

National Science Foundation
Directorate for Geosciences
and Office of Polar Programs
FY 2019 Budget Request

Peter Milne

OPP Antarctic Ocean and
Atmospheric Sciences

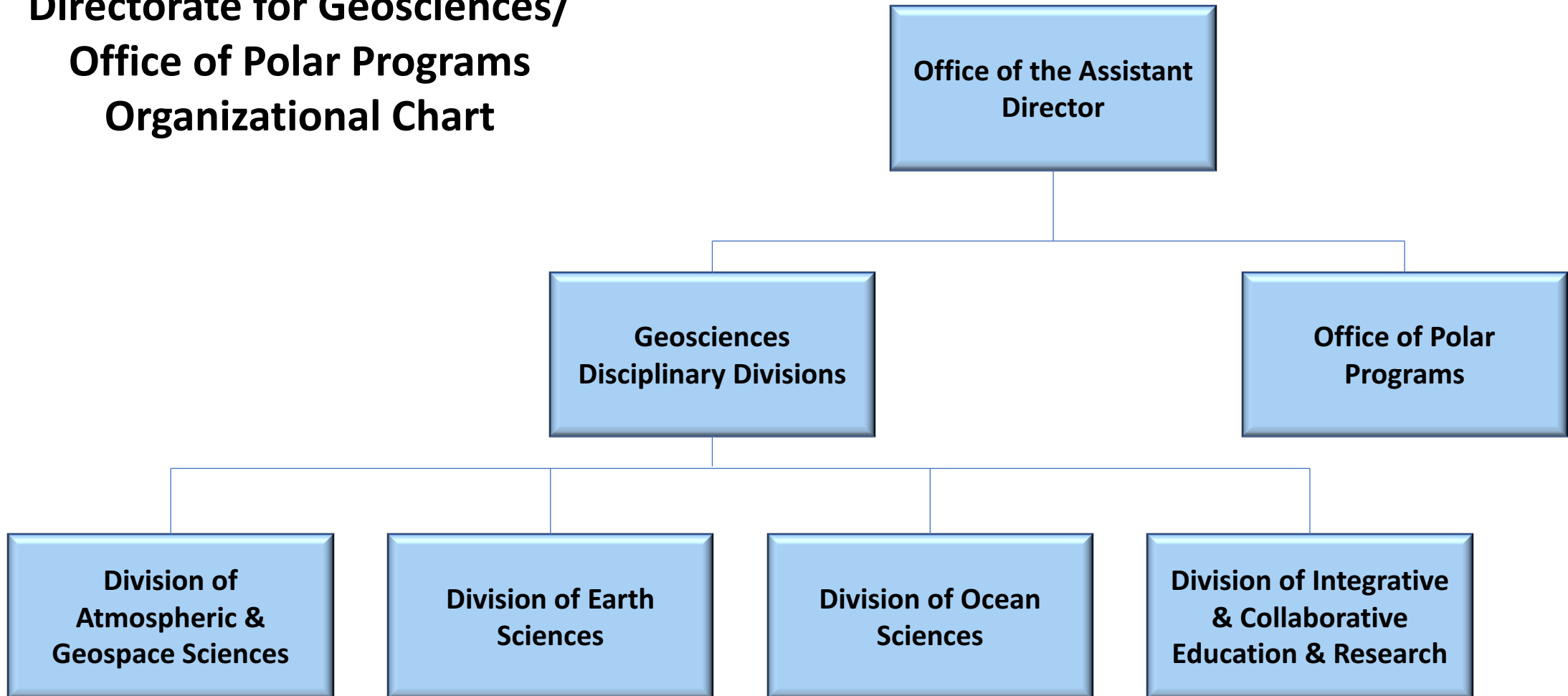


Directorate for Geosciences (GEO): Our Mission

- Address the Nation's need to understand, predict and respond to environmental events and changes in order to protect lives and property and to use the Earth's resources wisely.
- Support fundamental research in atmospheric, earth, and ocean sciences, and in the Earth's polar regions.



