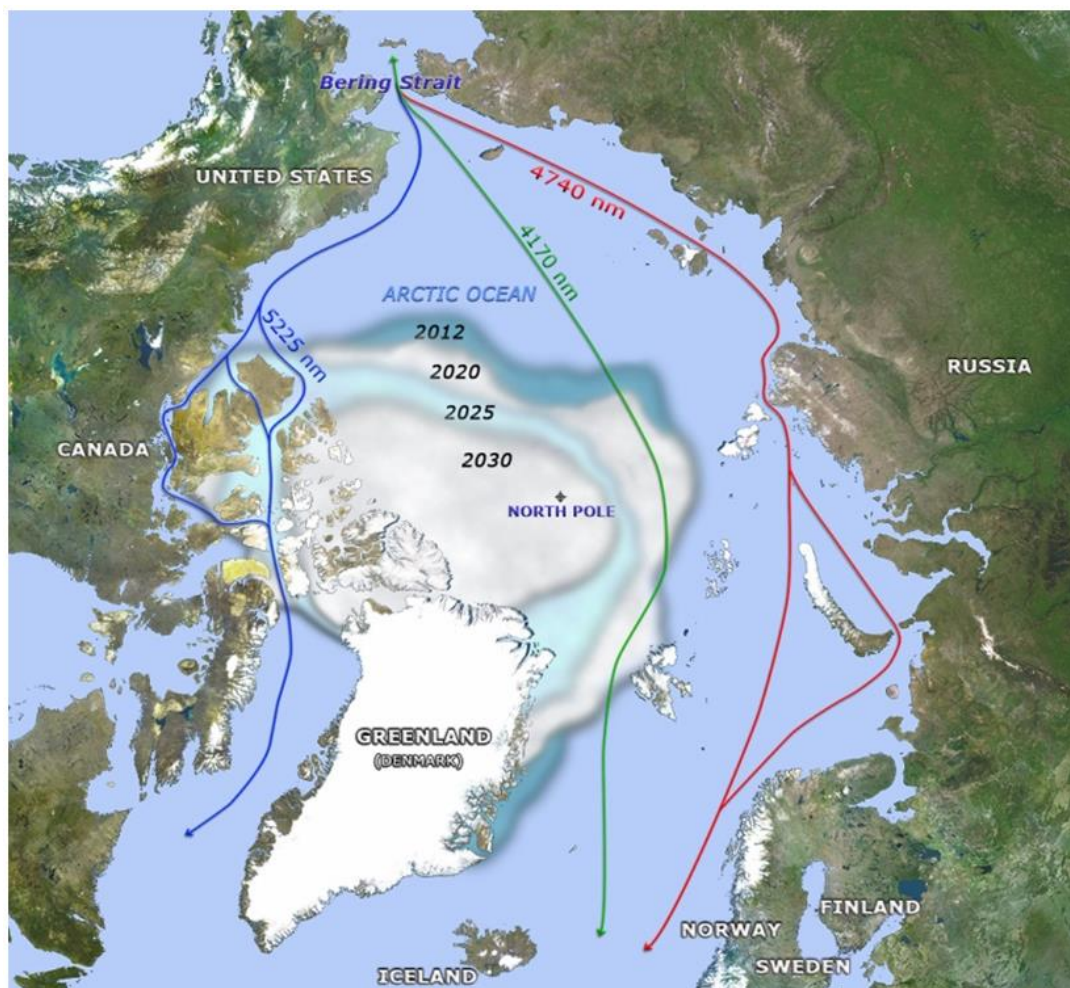
Penn State Arctic Symposium

October 20th, 2015





Anticipated Arctic Transit Routes





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What is the NGA Mission?

The National Geospatial-Intelligence Agency has a responsibility to provide the products and services that decision makers, warfighters, and first responders need, when they need it most.

Geospatial intelligence, or GEOINT is the exploitation and analysis of imagery and geospatial information to describe, assess and visually depict physical features and geographically referenced activities on the Earth. GEOINT consists of imagery, imagery intelligence and **geospatial information**.



