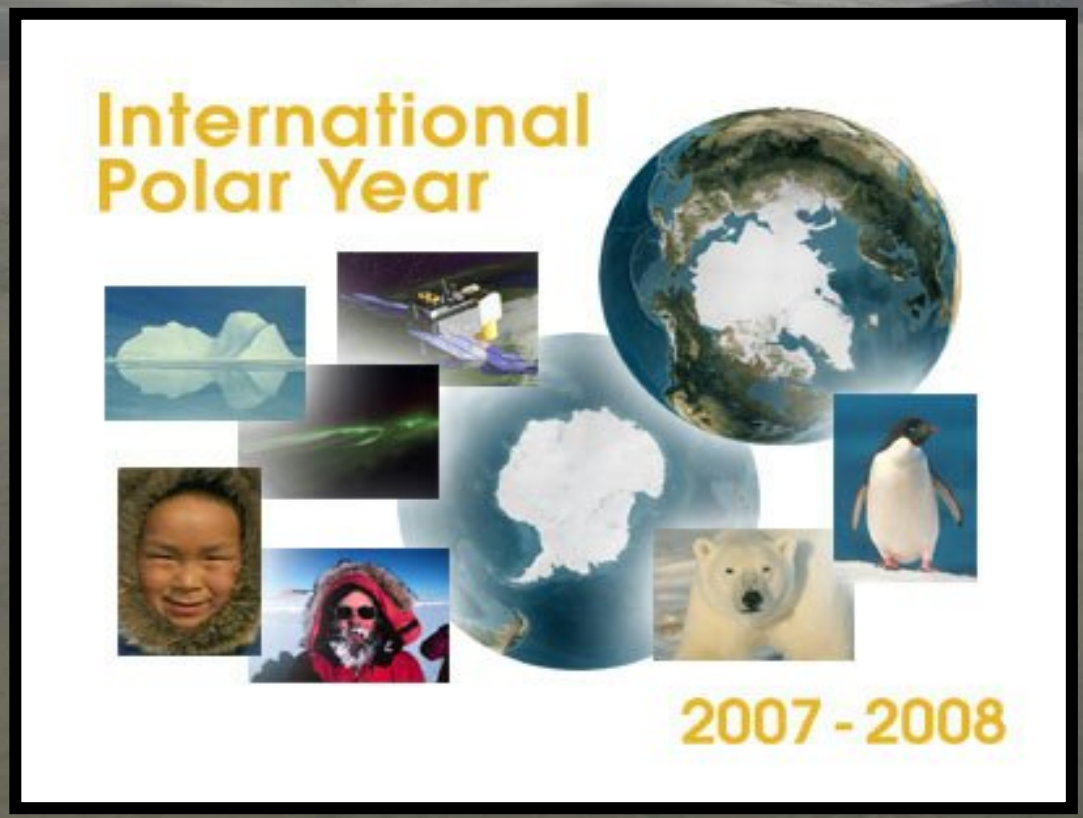
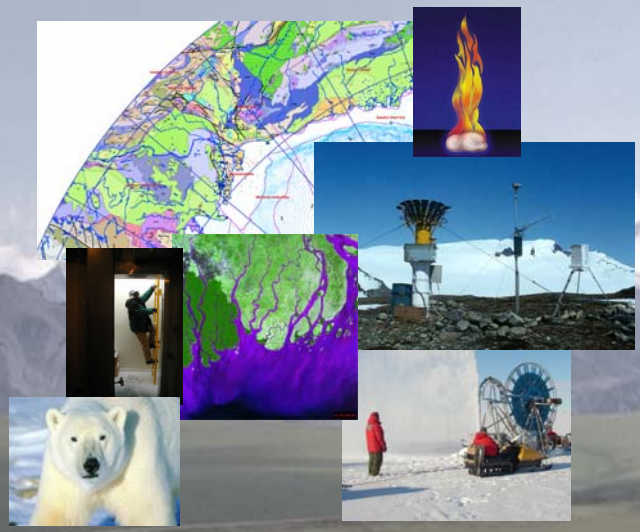
U.S. Geological Science at the Poles in the International Polar Year 2007-2009

Jerry L. Mullins
Cheryl A. Hallam
US Geological Survey





US Geological Survey

(Multidisciplinary Science Agency)

Geologists - 1500

Hydrologists - 1700

Biologists - 1400

Geographers (175-200) + EROS

Geospatial Information - 650

The topical directory below provides an alternate way to browse USGS science programs and activities. It is not an exhaustive list of all USGS science topics but provides a categorization using a thesaurus of related terms that will give you definitions, links to science content, and a structured approach to discovery.

Atmosphere and Climate
acid deposition, climate change, global change, precipitation

Earth Characteristics
earth structure, geologic history, geologic structure, gravity, magnetic field, land surface, rocks and deposits, snow and ice cover, stratigraphy

Ecology and Environment
biodiversity, biogeography, ecological processes, ecosystems, habitats

Environmental Issues
health and disease, human impacts, land use, mining hazards, natural contaminants, pollution, recreation, water quality

Geologic Processes
erosion, geochemistry, land subsidence, sedimentation, tectonic processes

Hydrologic Processes
glaciation, ground-water flow, runoff, sediment transport, streamflow

Geographic Analysis and Mapping
aerial photography, cartography, geospatial analysis, maps and atlases, remote sensing

Natural Hazards
droughts, earthquakes, fires, floods, landslides, storms, tsunamis, volcanoes

Natural Resources
energy resources, fishery resources, mineral resources, resource exploration, resource extraction, water resources

Oceans and Coastlines
coastal zones, marine geology, marine geophysics, ocean characteristics, ocean processes

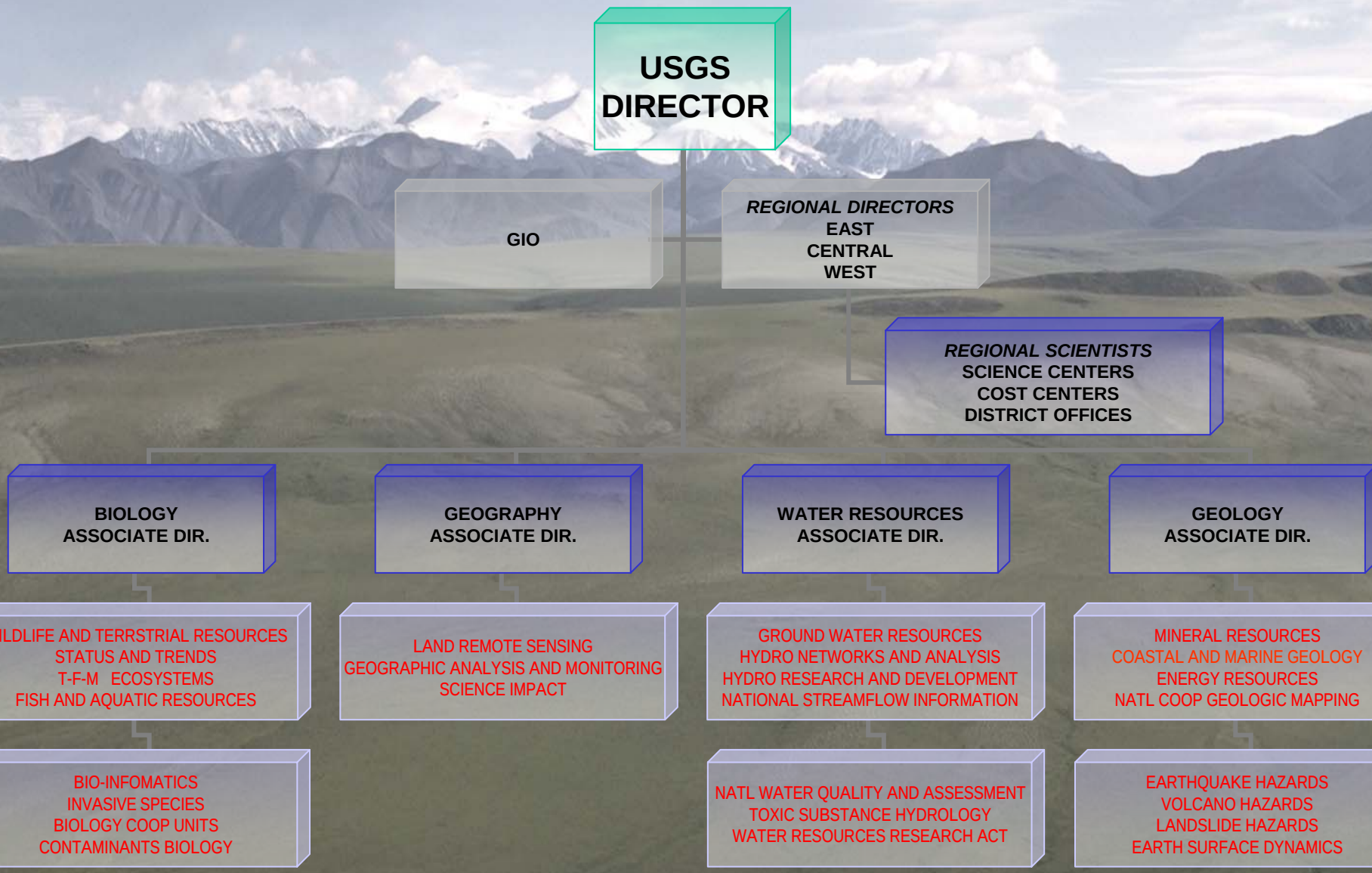
Planets
meteorites, planetary bodies

Plants and Animals
animals, endangered species, invasive species, plants, vegetation, wildlife

Techniques and Methods
geographic information systems (GIS), mathematical modeling, remote sensing, real-time monitoring and reporting,

Water Resources
ground water, surface water, water properties, water quality, water supply and demand, water use

USGS PROGRAMS



Full Proposals for IPY 2007-2008 Activities

Proposed IPY Activity Details

1.0 PROPOSER INFORMATION

(Activity ID No: 86)

1.1 Title of Activity

US Geological Survey participation in the International Polar Year

1.2 Short Form Title of Proposed Activity

USGS-IPY

1.3 Activity Leader Details

P. Patrick Leahy
U.S. Geological Survey
United States

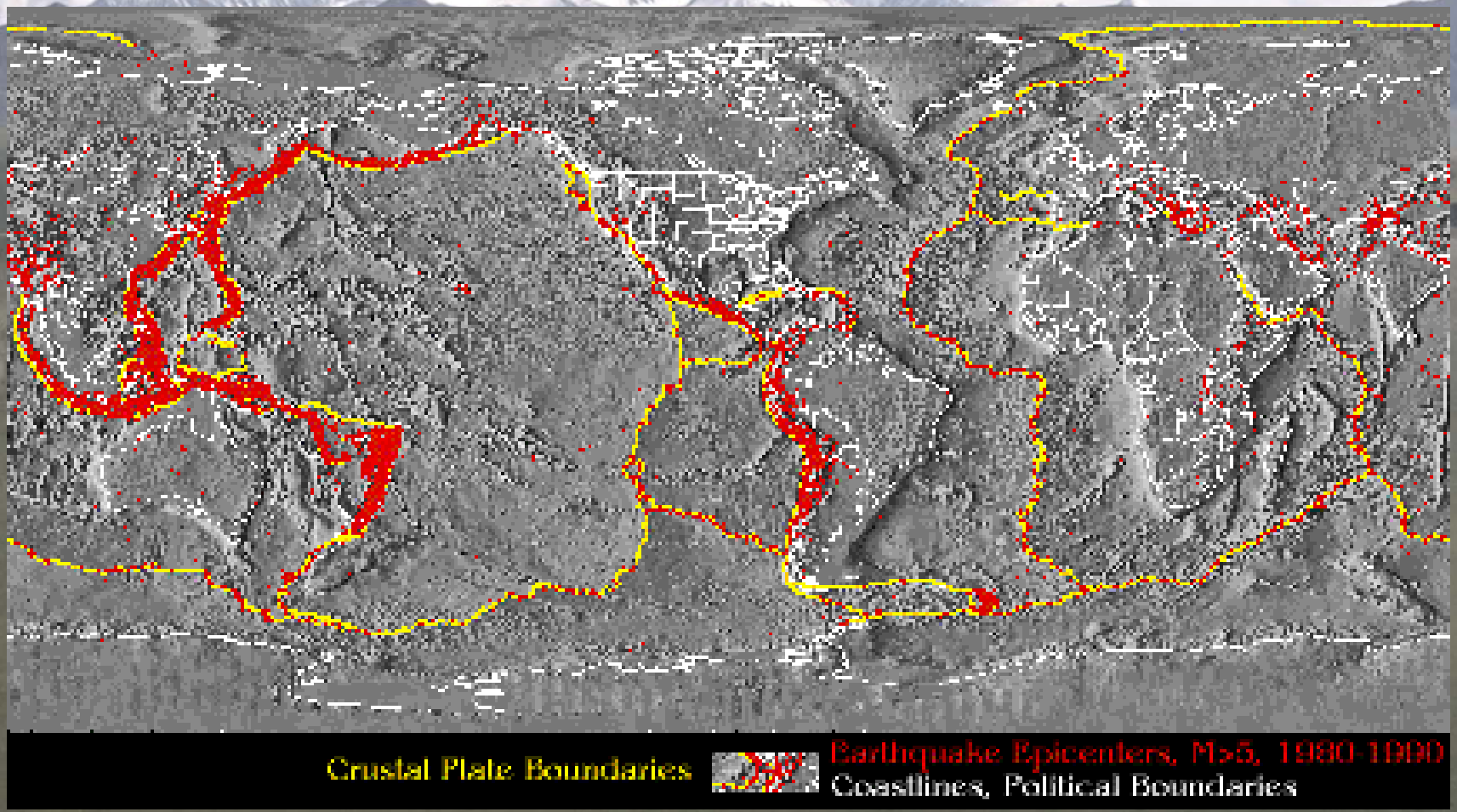
USGS and the IPY

- USGS IPY Committee – Patrick Leahy, Acting Director
- Jerry Mullins Polar Programs & Canada, International Programs Office, Reston, Virginia
- Leslie Holland-Bartels, Director, Alaska Science Center, Anchorage, Alaska
- Kay Briggs, Biology, International Activities, Reston, Virginia,
- Suzanne Weedman, Science Advisor, Reston, Virginia
- Joan Fitzpatrick, Geology, Central Region, Denver, Colorado
- Cheryl Morris, Geospatial Information Office, Central Region, Denver, Colorado

- The National Science Foundation is the Lead Agency for the IPY in the U.S.
- USGS has Received Endorsement from the International IPY Committee
- National and International Cooperation is Important to USGS in the IPY
- USGS's Polar Research as it relates to the IPY (Arctic & Antarctic)
  - Current Work, New IPY Cooperation, New IPY Funding