Directorate for Geosciences/ Office of Polar Programs Organizational Chart



**NATIONAL SCIENCE FOUNDATION
SUMMARY TABLE
FY 2019 BUDGET REQUEST TO CONGRESS**
(Dollars in Millions)

NSF by Account	FY 2018		FY 2019 Request	FY 2019 Request change over FY 2017 Actual	
	FY 2017 Actual	Annualized CR		Amount	Percent
BIO	\$742.22	-	\$738.16	-\$4.06	-0.5%
CISE	935.93	-	925.42	-10.51	-1.1%
ENG	930.92	-	921.43	-9.49	-1.0%
<i>Eng Programs</i>	731.87	-	722.86	-9.01	-1.2%
<i>SBIR/STTR</i>	199.05	-	198.57	-0.48	-0.2%
GEO	825.62	-	852.98	27.36	3.3%
MPS	1,362.43	-	1,345.32	-17.11	-1.3%
SBE	270.89	-	246.19	-24.70	-9.1%
<i>SBE Programs</i>	219.70	-	195.00	-24.70	-11.2%
<i>NCSES</i>	51.19	-	51.19	-	-
OISF	48.96	-	48.50	-0.46	-0.9%
OPP	467.85	-	534.54	66.69	14.3%
IA	420.27	-	536.72	116.45	27.7%
U.S. Arctic Research Commission	1.43	-	1.42	-0.01	-0.7%
Research & Related Activities	\$6,006.51	\$5,992.67	\$6,150.68	\$144.17	2.4%
Education & Human Resources	\$873.37	\$874.02	\$873.37	-	-
Major Research Equipment & Facilities Construction	\$222.78	\$207.58	\$94.65	-\$128.13	-57.5%
Agency Operations & Award Management	\$382.06	\$327.76	\$333.63	-\$48.43	-12.7%
National Science Board	\$4.27	\$4.34	\$4.32	\$0.05	1.2%
Office of Inspector General	\$15.10	\$15.10	\$15.35	\$0.25	1.6%
Total, NSF	\$7,504.10	\$7,421.47	\$7,472.00	-\$32.10	-0.4%

GEO Funding
(Dollars in Millions)

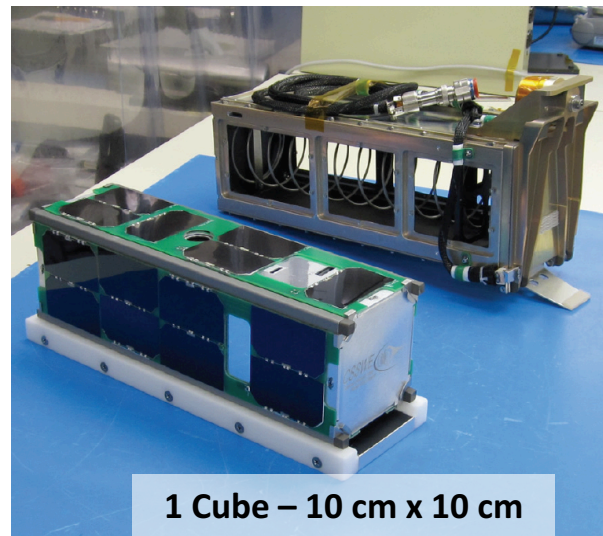
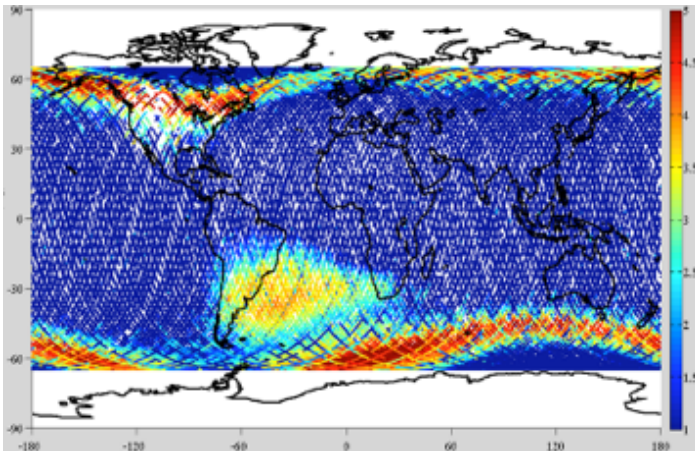
	FY 2017 Actual	FY 2018 (TBD)	FY 2019 Request	Change over FY 2017 Actual	
				Amount	Percent
Atmospheric & Geospace Sciences (AGS)	\$253.37	-	\$239.30	-\$14.07	-5.6%
Earth Sciences (EAR)	179.13	-	169.23	-9.90	-5.5%
Integrative & Collaborative Education and Research (ICER)	76.38	-	104.95	28.57	37.4%
Ocean Sciences (OCE)	316.74	-	339.50	22.76	7.2%
Total	\$825.62	-	\$852.98	\$27.36	3.3%