Bringing GEOINT to the Arctic

- Support for the United States as Chair of the Arctic Council:
 - NGA Arctic GEOINT Services Website
 - Digital Elevation Models
- Arctic Geophysical Information
 - Earth Gravitational Model 2008
 - Gravity measurements
- NGA's other unclassified opportunities



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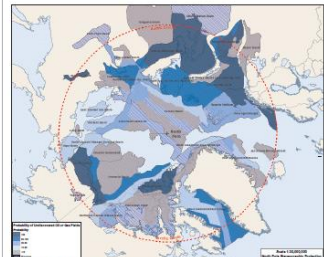
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NGA supported the GLACIER Conference with new maps and access to NGA data holdings

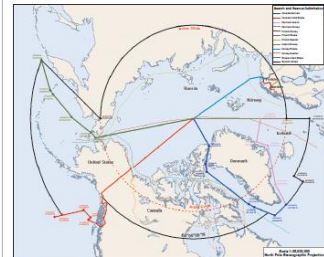
The Arctic - A GEOINT Perspective



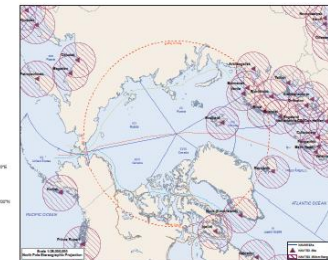
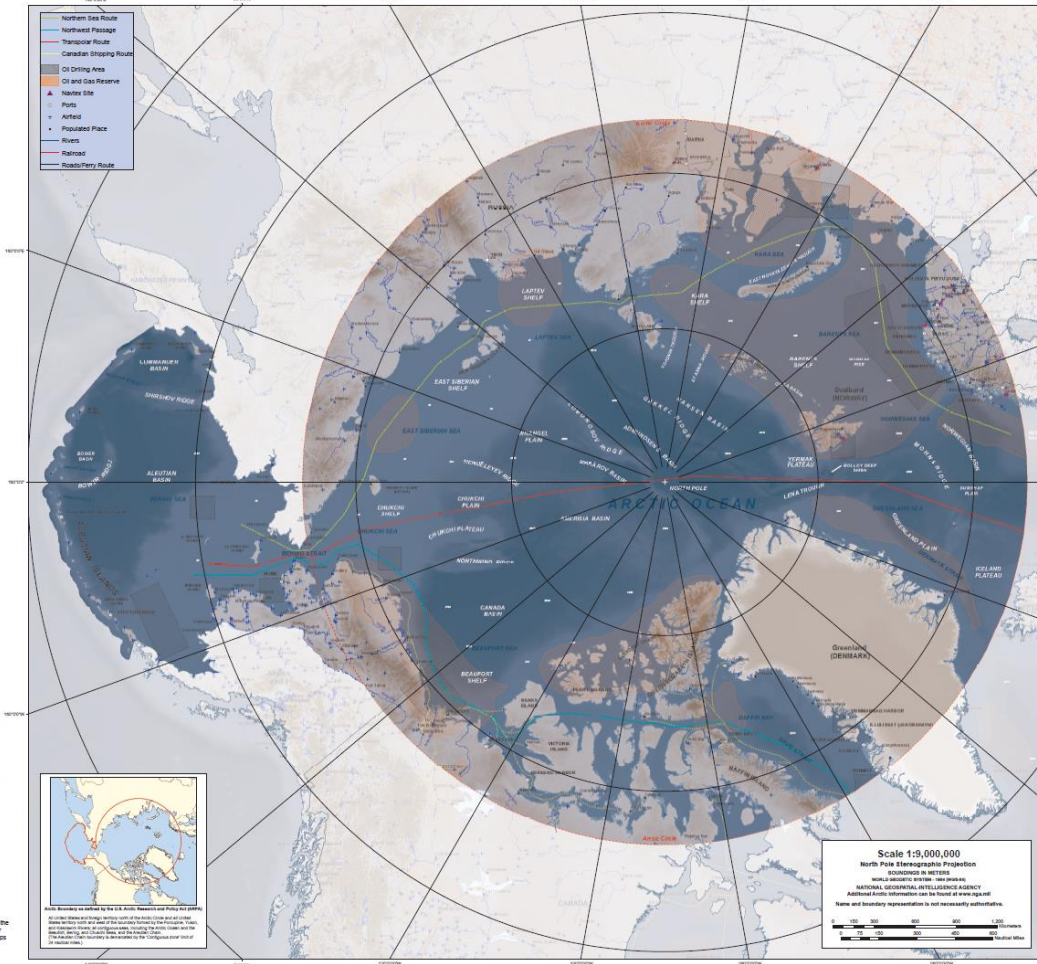
Past and Projected Minimum Ice Extents
Data for recent observations provided by the National Snow and Ice Data Center, Foster, F. K. Knowles, V. A. Meier, and S. Anon, 2002 (updated daily). Data for future, Routley, Colorado, USA.
Data for recent forecasts: 0.55 to 1.25 m thickness using data from the NOAA OASD model. Yearly extent represents average 85% sea ice concentration, approximately.