USGS Earthquake Program

Program Coordinator: David Applegate



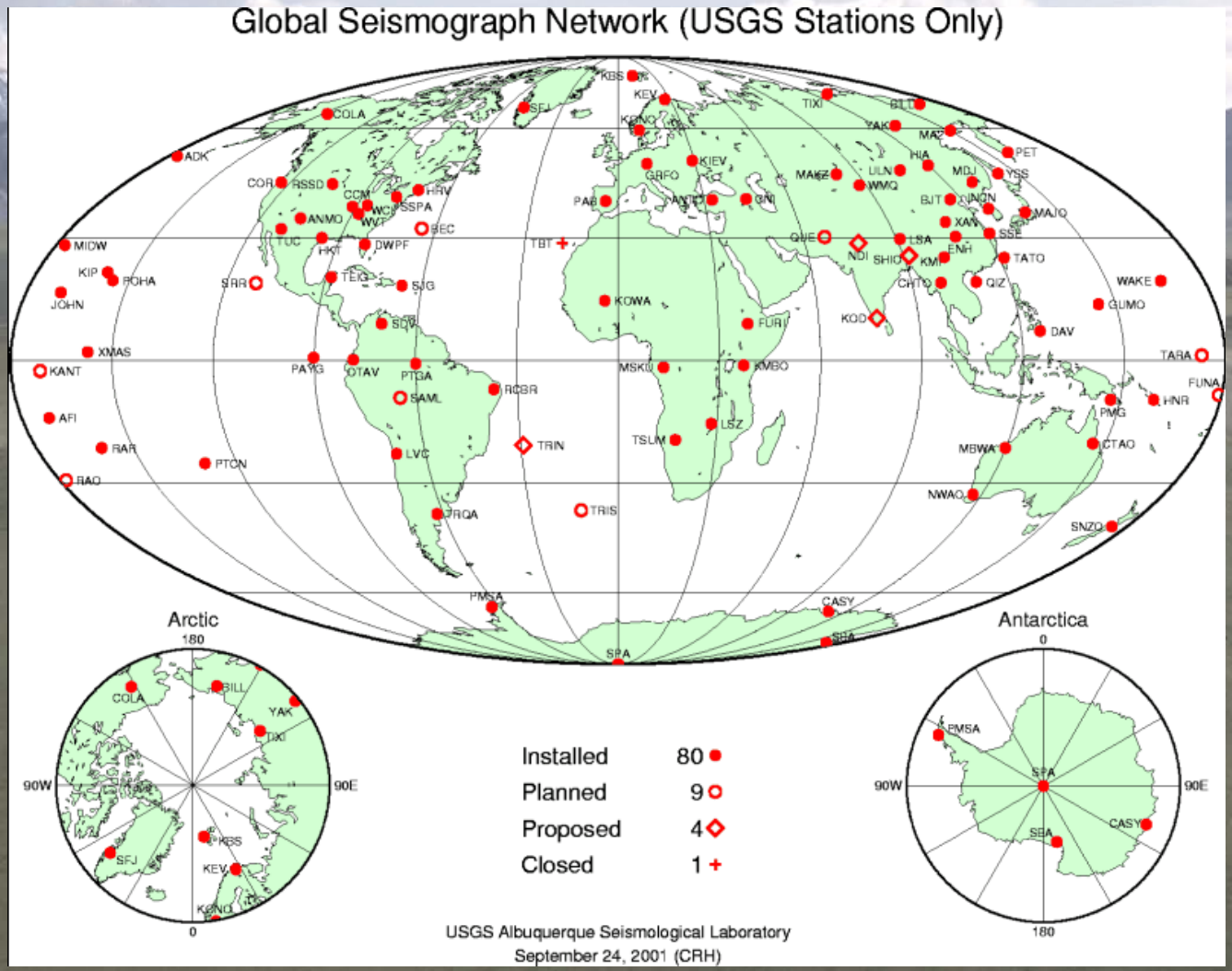
USGS Seismology

(Global Science)

- USGS's relies on the data from seismic stations to locate and determine the magnitude of earthquakes in the Polar regions and worldwide.