OPP Funding
(Dollars in Millions)

	FY 2017 Actual	FY 2018 (TBD)	FY 2019 Request	Change over	
				Amount	Percent
Office of Polar Programs (OPP)	\$467.85	-	\$534.54	\$66.69	14.3%
Total	\$467.85	-	\$534.54	\$66.69	14.3%

NSF/GEO CubeSat Program

- Program conceived in 2007.
 - 14 missions and 20 NSF-funded CubeSats to date
 - New solicitation issued this week (NSF 18-553)
- NSF pioneered the use of CubeSats for space weather research.
- Use of CubeSats for science has grown rapidly (by $\sim x5$) in last 5 years.
- NSF-funded CubeSats have provided critical space weather measurements, but are poised to be leveraged for a wide array of Earth observations, astrophysics and space research uses.



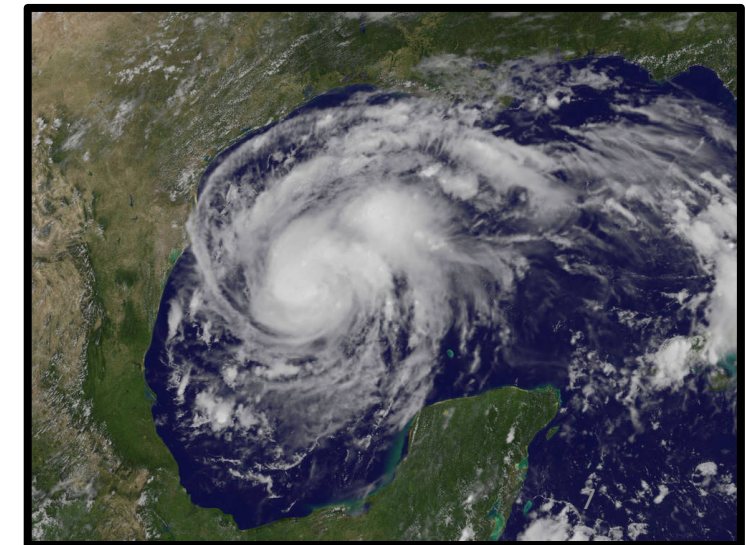
Colorado Student Space Weather Experiment (CSSWE)



GEO Natural Disaster Research

Prediction of and Resilience Against Extreme Events (PREEVENTS) program

- FY 2019 Request is \$17.25 million in GEO and \$500,000 in OPP.
- Enhance understanding of natural processes underlying geohazards and extreme events.
- Improve capability to model and forecast such hazards and events.
- Reduce the impact of extreme events on life, society, and economy.
- Improve prediction and warning systems that will support mission agencies such as NOAA, DHS, and USGS.