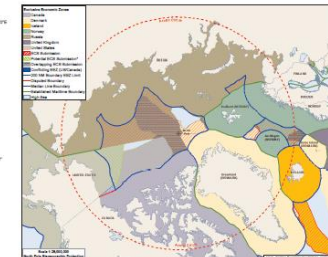
Energy Resource Potential
Assessment units (AU) in the Circum-Arctic Resource Appraisal (CARA) color-coded by assessed probability of the presence of at least one petroleum or other gas field with recoverable reserves greater than 50 million barrels of oil equivalent. AUs are based on the entire area of the AU, including any part south of the Arctic Circle.
United States Department of Energy, U.S. Geological Survey, April 2006/2008/09.



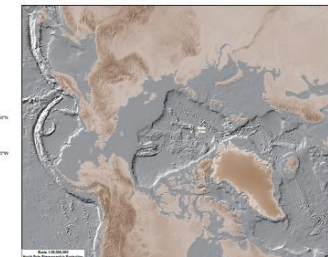
Arctic Search and Rescue Agreement
The 2011 Arctic Search and Rescue Agreement on Aeronautical and Maritime Search and Rescue in the Arctic divides the Arctic region into eight sectors and assigns to each of them Arctic flight sectors to coordinate primary responsibility for search and rescue operations. This agreement, along with the International Maritime Organization's Guidelines for Ships Operating in Arctic Ice-Contested Waters, and other widely accepted treaties regulate "operating" efforts in the Arctic.
Source: "Agreement of Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic", May 12, 2011. <http://www.arctic-council.org/ArcticSearchandRescueAgreement.pdf>, 27 June 2011/14/16



World-Wide Navigational Warning Service
WWNWSA is a geospatial sea area established for the purpose of coordinating the broadcast of navigational warnings to mariners. WWNWSA coverage area is an area defined by an arc for which maritime safety information is provided from a particular VHF DSC station.
International Maritime Organization Resolution A.769(17), World-Wide Navigational Warning Service.



Maritime Boundaries and Submissions
The Exclusive Economic Zone (EEZ) starts at a State's coastline and extends 200 nautical miles seaward. States have rights to the seabed and subsoil of the submarine areas of the continental shelf where it extends beyond the EEZ, to the limits allowed by Article 76 of the United Nations Convention on the Law of the Sea. The position of the continental shelf beyond the EEZ is shown as the Extended Continental Shelf (ECS). ECS submissions are subject to technical review by the Commission on the Limits of the Continental Shelf and maritime boundary over-riding submissions are resolved with neighboring States. The definitions above are for reference purposes only.