USGS Seismology Program

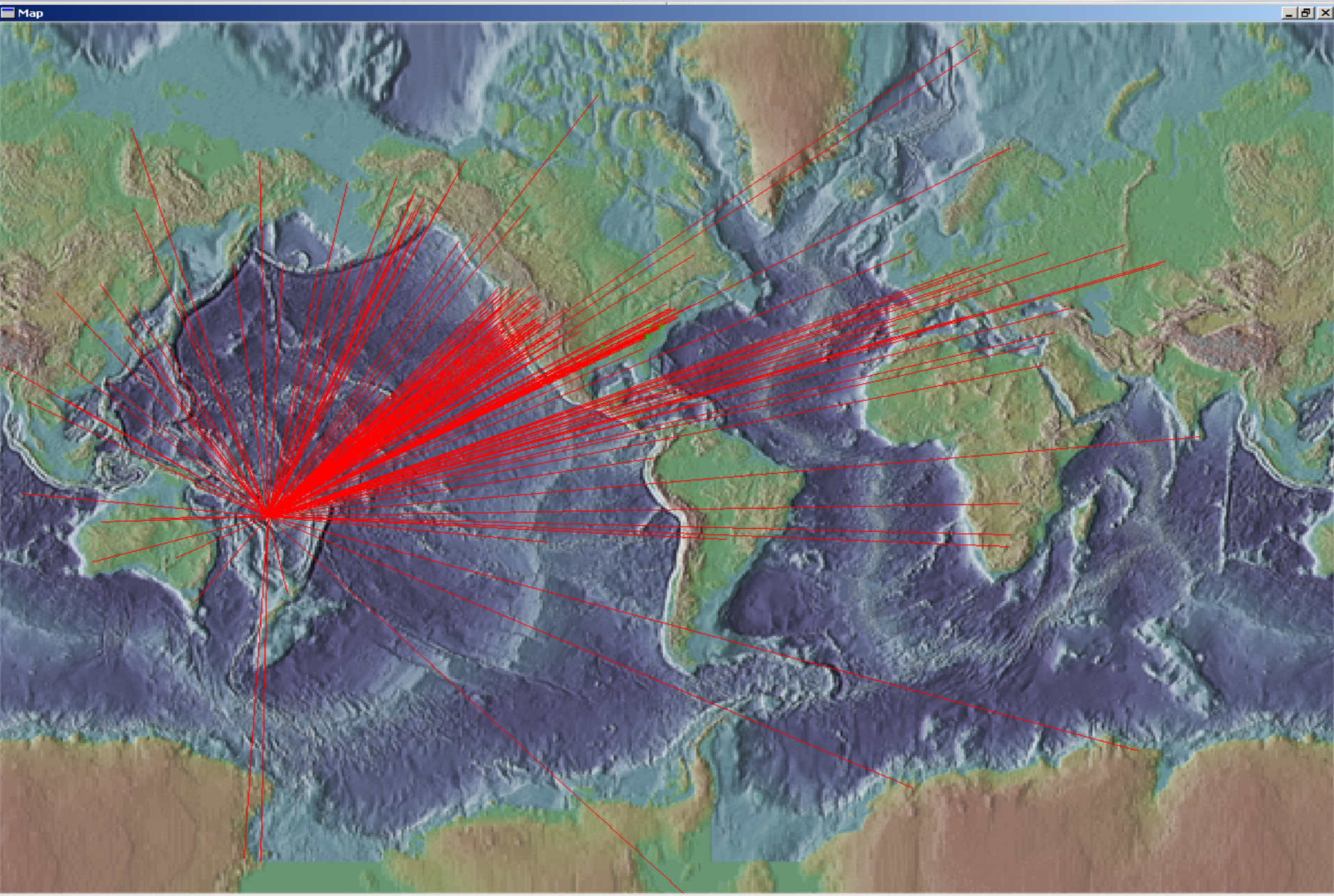
Worldwide Cooperative Program



USGS
science for a changing world
Earthquake Hazards Program

Vanuatu - 6 November 2003

Magnitude 6.6 ***Depth 71 miles***



Earthquake Activity

Earthquakes in 2002, Located by the NEIC

Current Earthquakes

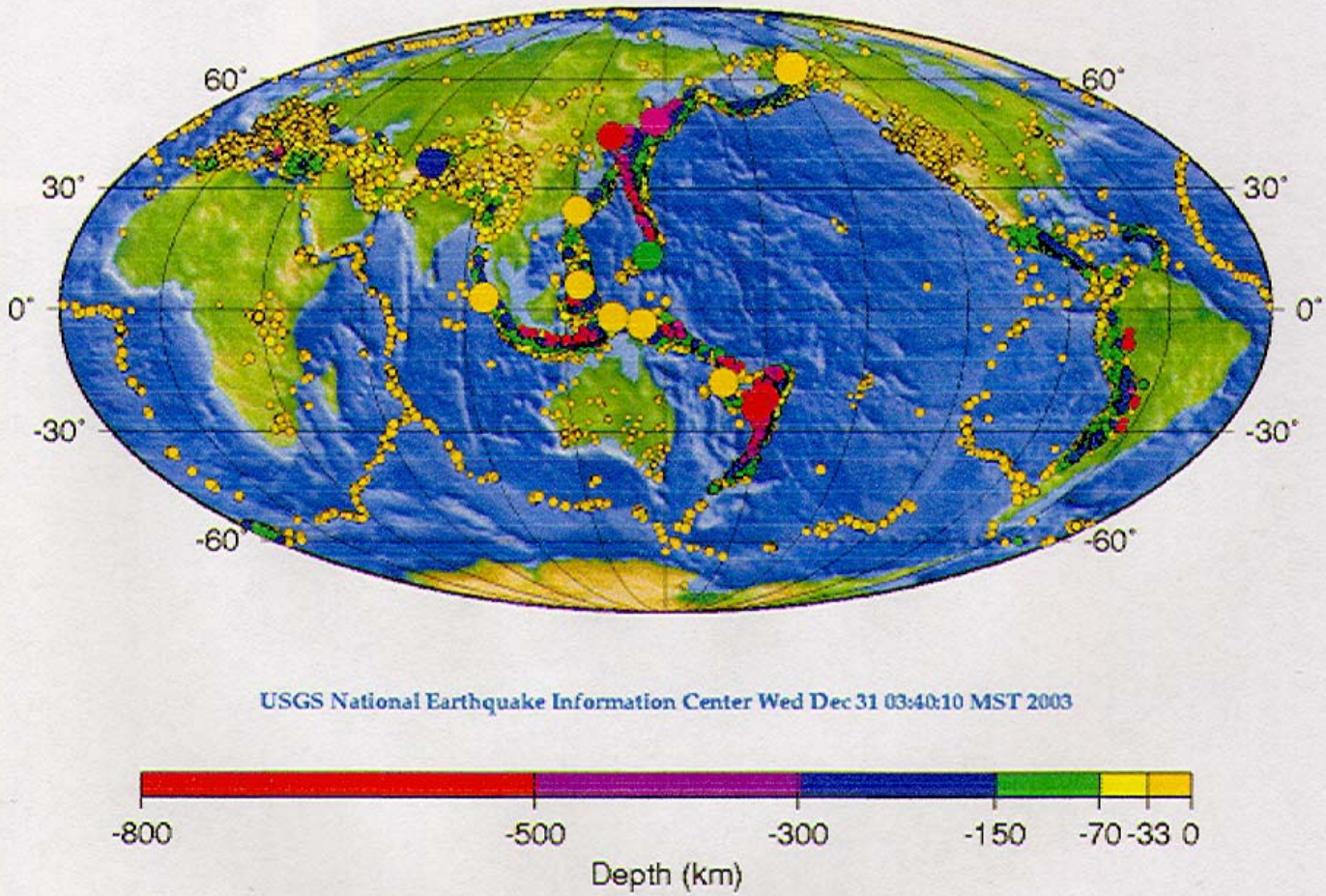
USA
World

ShakeMaps

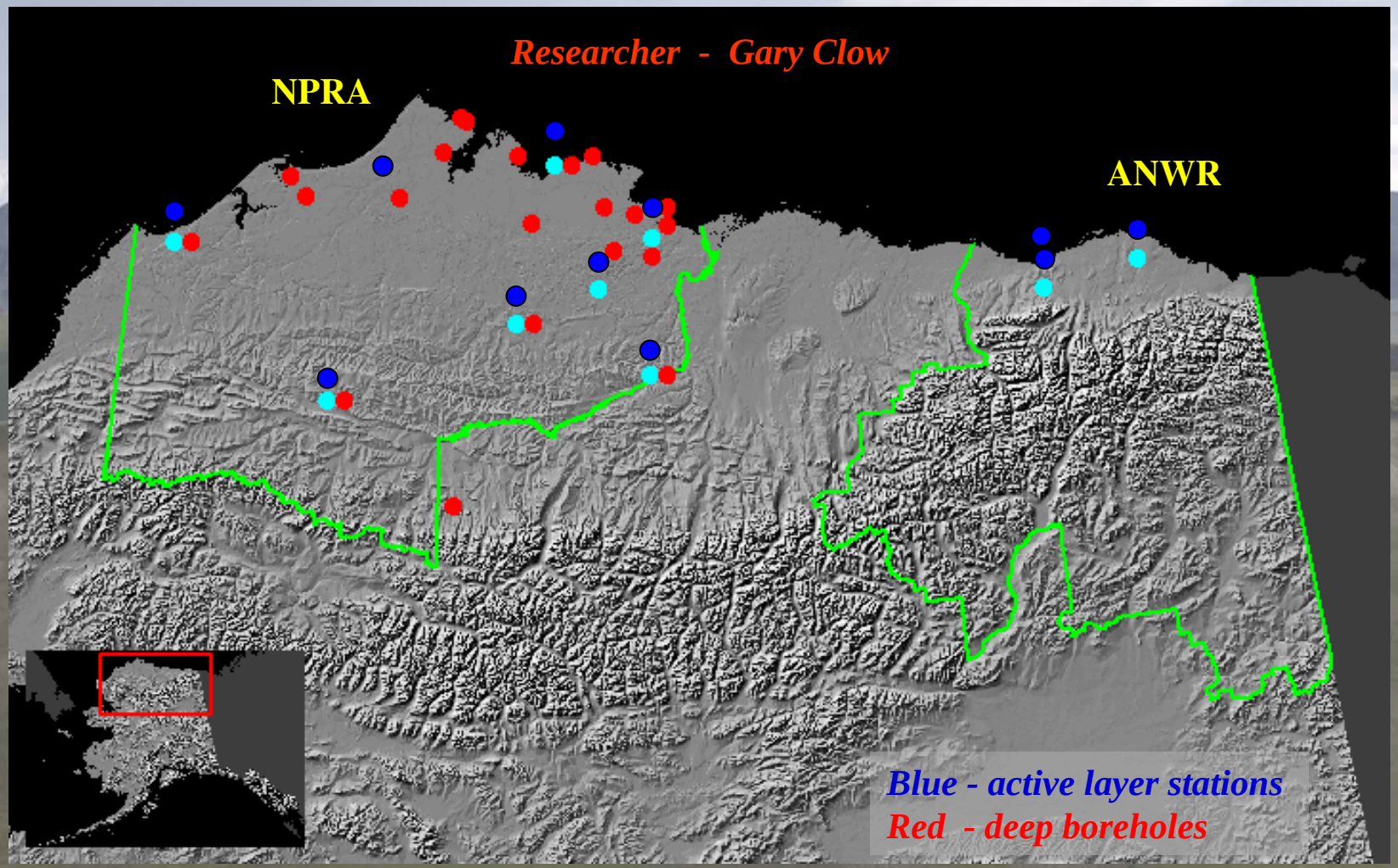
Seismogram Displays

Historical Earthquakes

Earthquake E-Mail Notification

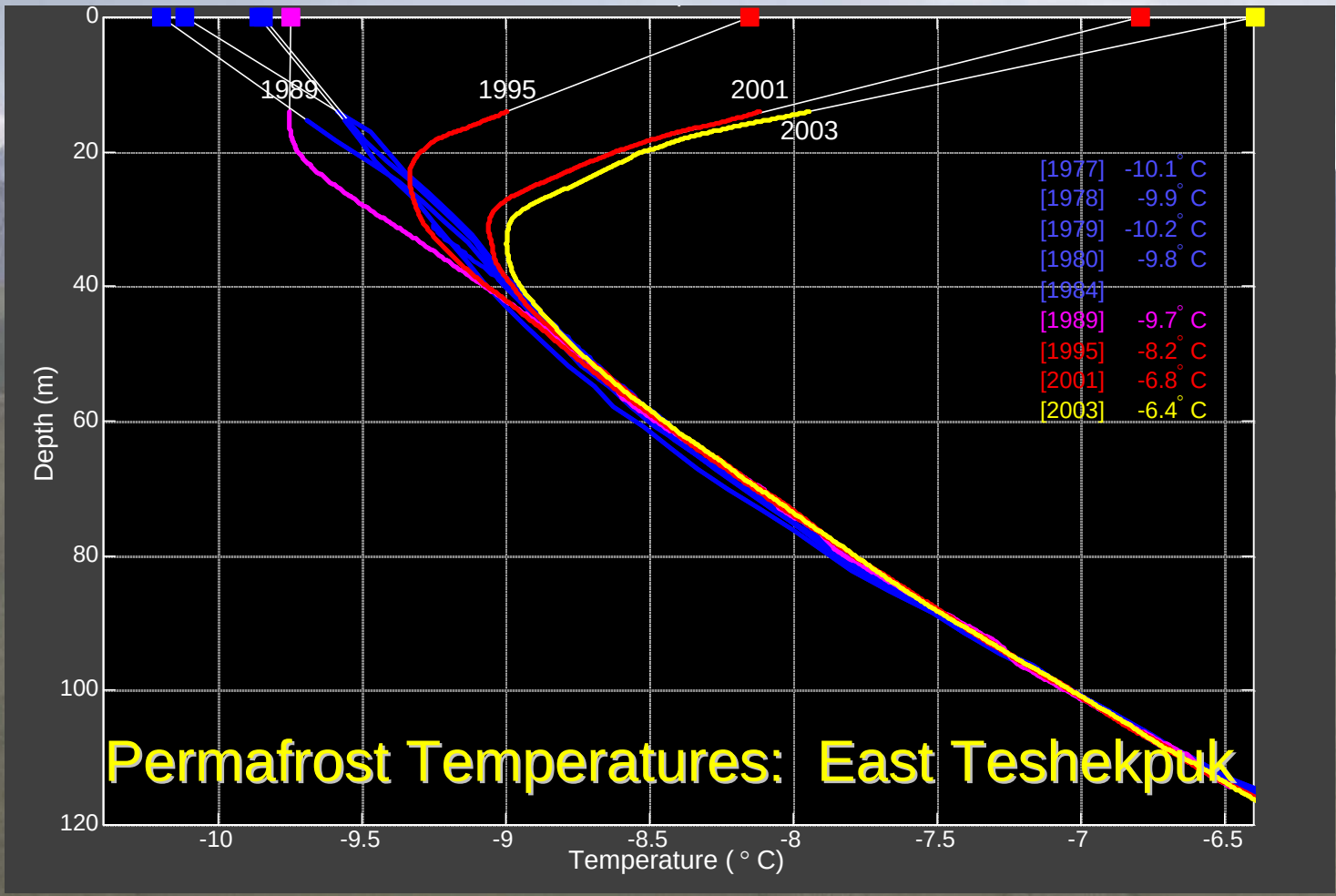


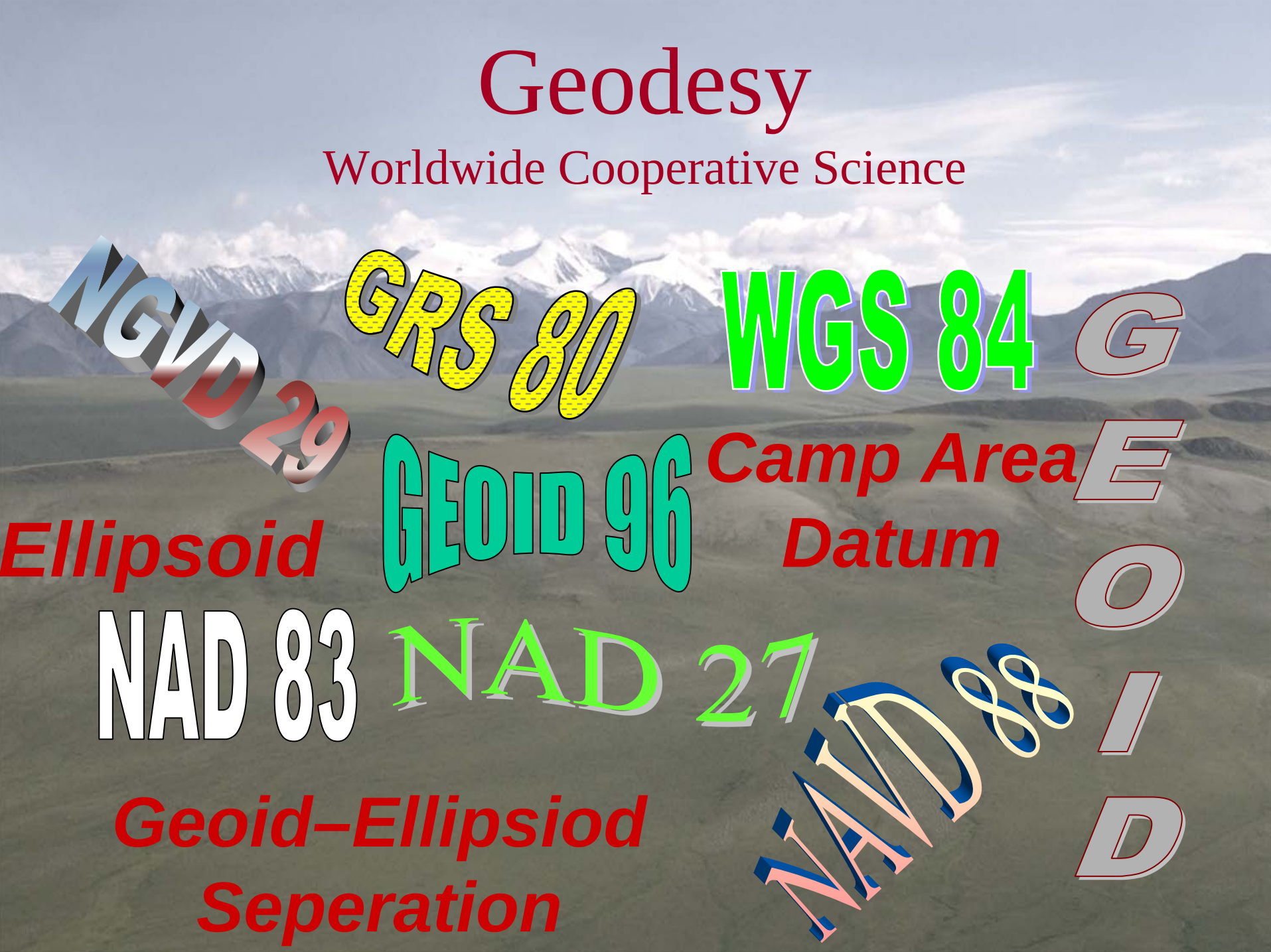
Climate Monitoring Network
DOI - USGS/ GTN-P



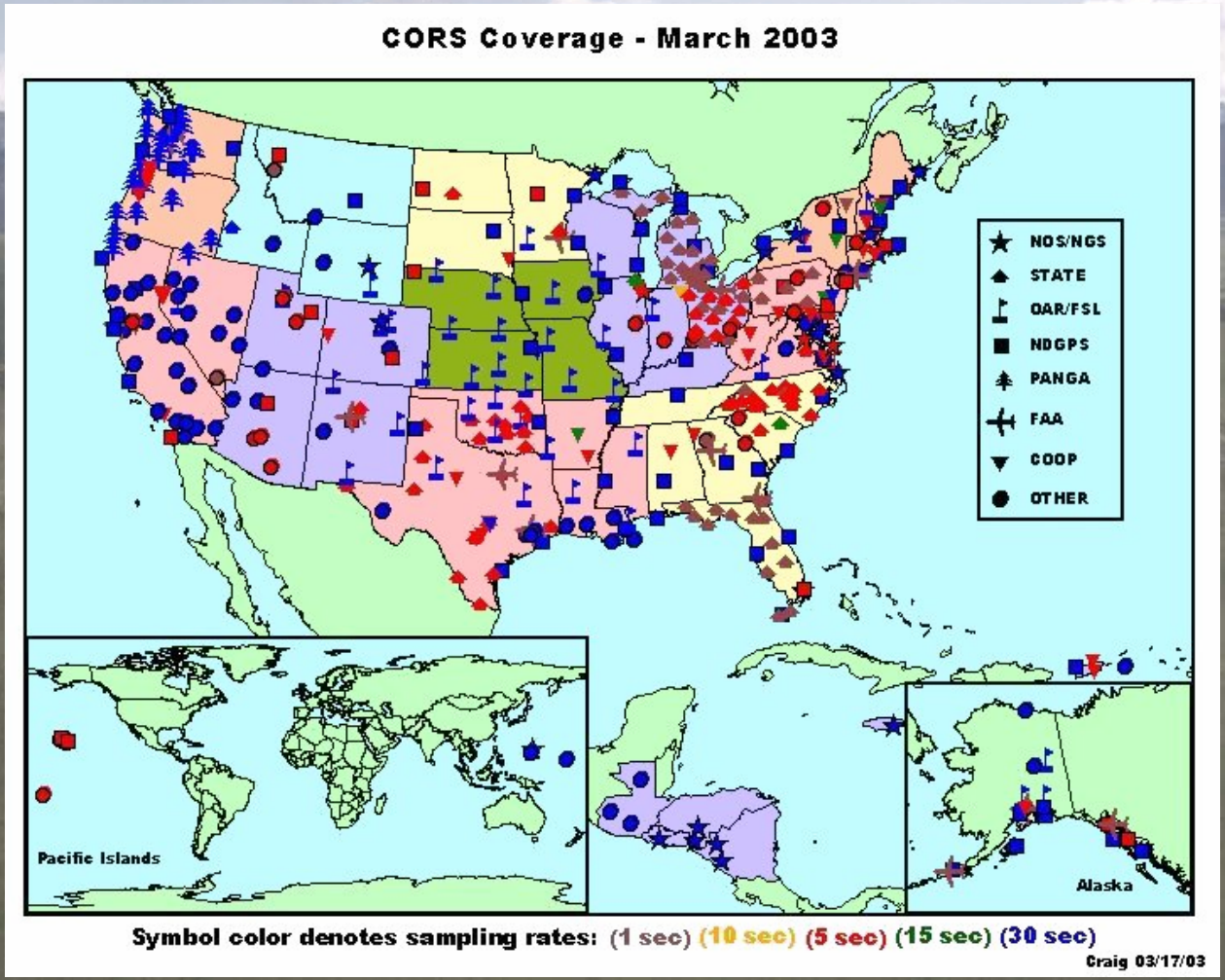
The USGS monitors aspects of GTN-P with sites on federal lands in the National Petroleum Reserve Alaska (NPRA) and the Arctic National Wildlife Refuge (ANWR).

Surface temps ~ 3.6°C warmer during 2003 than late-70's, early-80's




Geodesy
Worldwide Cooperative Science
NGVD 29
GRS 80
WGS 84
GEOID
Camp Area Datum
Ellipsoid
GEOID 96
NAD 83
NAD 27
NAD 88
Geoid–Ellipsiod Seperation

Antarctic GPS CORS Stations

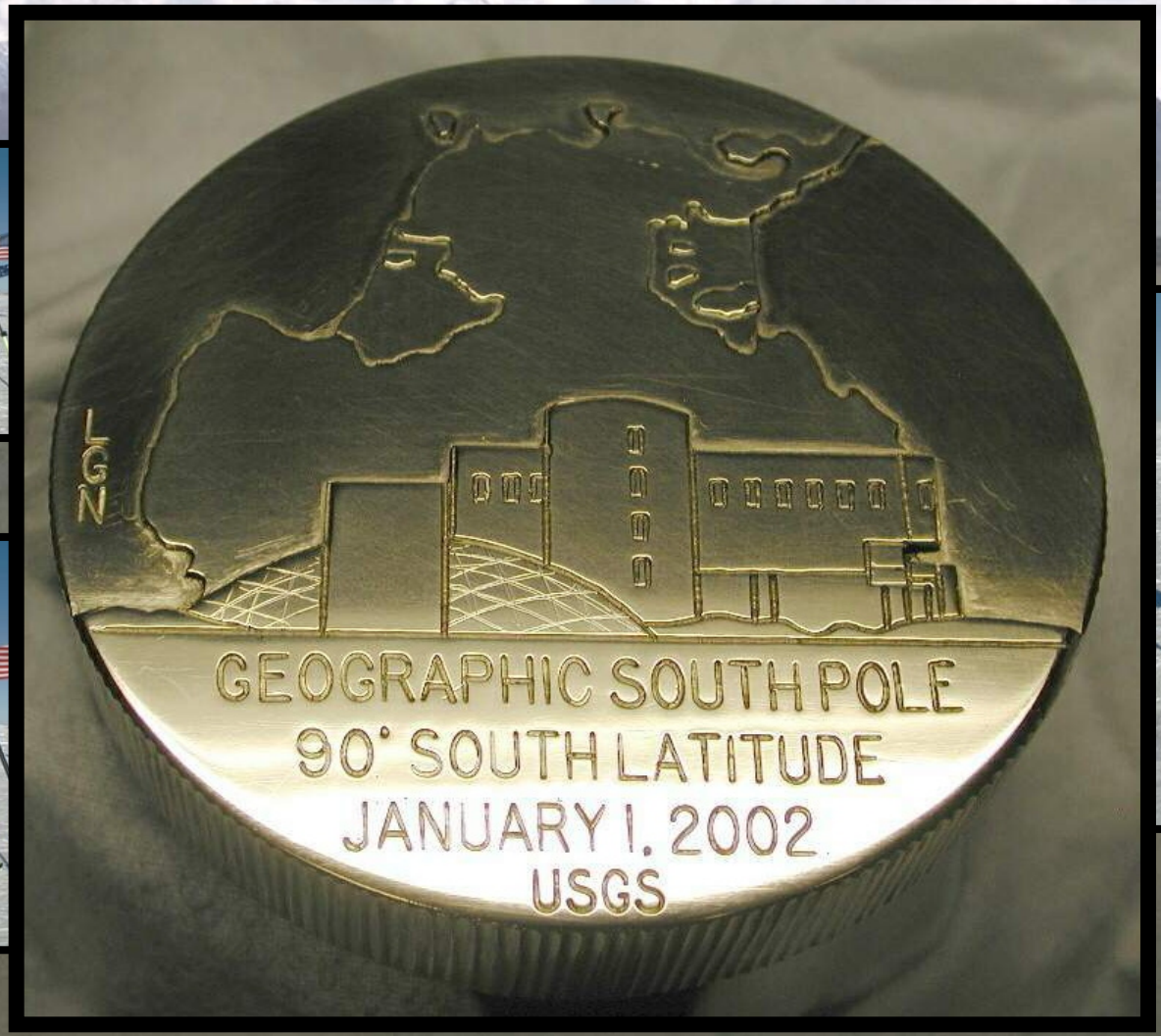


GPS CORS Stations

Geodetic Infrastructure for Antarctica (GIANT)

Geodesy

Worldwide Cooperative Program



National ICE CORE Laboratory

Researcher - Todd Hinkley

National Ice Core Laboratory (NICL)