Food, Energy, And Water (FEW) Systems Research

- Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS) responds to urgent need to understand, model, and manage interconnected FEW systems.
- FY 2019 Request is \$16.40 million.
- Partnership with USDA.
- Solicitation issued March 2018 (NSF 18-545).

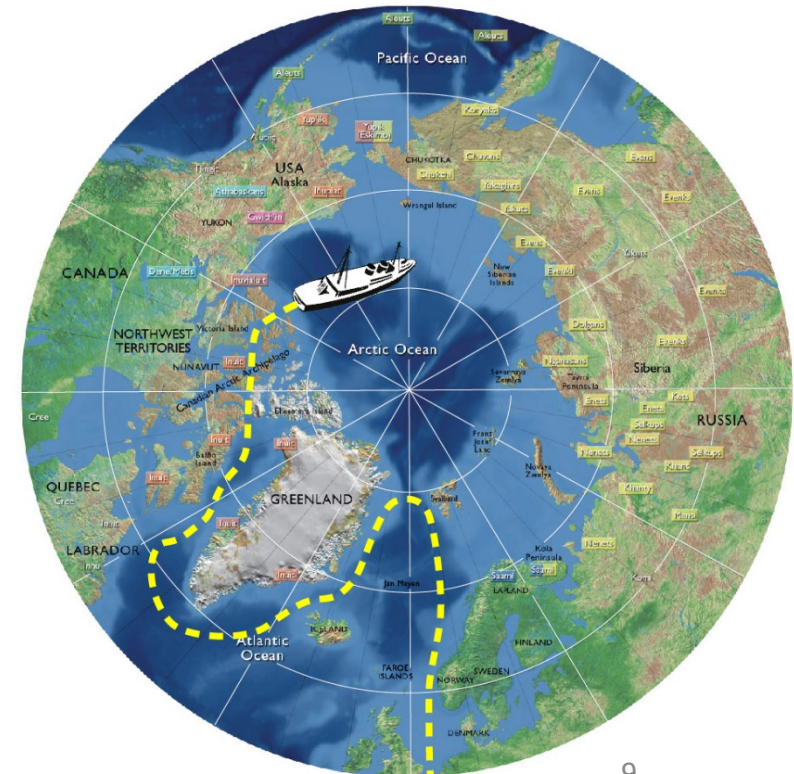
INFEWS
Funding by Directorate
(Dollars in Millions)

	FY 2019
Dir/Office	Request
ENG	5.00
GEO	8.00
SBE	2.50
OISE	0.90
Total	\$16.40

NSF Big Ideas: Navigating the New Arctic (NNA)