Digital Elevation Models
Global Multi-resolution Terrain Elevation Data 2010 (GMTED) is a public domain suite of terrain elevation products covering the Earth from 90°N to 90°S, generated at three levels resolution of 30 arc seconds, 15 arc seconds, and 7.5 arc seconds. The Global Bathymetric Chart of the Oceans (GEBCO) provides gridded bathymetric data sets (seafloor models) for ocean and arctic. GEBCO-2010 is a global 30 arc-second netline grid.



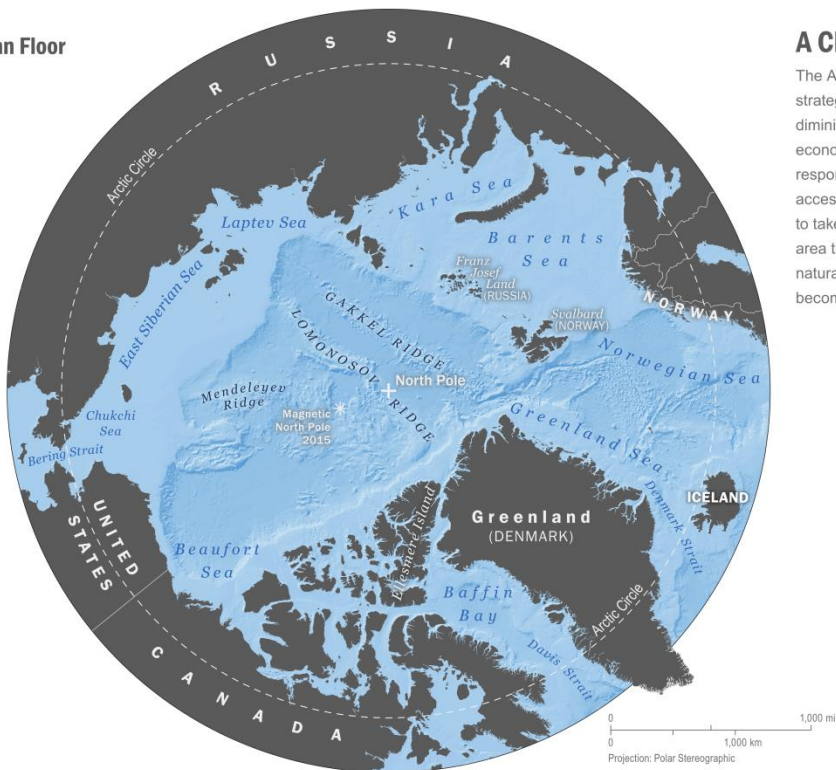
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NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY The Arctic: A GEOINT Perspective

Ocean Floor



A Changing Landscape

The Arctic is becoming a region of strategic importance; its icecap is diminishing and human activity driven by economic opportunity is increasing in response to the area's growing accessibility. Some countries are trying to take advantage of the more accessible area that is emerging as a source of natural resources as shipping corridors become more apparent.



Zones and Submissions

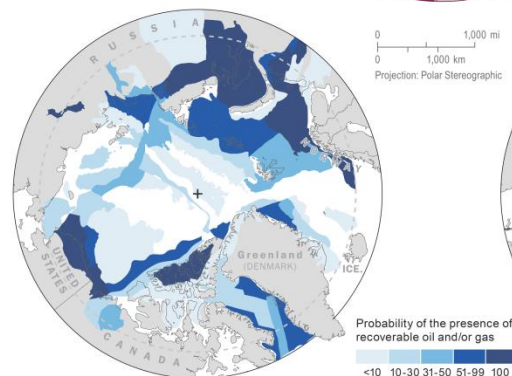
Country	EEZ*	ECS**
US		
Russia		
Norway		
Iceland		
Denmark		
Canada		