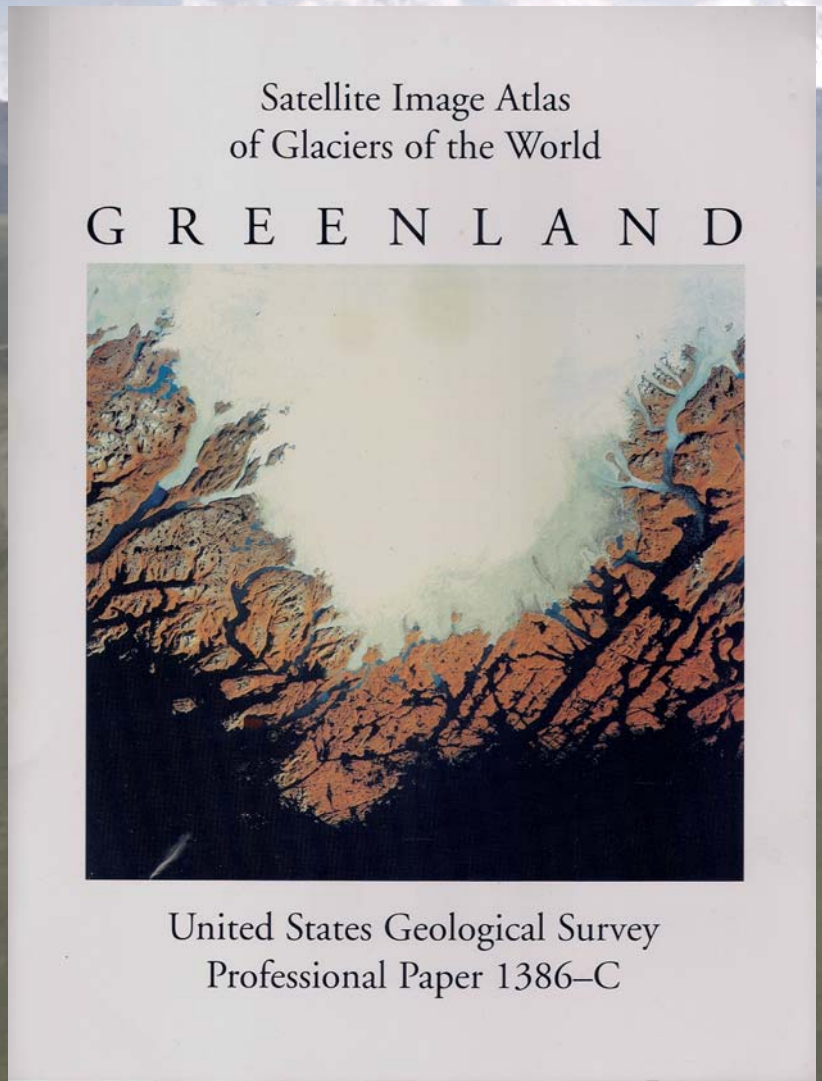
Core Processing Line

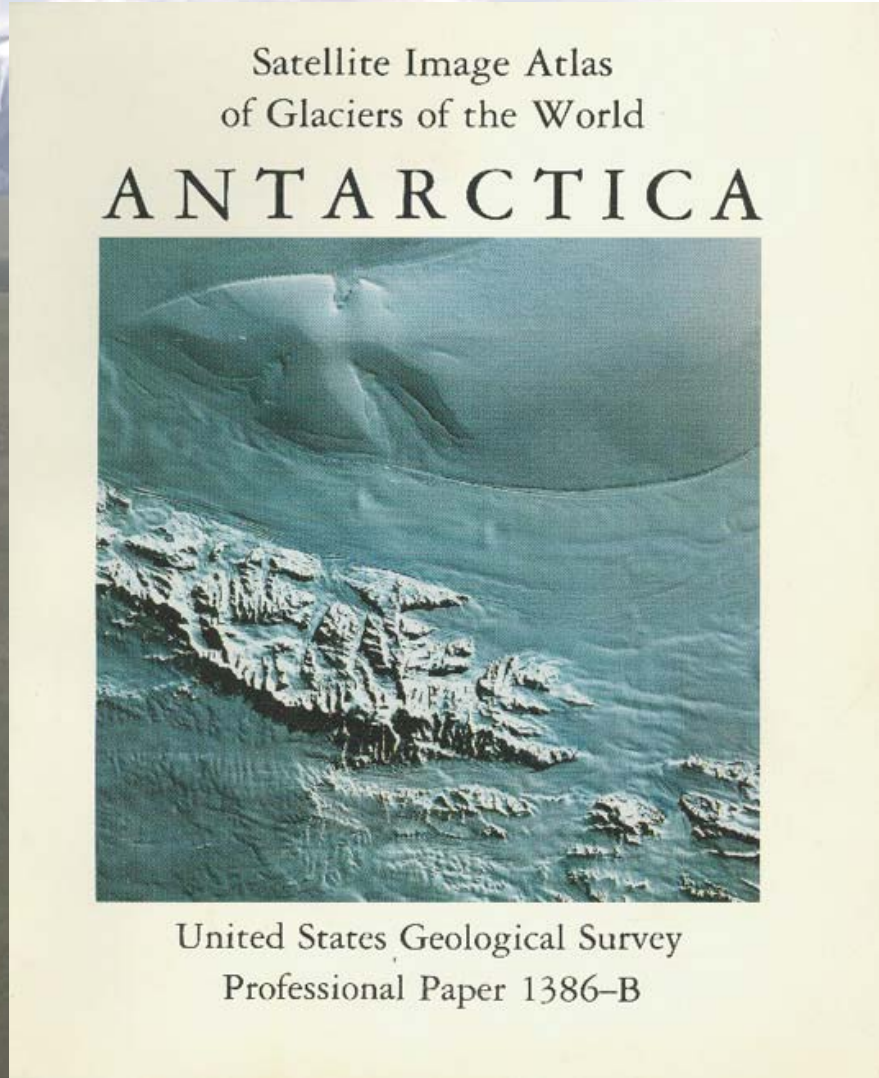
U.S. Antarctic Program, New Investigators workshop

23 - 24 April 2001

Satellite Image Atlas of Glacier of the World

Researcher – Richie Williams





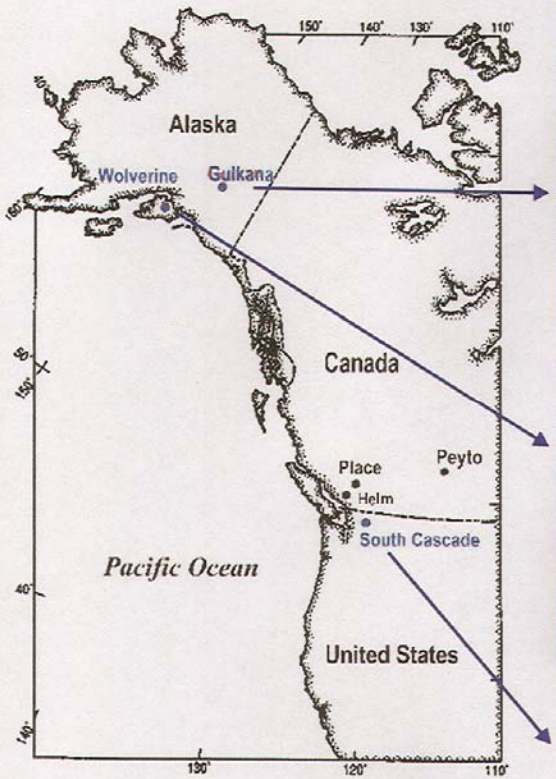
Benchmark Glaciers

BENCHMARK GLACIERS
- Main Page
- 3-Glacier Data
  - Mass Balance
  - Runoff
  - Temperature
- **Gulkana Glacier**
- Main Page
- History
- Data
  - Ice Thickness
  - Mass Balance
  - Meteorology
  - Motion
  - Runoff
  - Surface Altitude
  - Terminus Position
- Maps
- Photos
- Reports
- **South Cascade Gl.**
- Main Page
- Data
  - Mass Balance
- Reports
- **Wolverine Glacier**
- Main Page
- Data
  - Mass Balance
  - Meteorology
  - Runoff
- Maps
- Reports

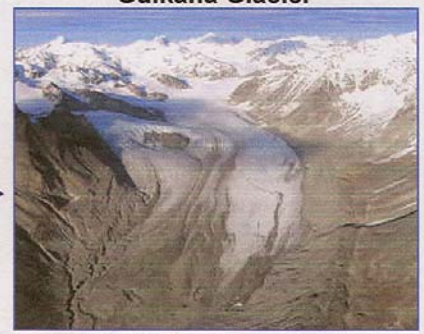
OTHER GLACIERS
- **Hubbard Glacier**
- Main Page
- Maps
- Photos
- Reports
- **Denali Fault Earthquake**
- Main Page
- Photo Gallery

LEARN ABOUT GLACIERS
- **Univ. of Alaska**
- Glacier Power
- **USGS**
- Questions & Myths
- Glaciers in the News
- Ask a glaciologist
- **World Data Center-A**
- All About Glaciers

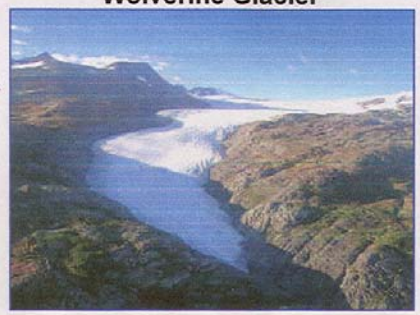
The U.S. Geological Survey (USGS) operates a long-term "benchmark" glacier program to monitor climate, glacier geometry, glacier mass balance, glacier motion, and stream runoff. The data collected are used to understand glacier-related hydrologic processes and improve the quantitative prediction of water resources, glacier-related hazards, and the consequences of climate change (Fountain and others, 1997). The approach has been to establish long-term mass balance monitoring programs at three widely spaced glacier basins in the United States that clearly sample different climate-glacier-runoff regimes. From north to south, the three basins are Gulkana and Wolverine Glaciers in Alaska and South Cascade Glacier in Washington State.



Gulkana Glacier



Wolverine Glacier



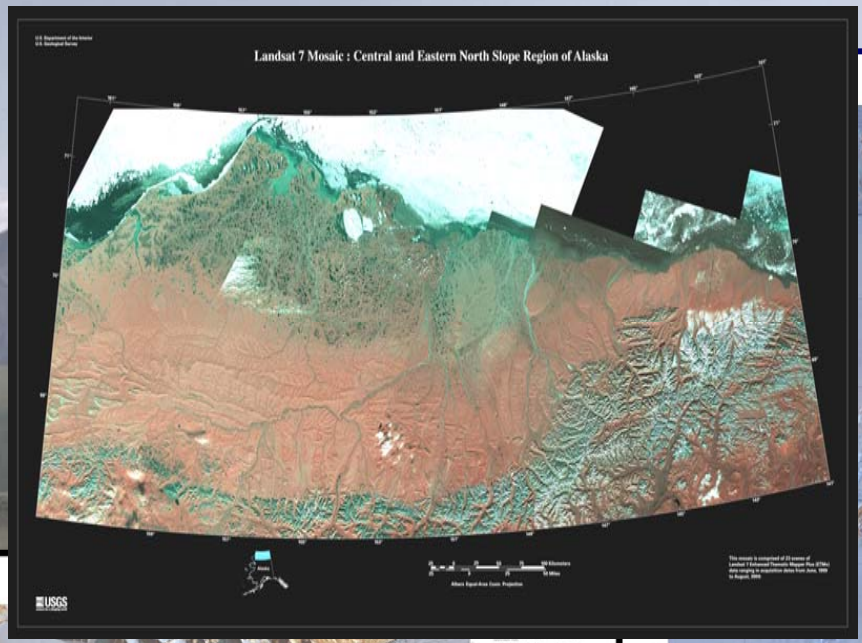
South Cascade Glacier

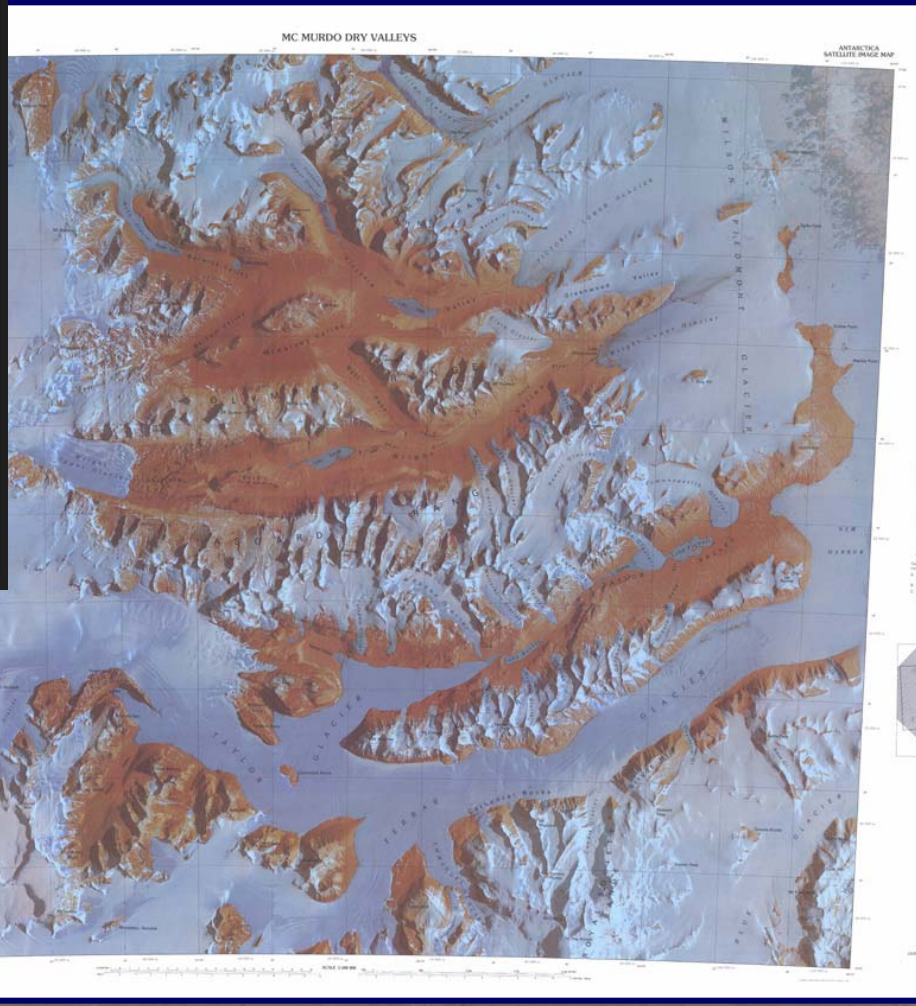
The Nine Alaska IGY Glaciers

(McCall, Polychrome, West Gulkana, Worthington, Chikuminuk, Bear Lake, Little Jarvis, Lemon Creek and Blue Glacier)

Researcher – Bruce Molnia

Satellite Image Mapping





Earth Resources Observation Systems (EROS)

Sioux Falls, SD

USGS
science for a changing world

Earth Resources Observation Systems (EROS) Data Center

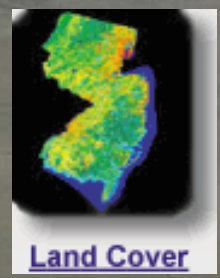
SITE MAP SITE SEARCH

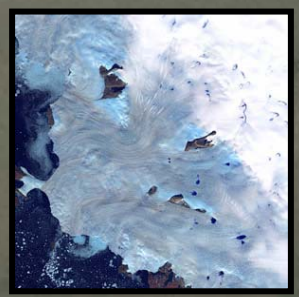
A leading source of land information for exploring our changing planet.