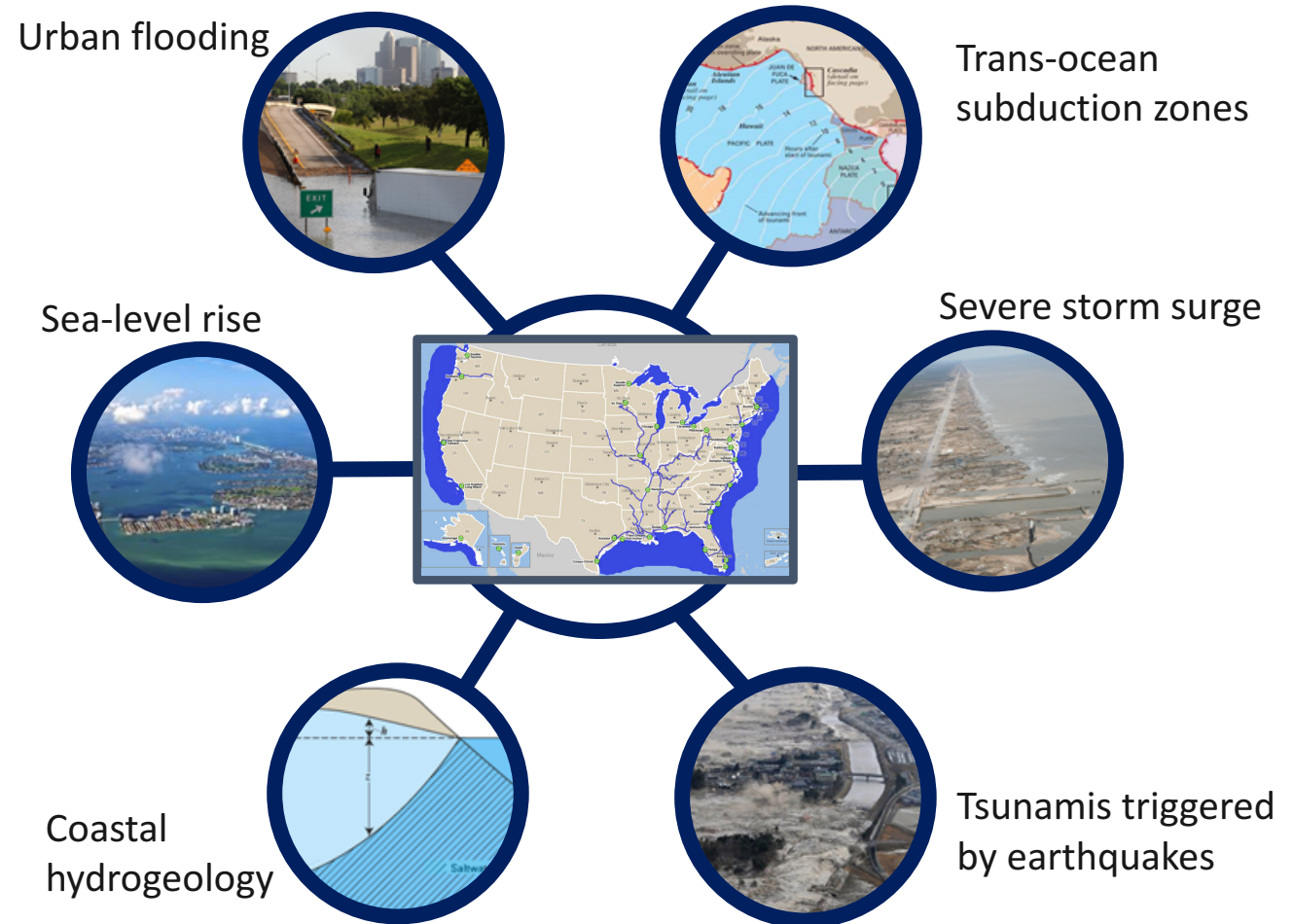
- FY 2019 Request is \$30.00 million. NSF investments will support:
 - Development of robust, integrated pan-Arctic observational network.
 - Research to foster comprehensive understanding and modeling of natural and human activities.
 - Partnering with state and local governments, indigenous peoples and international organizations.
- Dear Colleague Letter issued February 2018 (NSF 18-048)

(Dollars in Millions)	
Big Ideas	FY 2019 Request
Research Ideas	\$180.00
Harnessing the Data Revolution for 21st- Century Science and Engineering - HDR (CISE/ITR) ¹	30.00
Navigating the New Arctic - NNA (GEO/ICER)	30.00
The Future of Work at the Human-Technology Frontier - FW-HTF (ENG/EFMA) ¹	30.00
The Quantum Leap - QL (MPS/OMA)	30.00
Understanding the Rules of Life - URoL (BIO/EF)	30.00
Windows on the Universe - WoU (MPS/OMA)	30.00



GEO Interest Area – Coastlines and People

- Important coastal economy -- tourism, construction, fisheries, and national security -- must be safeguarded.
- Research, interagency cooperation, and public engagement needed to safeguard vulnerable coastal areas and populations.