Potential overlap

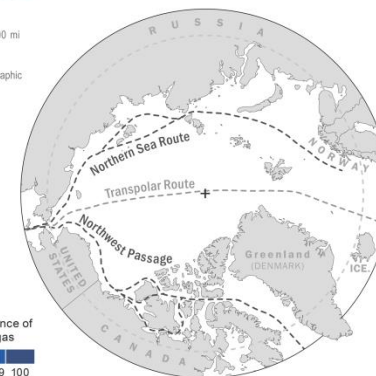
*exclusive economic zone

**extended continental shelf (notional and submitted)

Energy Resources



Shipping Routes



Ice Extent

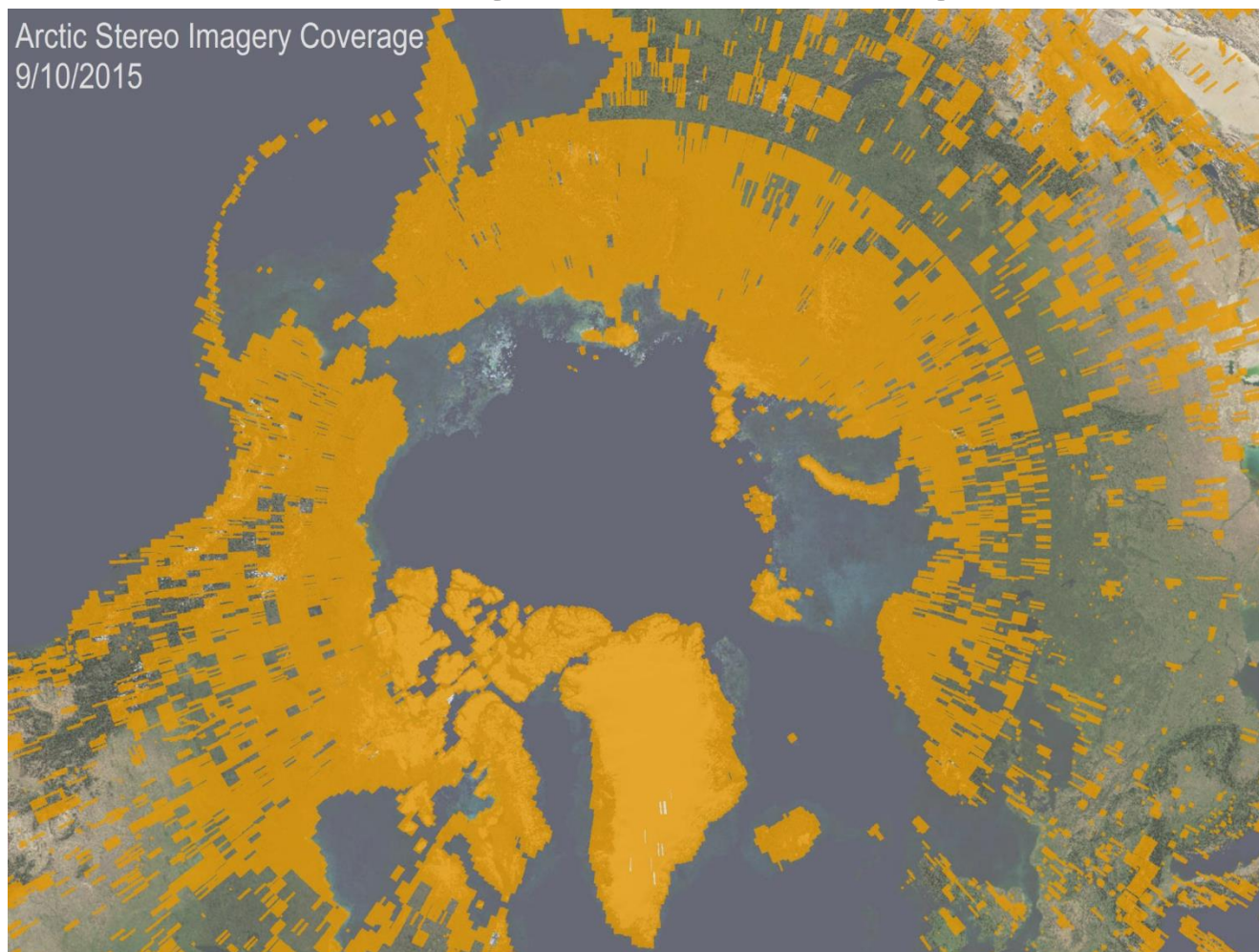
North American area comparison showing minimum sea ice extent and modeled future extent (millions of square kilometers).