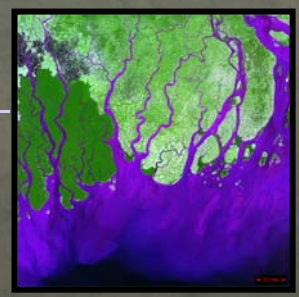

Aerial


Satellite


Elevation


Land Cover

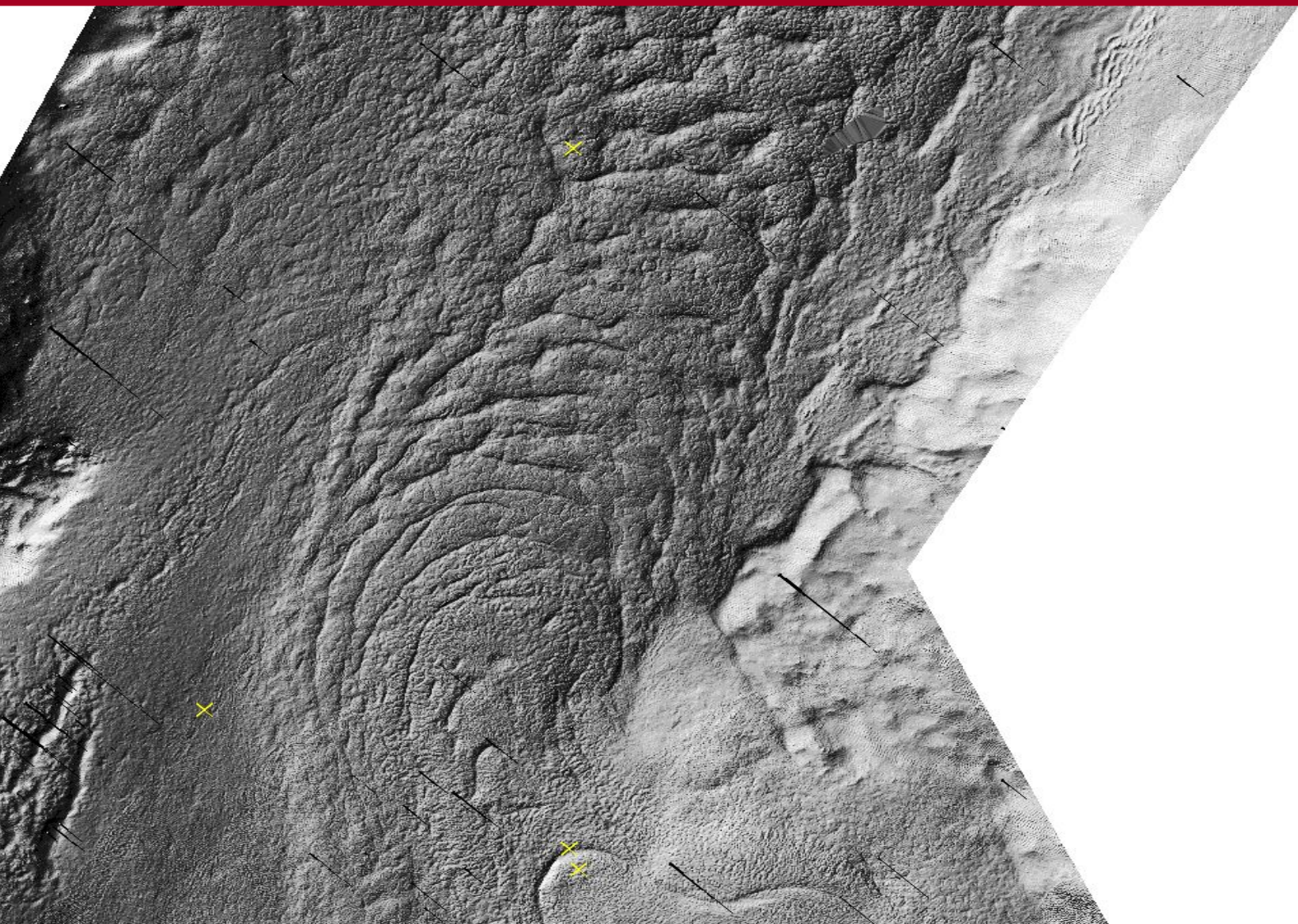




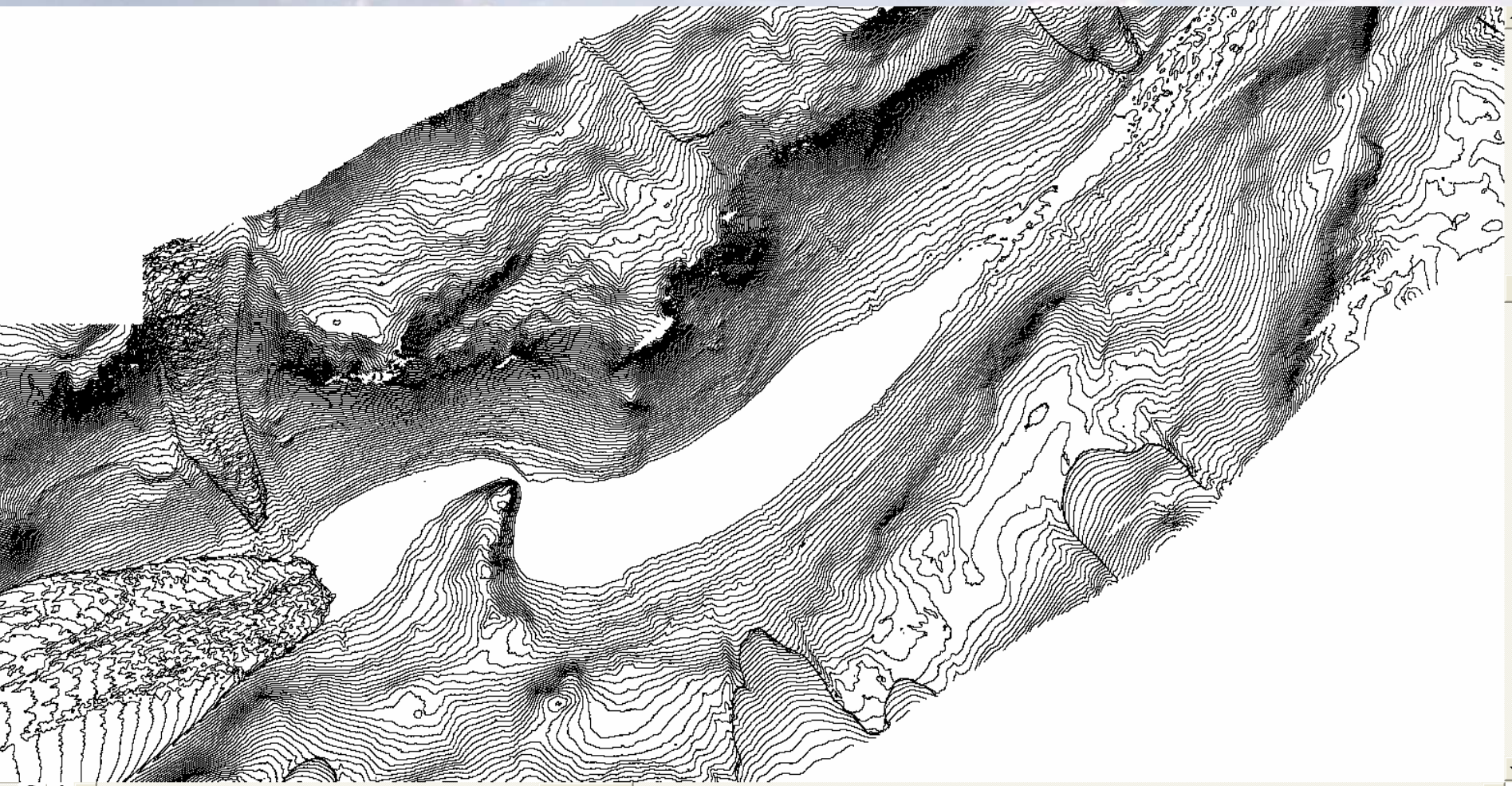
LIDAR

Cooperative USGS/NSF/NASA

Researcher – Cheryl Hallam



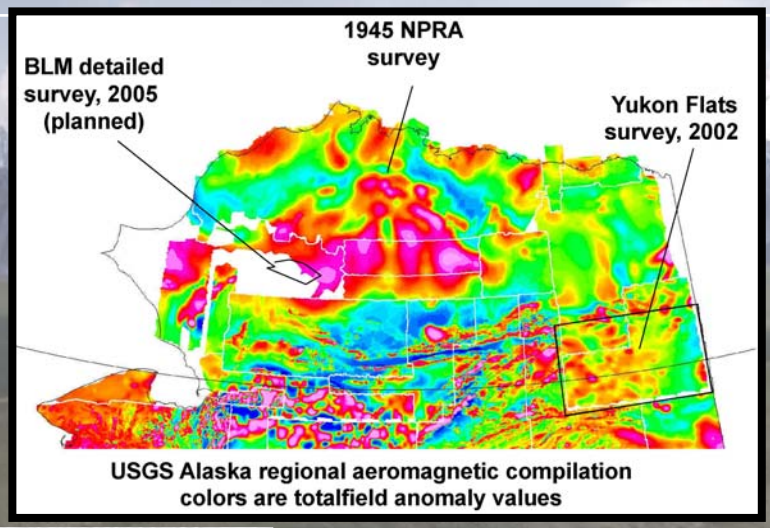
Lake Bonney, Antarctica (10 meter Contours)

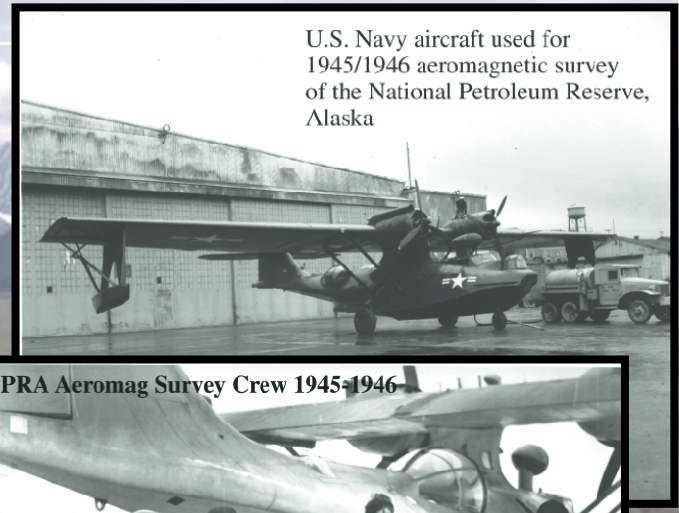


9642.10 32313.59 Meters

USGS Aeromagnetic Projects

Researcher - Carol Finn





Admiral Byrd's RD-4 (DC-3), was equipped with a magnetometer by USGS and was the platform for the first airborne geophysical surveys in Antarctica, in 1946-1947 (during Operation High Jump).

USGS

USGS
science for a changing world

Volcano observatories | Alaska | Cascades | Hawai`i | Long Valley | Yellowstone

U.S. Geological Survey Volcano Hazards Program Search

Researchers - Jim Quick (USGS) & Ken Dean (UAF)

- The **Alaska Volcano Observatory** (AVO) is a cooperative effort of the USGS Volcano Hazards Program, University of Alaska Fairbanks Geophysical Institute (UAFGI), and State of Alaska Division of Geological and Geophysical Surveys (ADGGS). AVO monitors about half of the 42 historically active volcanoes of Alaska, which not only threaten local populations but also aircraft and travelers using major air routes across the North Pacific. AVO also disseminates warnings and information on dangerous eruptions and ash clouds from Kamchatkan volcanoes in the Russian Far East.

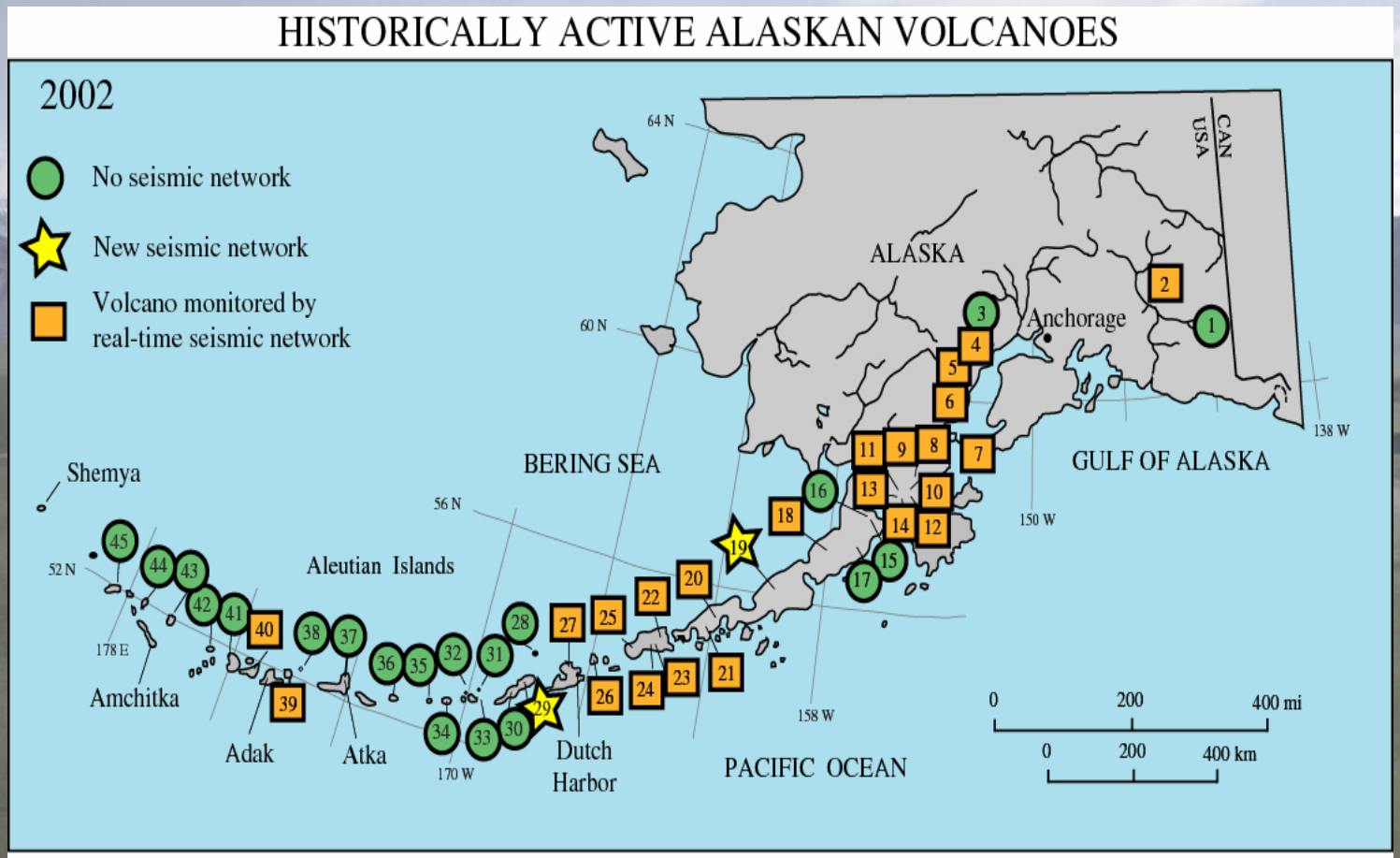
- The **Hawaiian Volcano Observatory** (HVO) conducts an intensive program of seismic, gas, ground-deformation, and observational monitoring of the frequently active volcanoes of the Island of Hawaii.