Connection to Community Priorities

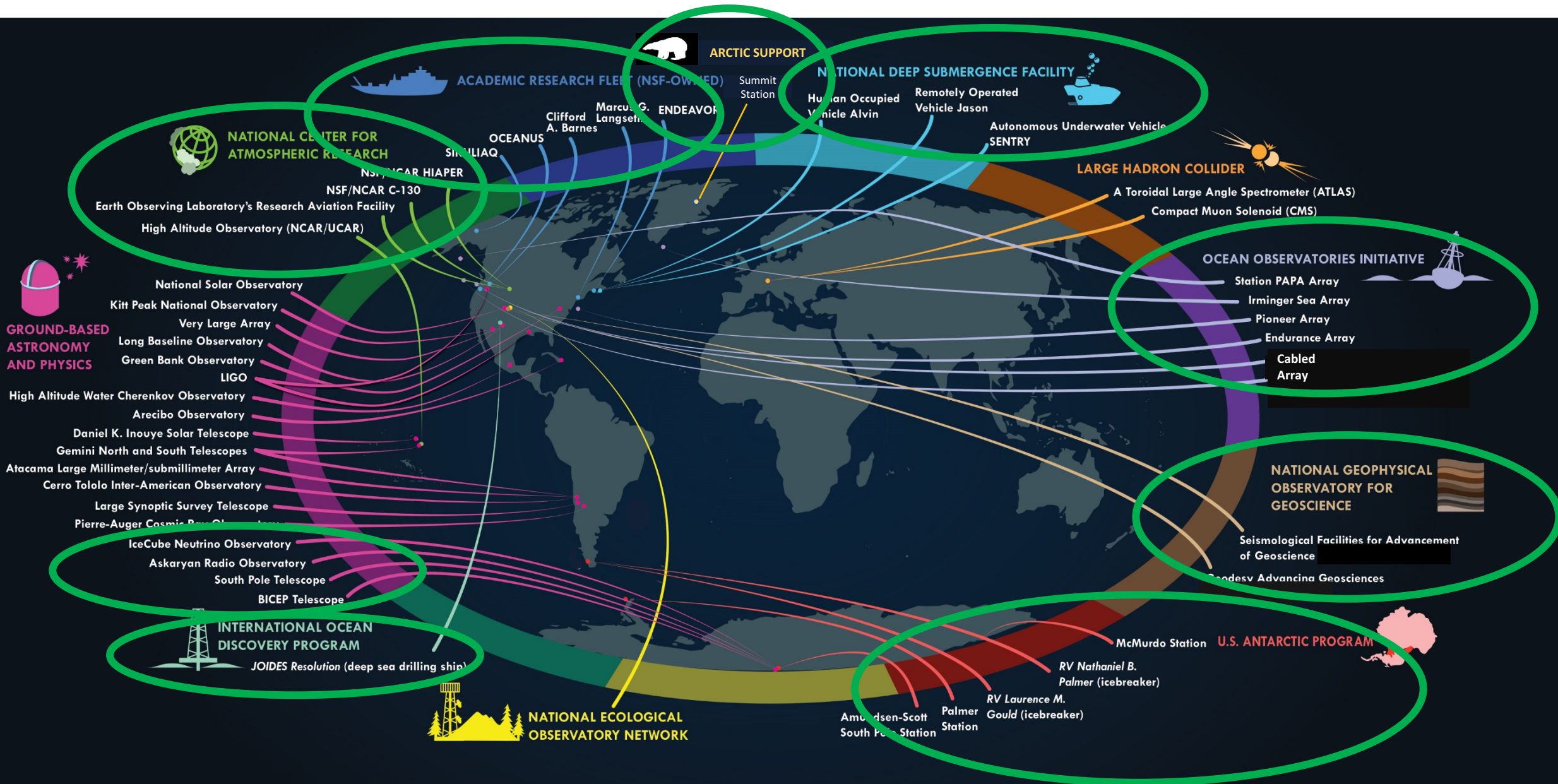
Dynamic Earth, AC GEO, 2014

GEO Research Frontiers

- Earth Systems Processes that Cross the Land/Ocean Interface
- High Latitude Ocean-Atmosphere-Ice-Ecosystem Interactions and Processes
- Urban Geo-system Science
- Early Earth