Names and boundary representation are not necessarily authoritative.
Sources: National Snow and Ice Data Center, NOAA GFDL CM2.1, US Geological Survey CARA, US Navy Task Force Climate, International Hydrographic Organization, International Oceanographic Commission.

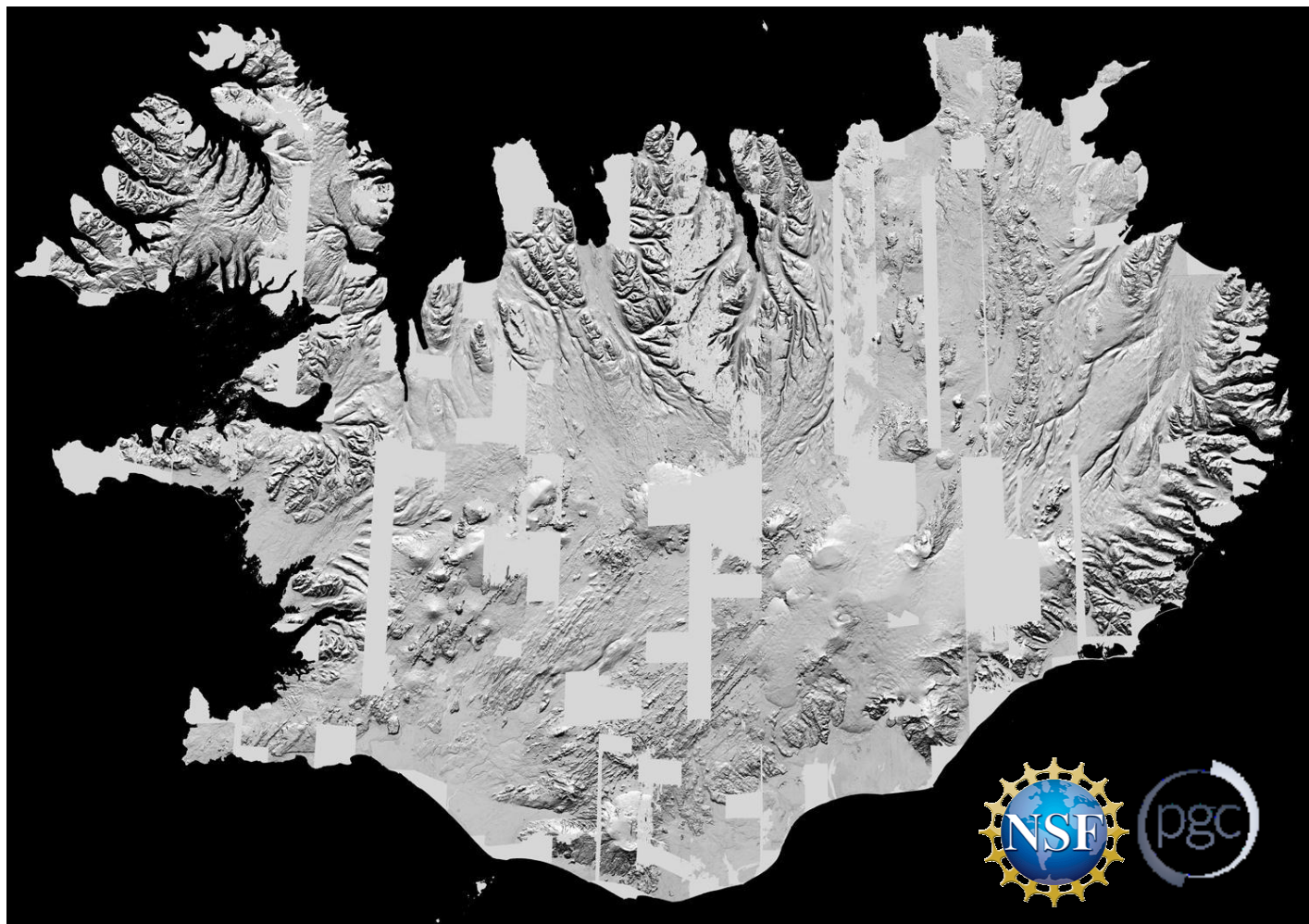


Arctic Stereo Imagery Coverage (9/10/2015)





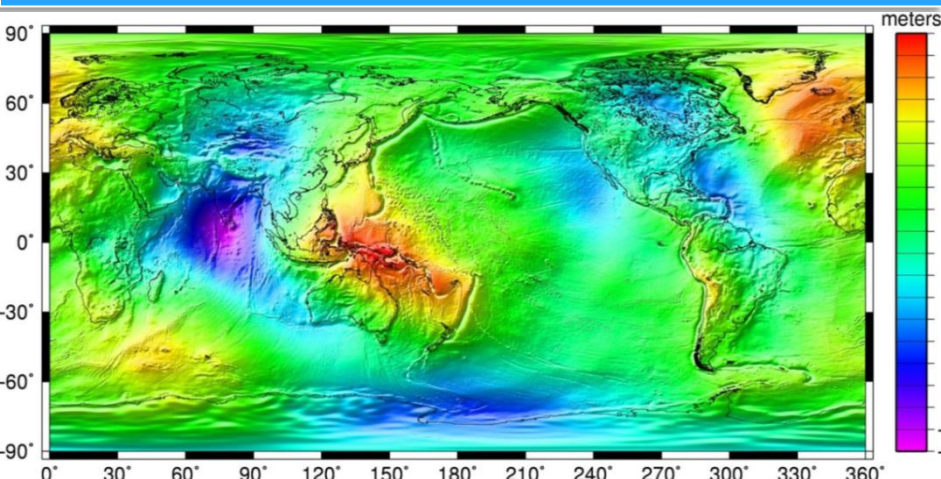