- The **Cascades Volcano Observatory** (CVO) in Vancouver, Washington, monitors and assesses hazards from the volcanoes of the Cascade Range of Washington, Oregon, and California. Seismic monitoring is shared with the USGS center in Menlo Park, California, (for northern California) and the Geophysics Program of the University of Washington in Seattle (for Washington and Oregon). CVO also is home to the **Volcano Disaster Assistance Program**.

- The **Long Valley Observatory** (LVO) in Menlo Park, California, conducts seismic, deformation, hydrologic, and geochemical monitoring and research to interpret the recent unrest and assess the hazard from this large and potentially dangerous caldera system.

- The **Yellowstone Volcano Observatory** is the most recent U.S. volcano observatory. The goal of the observatory is to improve the existing collaborative study and monitoring of active geologic processes and hazards of the Yellowstone Plateau volcanic field and its caldera. The Observatory is supported by the U.S. Geological Survey, University of Utah, and the Yellowstone National Park. The park was the world's first National Park. It contains the largest and most diverse collection of natural thermal features in the world.

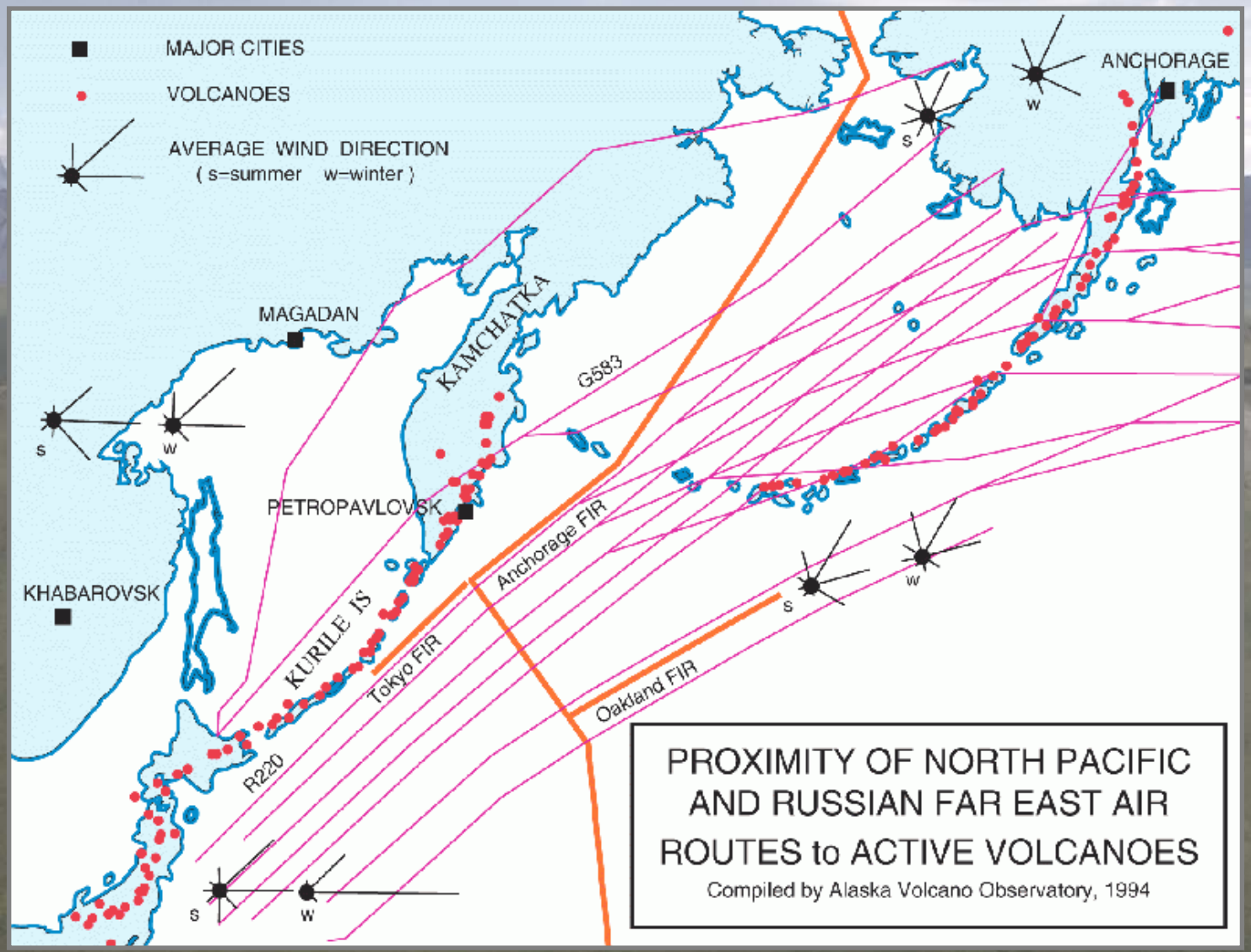
Historically Active Alaskan Volcanoes



1. Bona-Churchill [1]
2. Wrangell
3. Hayes [1]
4. Spurr
5. Redoubt
6. Iliamna
7. Augustine
8. Snowy
9. Griggs
10. Katmai
11. Novarupta
12. Trident
13. Mageik
14. Martin
15. Peulik
16. Ukinrek
17. Chiginagak
18. Aniakchak
19. Veniaminof
20. Pavlof
21. Dutton
22. Isanotski
23. Shishaldin
24. Fisher
25. Westdahl
26. Akutan
27. Makushin
28. Bogosloff
29. Okmok
30. Vsevidof
31. Kagamil
32. Carlisle
33. Cleveland
34. Yunaska
35. Amukta
36. Seguam
37. Korovin
38. Kasatochi
39. Great Sitkin
40. Kanaga
41. Tanaga
42. Gareloi
43. Cerebus
44. Little Sitkin
45. Kiska

[1]Though not historically active, merits observation owing to the hazard or eruptive potential

Volcanic Hazards - Alaska



National Volcano Early Warning System (NVEWS) Framework

The NVEWS report ranks the most dangerous U.S. volcanoes that pose a threat to human lives, property, and aviation safety and also discusses monitoring gaps at each volcano.

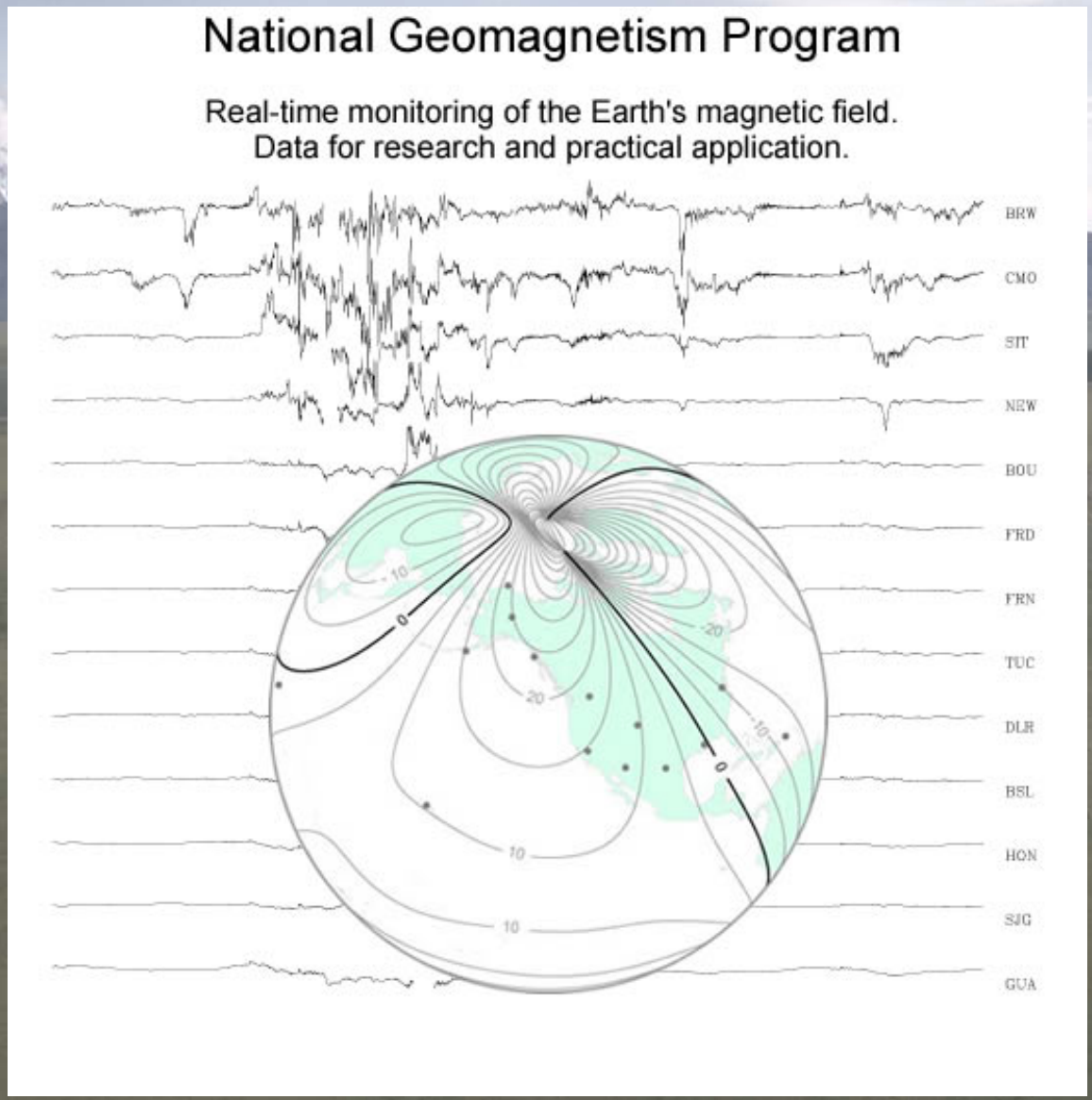
Based on NVEWS analysis and volcanic activity as of April 2005, the three highest priority targets for volcano monitoring improvements are:

1. **The volcanoes erupting now** – Mount St. Helens in Washington State, Anatahan in the Mariana Islands, and Kilauea in Hawaii – and the volcanoes that are showing periods of significant unrest – Mauna Loa in Hawaii and Mount Spurr in Alaska;

2. **The 13 very high threat volcanoes with inadequate monitoring:** nine volcanoes in the Cascade Range of the Western United States: Rainier, Hood, Shasta, South Sister, Lassen, Crater Lake, Baker, Glacier Peak, and Newberry. Although Cascade volcanoes do not erupt frequently, they threaten major populations and developments. Four Alaskan volcanoes in this group include: Redoubt, Makushin, Akutan, and Augustine

3. **Nineteen volcanoes in Alaska and the Mariana Islands that pose high risks to aviation combined with no real-time ground-based monitoring** to detect precursory unrest or the onset of an eruption. An additional 21 under-monitored volcanoes in Washington, Oregon, California, Hawaii, Alaska, the CNMI, and Wyoming are also priority NVEWS targets.

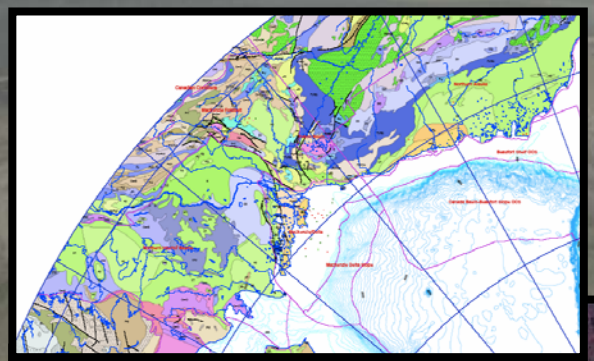
Geomagnetism

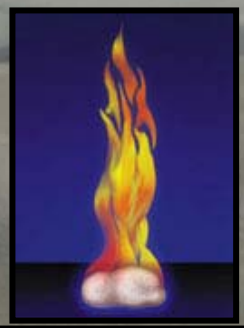


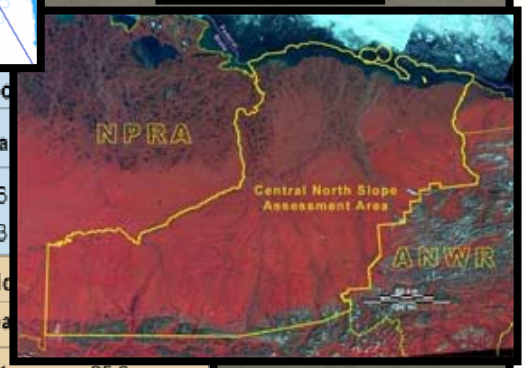

Magnetic Observatories
BRW
CMO
SIT
SHU
NEW
FRN
BOU
FRD
TUC
BSL
DLR
MID
HON
SJG
GUA

Energy Program in Alaska

- **USGS conducts Oil and Gas resource estimates for the major fields in Alaska**

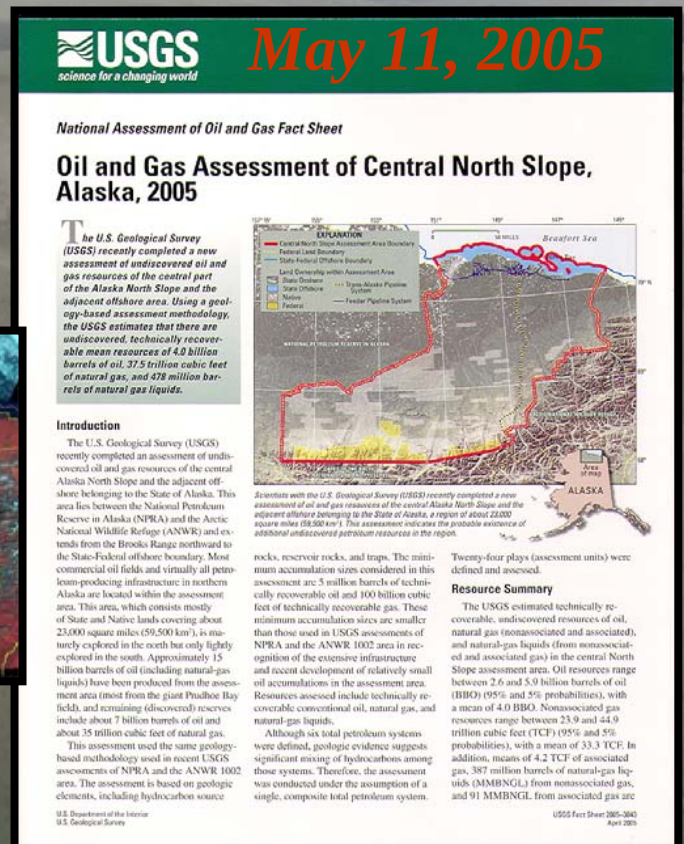






OIL	Volume of oil, billio		
Area	F_{95}	Mea	
Entire assessment area[1]	6.7	10.6	
Federal part of NPRA	5.9	9.3	
NONASSOCIATED GAS (gas in gas fields)	Volume of gas, trillio		
	F_{95}	Mea	
Entire assessment area[1]	40.4	61.4	85.3
Federal part of NPRA	39.1	59.7	83.2

[1] Includes NPRA, Native lands, and adjacent State offshore areas within 3-mile boundary (see figure 2).



USGS science for a changing world

May 11, 2005

National Assessment of Oil and Gas Fact Sheet

Oil and Gas Assessment of Central North Slope, Alaska, 2005

The U.S. Geological Survey (USGS) recently completed a new assessment of undiscovered oil and gas resources of the central part of the Alaska North Slope and the adjacent offshore area. Using a geology-based assessment methodology, the USGS estimates that there are undiscovered, technically recoverable mean resources of 4.0 billion barrels of oil, 37.5 trillion cubic feet of natural gas, and 478 million barrels of natural gas liquids.

Scientists with the U.S. Geological Survey (USGS) recently completed a new assessment of oil and gas resources of the central Alaska North Slope and the adjacent offshore belonging to the State of Alaska, a region of about 23,000 square miles (59,500 km²). This assessment indicates the probable existence of additional undiscovered petroleum resources in the region.

Introduction

The U.S. Geological Survey (USGS) recently completed an assessment of undiscovered oil and gas resources of the central Alaska North Slope and the adjacent offshore belonging to the State of Alaska. This area lies between the National Petroleum Reserve in Alaska (NPRA) and the Arctic National Wildlife Refuge (ANWR) and extends from the Brooks Range northward to the State-Federal offshore boundary. Most commercial oil fields and virtually all petroleum-producing infrastructure in northern Alaska are located within the assessment area. This area, which consists mostly of State and Native lands covering about 23,000 square miles (59,500 km²), is maturely explored in the north but only lightly explored in the south. Approximately 15 billion barrels of oil (including natural-gas liquids) have been produced from the assessment area (most from the giant Prudhoe Bay field), and remaining (discovered) reserves include about 7 billion barrels of oil and about 35 trillion cubic feet of natural gas.

This assessment used the same geology-based methodology used in recent USGS assessments of NPRA and the ANWR 1002 area. The assessment is based on geologic elements, including hydrocarbon source rocks, reservoir rocks, and traps. The minimum accumulation sizes considered in this assessment are 5 million barrels of technically recoverable oil and 100 billion cubic feet of technically recoverable gas. These minimum accumulation sizes are smaller than those used in USGS assessments of NPRA and the ANWR 1002 area in recognition of the extensive infrastructure and recent development of relatively small oil accumulations in the assessment area. Resources assessed include technically recoverable conventional oil, natural gas, and natural-gas liquids.

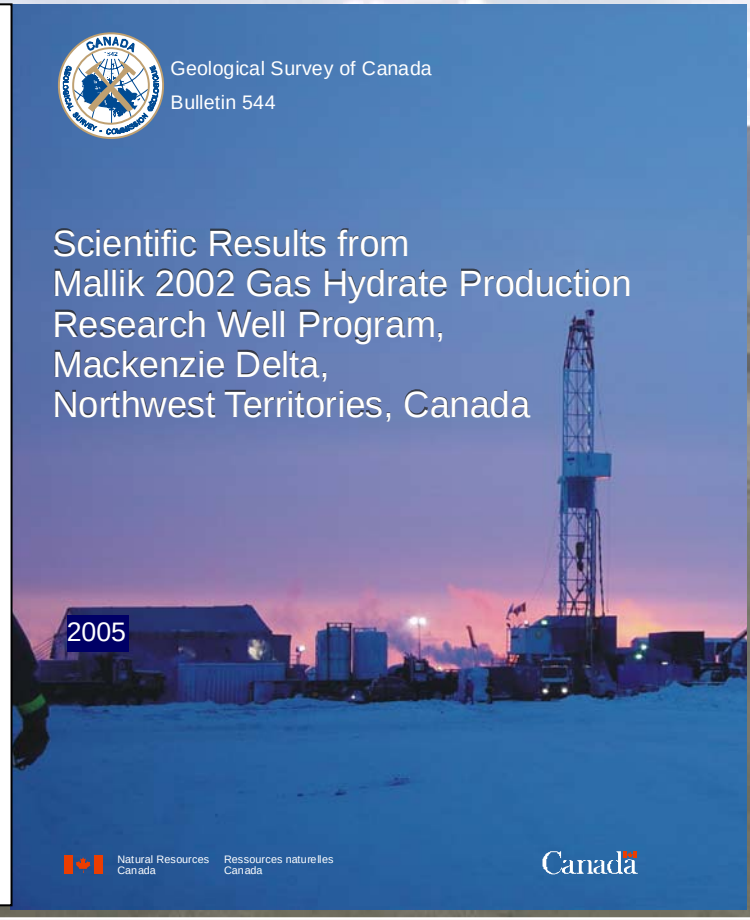
Although six total petroleum systems were defined, geologic evidence suggests significant mixing of hydrocarbons among those systems. Therefore, the assessment was conducted under the assumption of a single, composite total petroleum system. Twenty-four plays (assessment units) were defined and assessed.

Resource Summary

The USGS estimated technically recoverable, undiscovered resources of oil, natural gas (nonassociated and associated), and natural-gas liquids (from nonassociated and associated gas) in the central North Slope assessment area. Oil resources range between 2.6 and 5.9 billion barrels of oil (BBO) (95% and 5% probabilities), with a mean of 4.0 BBO. Nonassociated gas resources range between 23.9 and 44.9 trillion cubic feet (TCF) (95% and 5% probabilities), with a mean of 33.3 TCF. In addition, means of 4.2 TCF of associated gas, 387 million barrels of natural-gas liquids (MMBNGL) from nonassociated gas, and 91 MMBNGL from associated gas are

U.S. Department of the Interior
U.S. Geological Survey
USGS Fact Sheet 2005–3043
April 2005

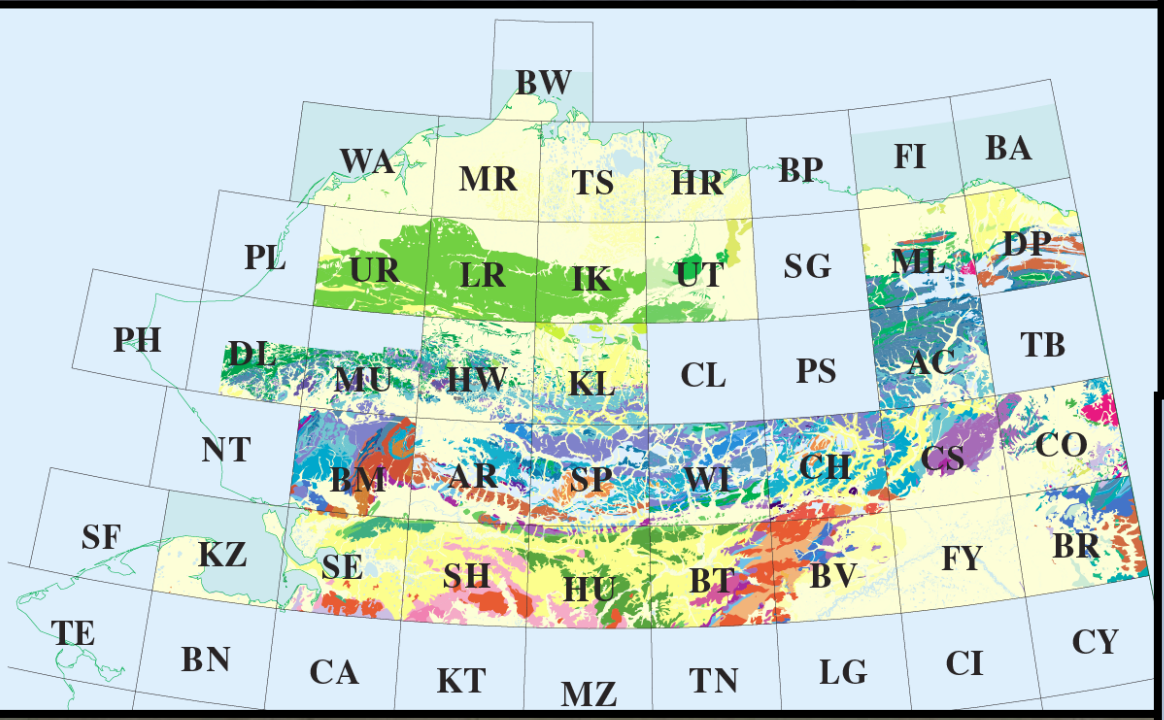
Gas Hydrate research in the Arctic

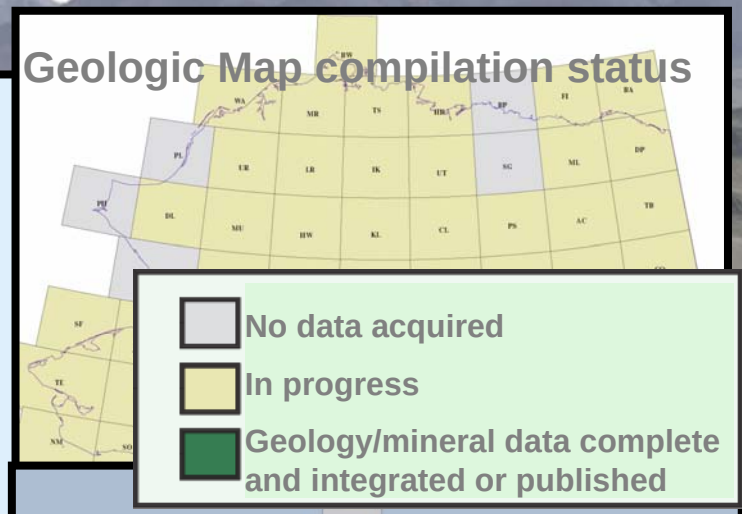


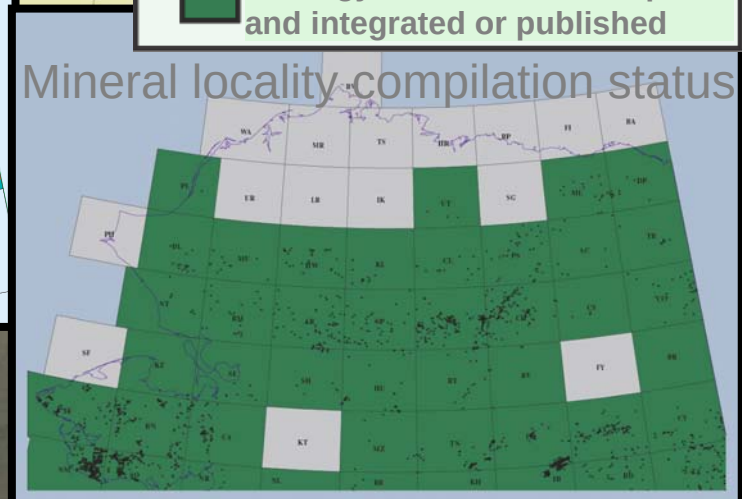
USGS

Geologic Mapping in Alaska

Researcher - Ric Wilson





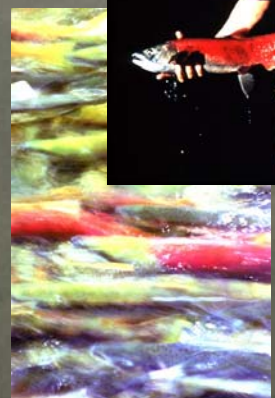


USGS Mineral Resources Program

- USGS conducts studies related to the origin, resources, and environmental behavior of mineral deposits

USGS Alaska Science Center

Biological Sciences



Biological Sciences Mission

Alaska Science Center

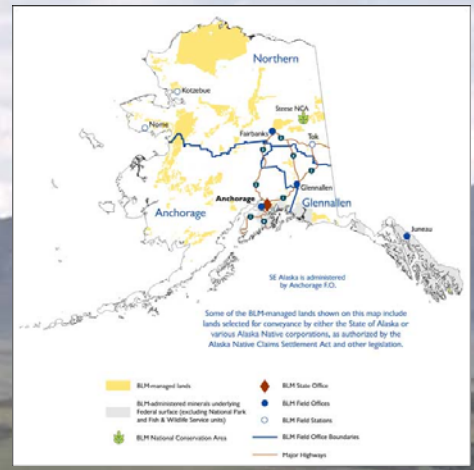
Responsible for research in trust lands and waters (including those of the National Park Service, Fish and Wildlife Service, Bureau of Land Management, and Minerals Management Service) and DOI trust species (including migratory birds, marine mammals, and anadromous fish) in Alaska, providing scientific information essential for resource management decisions.

DOI Trust Lands

FWS

NPS

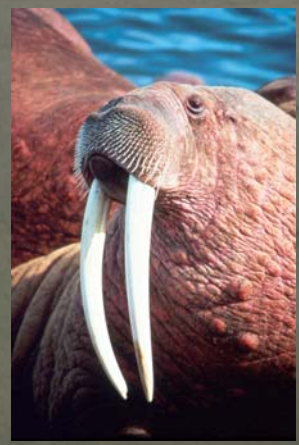
BLM



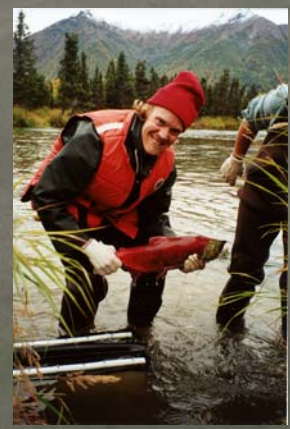
DOI Trust Species

Migratory birds

Marine mammals

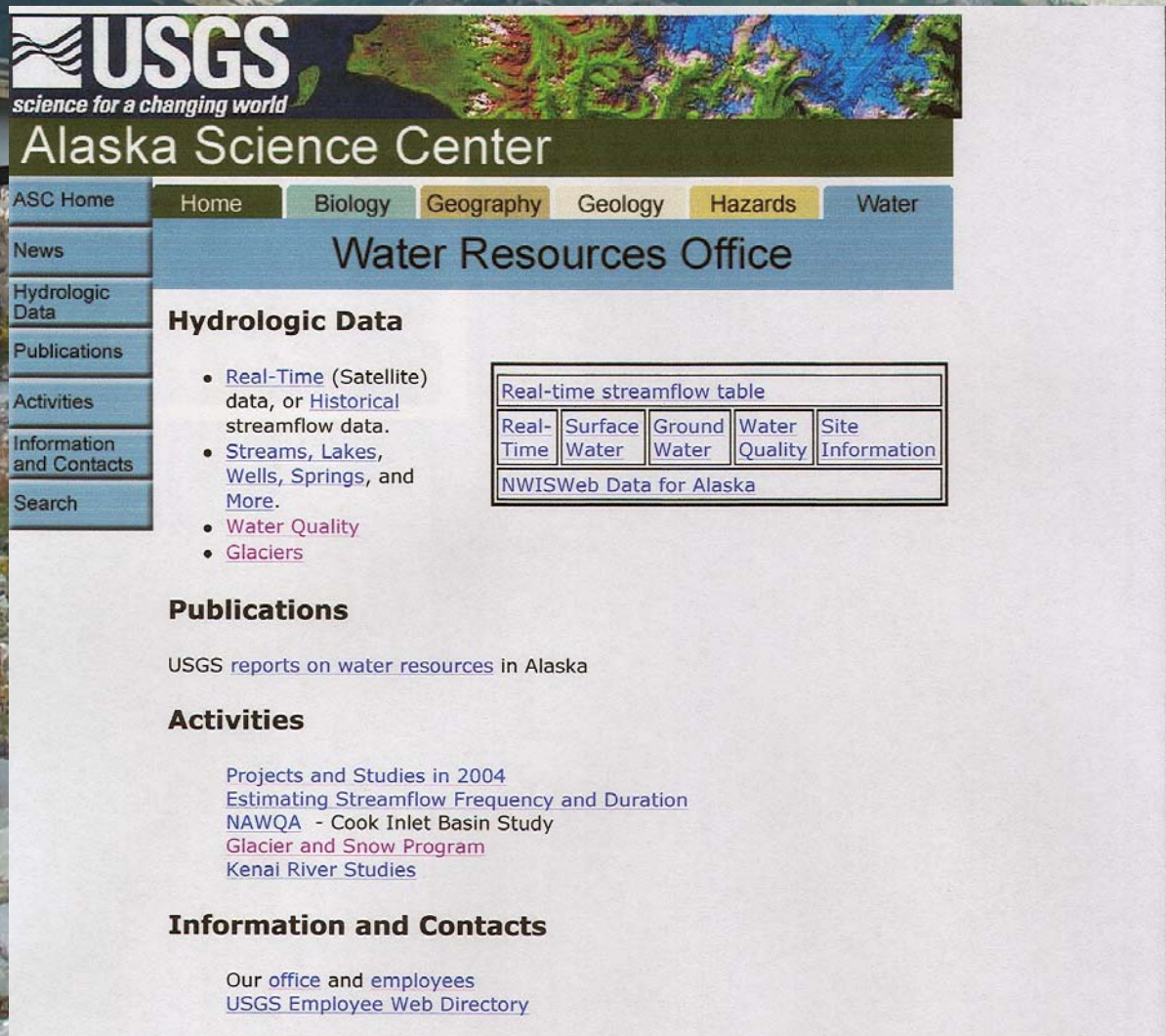


Anadromous fish



USGS

Alaska Science Center
Water Resource Program



Carbon Cycling and Export by the Yukon River, Alaska

USGS
science for a changing world

USGS
Geographic Names Information System (GNIS)