Polar Geospatial Center DEM 2m Test: Iceland



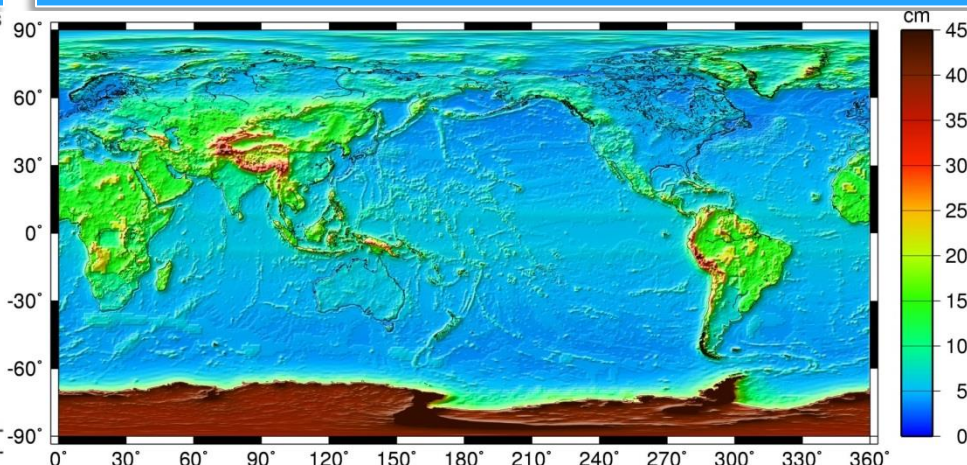


Earth Gravitational Model 2008 (EGM2008)

EGM2008



EGM2008 Commission Error





Opportunities to Partner with NGA

- Academic research grants
- Business opportunities
- Cooperative agreements
- See www.nga.mil/partners for a full list



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