Secretary of the Interior

United States Board on Geographic Names

Members

Central Intelligence Agency

Library of Congress

Department of the Interior

Department of Commerce

Department of Agriculture

Postal Service

Department of Defense

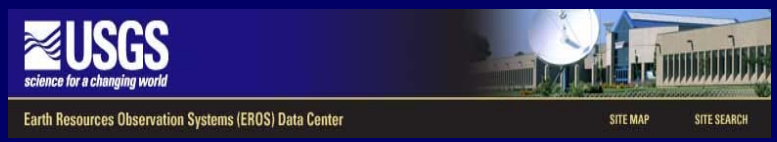
Department of State

Government Printing Office

US Antarctic Resource Center (USARC)

- 450,000 Aerial Photographs
- U.S. Antarctic Maps
- Geodetic Control
- Maps from Treaty Nations
- USAP Historic Photography

http://usarc.usgs.gov



USGS science for a changing world

NSF

United States Antarctic Resource Center

A joint effort of the USGS National Mapping Division and the National Science Foundation United States Antarctic Program

SCAR	SCAR GGI	GEOGRAPHIC NAMES	ATLAS	DECLASSIFIED IMAGES	SATELLITE IMAGES	ANTARCTIC GROUND CONTROL
ANTARCTIC AVHRR IMAGE	NATIONAL SCIENCE FOUNDATION	NSF POLAR PROGRAMS	NSF POLAR RESEARCH	NSF 46 SLIDE COLLECTION	POLAR LINKS	MAPS OF POLAR REGIONS/OCEANS
			U.S. ANTARCTIC MAP LIST			

The U.S. Antarctic Resource Center (USARC) at the U.S. Geological Survey (USGS), Reston,Va., maintains the Nation's most comprehensive collection of Antarctic maps, charts, satellite images, and photographs produced by the United States and other member nations of the Scientific Committee on Antarctic Research (SCAR). The USARC holdings include maps and charts from Argentina, Australia, Belgium, Brazil, Chile, China, Ecuador, Finland, France, Germany, India, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Peru, Poland, Russia, South Africa, Spain, Sweden, the United Kingdom, the United States, and Uruguay.

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Call 703-648-6010
Fax 703-648-5080

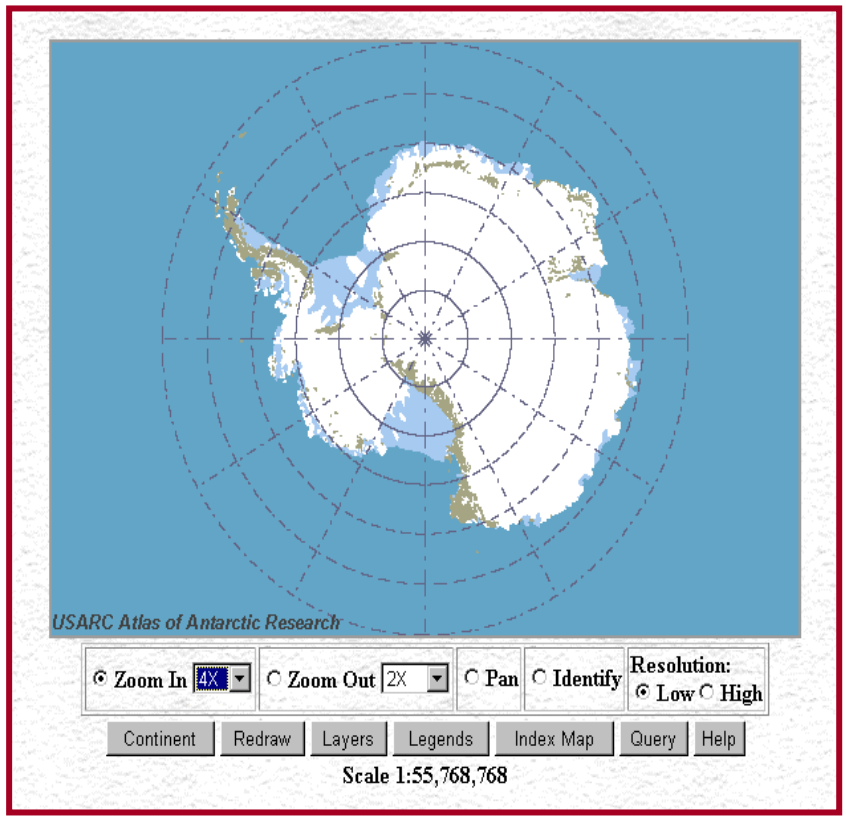
MAPPING APPLICATIONS CENTER	USGS PRIVACY POLICY AND DISCLAIMERS	MAPPING INFORMATION	USGS

Atlas of Antarctic Research

U.S. Atlas of Antarctic Research

- http://usarc.usgs.gov/antarctic_atlas/

- Full resolution Viewer
- Download Data
- Find Sites and Features/Find Maps
- Web Map and Feature Services
- SCAR Feature Catalog
- Polar Region Data Standards



USGS IPY

(Program Coordinators)

- Landsat Image Map of Antarctica (LIMA) *(USGS, NASA, NSF)*
- Permafrost Temperature Monitoring – Global Terrestrial for Permafrost and Network of Permafrost Monitoring Stations (GTN-P)
- Coastal Change Mapping in Antarctica
- Seismic Monitoring (Arctic and Antarctic)*(GSC)*
- NICL (Antarctica and Greenland)
- Satellite Image Atlas of Glaciers of the World
- POLENET in Antarctica *(National and International)*
- Energy Resources of the Arctic *(Canada, Greenland, Norway, Russia)*

USGS IPY

- Permanent GPS CORS Stations and Geodesy Research
- TransAntarctic Mountains Deformation (TAMDEF)
- US Antarctic Resource Center
- Atlas of Antarctic Research
- Landsat Image Map of Antarctica
- USBGN International Antarctic Names Collaboration

USGS IPY

(Program Coordinators)

- Bedrock Geologic Mapping of the Circum-Arctic (Alaska)
- The Nine IGY Glaciers – 50 Years of Change
- Yukon River Basin – A Microcosm of Arctic Change

High Impact and Lasting Legacy

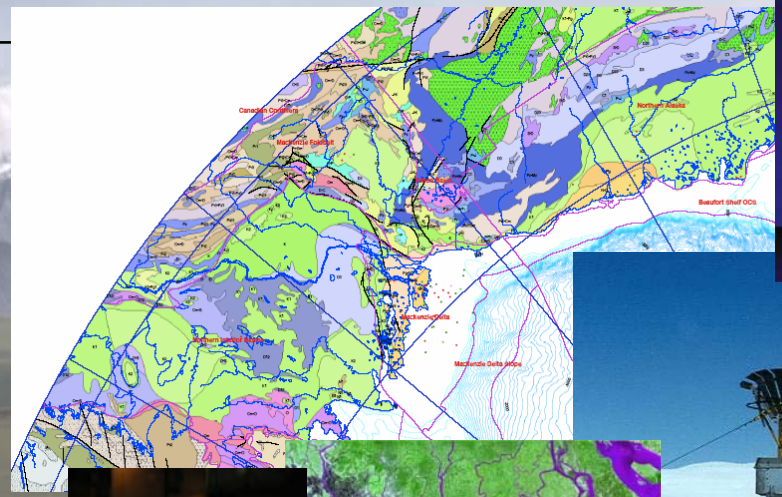
- Time Series Vegetation (Phenological) Cover for the Arctic
- Freshwater Input into the Arctic (in collaboration with Arctic-HYCOS & Arctic – HYDRA)
- DOI Trust Species Survival in Changing Sea Ice Environments (POC - Tony DeGange)
- Multi-scale Remote Sensing Monitoring of High Arctic Transects

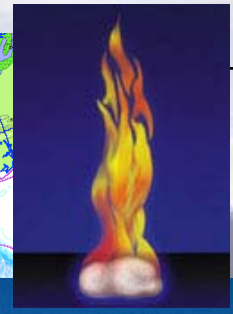
Education, Outreach and Communication

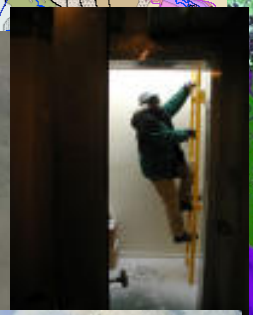
- The USGS maintains outreach and communication activities through headquarters and regional Offices of Communications
- Student intern placement activities and post-doctoral appointment programs
- These resources are part of our IPY activities

USGS

Thank You

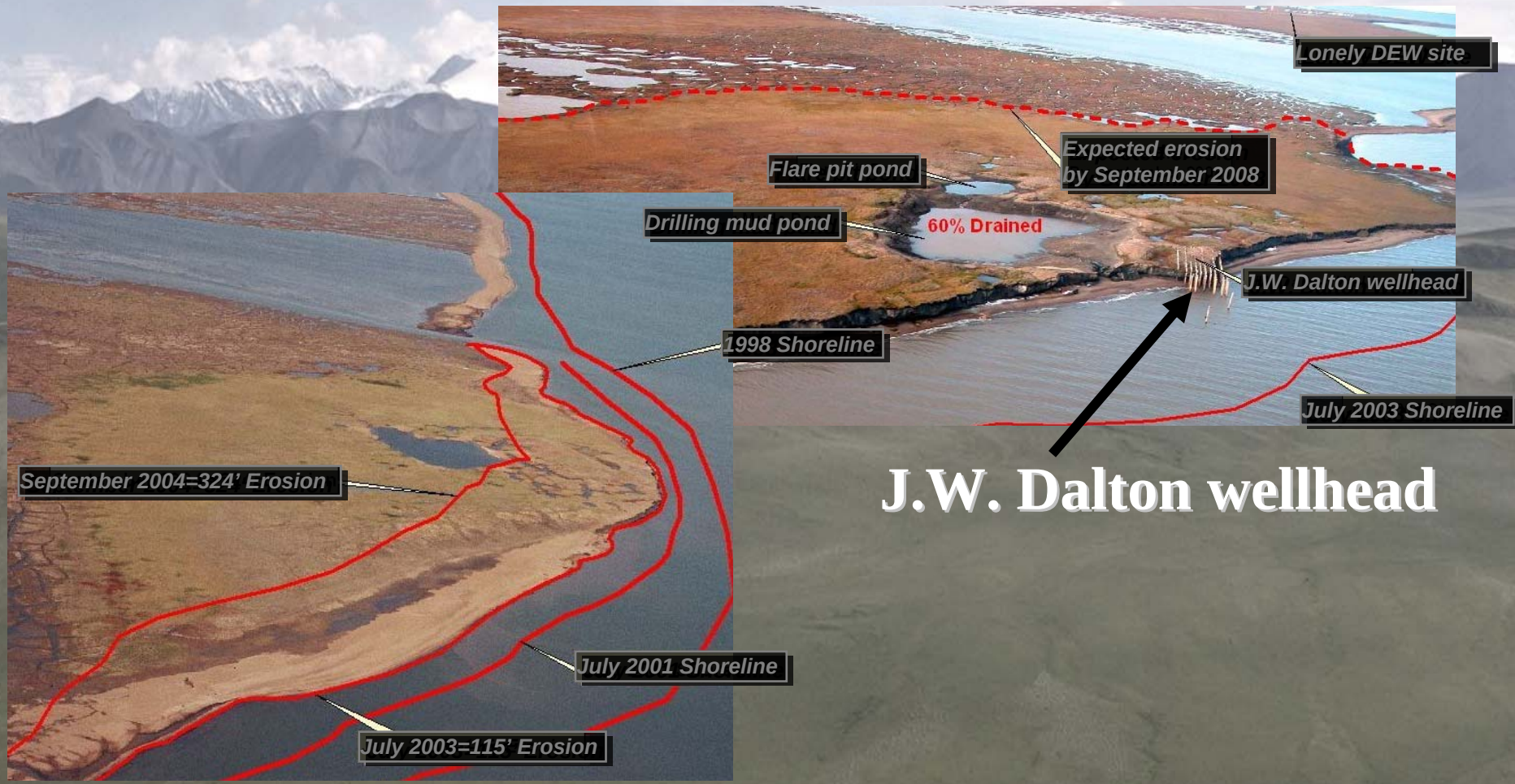






USGS

DOI/GTN-P: Active-Layer Monitoring Stations



NGPO Home

About the NGPO

What's New

National Geospatial Programs Office

This is an interim web site for the newly created NGPO as it realigns national geospatial assets to facilitate the build out of the National Spatial Data Infrastructure.

A Bold Step for the National Spatial Data Infrastructure

In a bold, forward-looking step, the USGS Director has realigned the geospatial programs for which the USGS has a leadership responsibility into a National Geospatial Programs Office (NGPO) to serve the needs and interests of the geospatial community throughout the Nation. This realignment brings *The National Map*, Geospatial One-Stop, and the Federal Geographic Data Committee into a single program office. With the creation of the NGPO, the essential components of delivering the National Spatial Data Infrastructure (NSDI) and capitalizing on the power of place will be managed as a unified portfolio that benefits the entire geospatial community.

The emphasis of the NGPO will be to engage partners throughout the geospatial community in its planning and in ensuring that its unified portfolio meets the needs of those on the landscape. By connecting the components of *The National Map* (integrated base data), FGDC (coordination, policy, and standards), and Geospatial One-Stop (information discovery and access), and by embracing and communicating the message of the importance of the NSDI, the geospatial community and the Nation will realize the vision of "current and accurate geospatial data will be available to contribute locally, nationally, and globally to economic growth, environmental quality and stability, and social progress."

Related activities that are part of the NGPO geospatial portfolio include The National Atlas, Department of the Interior Enterprise Geographic Information Management, and GEODE--Geologic Data Explorer.