GEO Facilities and Infrastructure Investments – FY 2019 Request



GEO Facilities and Infrastructure are Critical



- Multiple goals: foundational, frontier
- Missions and goals change with time
- Serve diverse research community
- Most are leveraged with funding from other agencies
- Facilities leverage investigator research and vice versa



GEO and OPP Funding for Facilities
(Dollars in Millions)

	FY 2017 Actual	FY 2018 (TBD)	FY 2019 Request	Change over FY 2017 Actual	
				Amount	Percent
Total	\$618.94	-	\$717.52	\$98.58	15.9%
Academic Research Fleet (ARF)	84.14	-	77.80	-6.34	-7.5%
Arecibo Observatory	4.10	-	3.03	-1.07	-26.1%
Geodesy Advancing Geosciences and EarthScope (GAGE) ²	13.10	-	12.19	-0.91	-6.9%
International Ocean Discovery Program (IODP)	48.00	-	48.00	0.00	-
National Center for Atmospheric Research (NCAR)	99.70	-	94.70	-5.00	-5.1%
National Nanotechnology Coordinated Infrastructure (NNCI)	0.30	-	-	-0.30	-100.0%
Ocean Observatories Initiative (OOI) ¹	0.34	-	40.00	39.66	11638.8%
Seismological Facilities for Advancement of Geoscience & EarthScope (SAGE) ²	26.05	-	24.16	-1.89	-7.3%
Arctic Research Support and Logistics	45.06	-	39.33	-5.73	-12.7%
IceCube Neutrino Observatory	3.50	-	3.50	0.00	-
U.S. Antarctic Facilities and Logistics	215.79	-	193.61	-22.18	-10.3%
Polar Environment, Safety, and Health (PESH)	6.61	-	6.13	-0.48	-7.2%
AIMS Concept and Design	2.97	-	0.37	-2.60	-87.5%
AIMS Construction	-	-	103.70	103.70	N/A
U.S. Antarctic Logistical Support	69.28	-	71.00	1.72	2.5%

¹The FY 2017 budget of \$340,000 reflects only the incremental support necessary to enable the potential transition of managing institutions associated with the competition for a new operation and management award of the OOI. FY 2017 operations and maintenance were funded in a prior year.

²GAGE and SAGE include OPP support.

Regional Class Research Vessels (RCRV)



- FY 2017 P.L. 115-31 appropriated \$121.88 million to facilitate planning and construction of three vessels.
- In the context of overall fiscal goals intended to maintain spending restraint, FY 2019 Budget Request supports construction of two vessels.

Modernization of US Academic Research Fleet is a high priority for NSF and the Office of Naval Research (ONR).

**Appropriated and Requested MREFC Funds
for the Regional Class Research Vessel Project**
(Dollars in Millions)

	FY 2017 Actual	FY 2018 Estimate	FY 2019 Request	Total Project Cost
Current Funding Profile	\$121.88	\$105.00	\$28.70	\$255.58

Antarctic Infrastructure Modernization for Science (AIMS)

- Construction planned to cost \$354.95 million and support science requirements for next 30-50 years.
- Streamline support by co-locating/consolidating warehousing, skilled trades work, and field science support.
- Leidos Innovation Corporation as Contractor. OPP and Division of Acquisition and Cooperative Support (DACS) provide oversight.
- Although funded through the R&RA account, AIMS is considered a major facility under the 2017 American Innovation and Competitiveness Act (AICA).
 - All of NSF's current MREFC oversight requirements will apply, including project management assistance and oversight from the Large Facilities Office (LFO).

Total Funding Requirements for AIMS

(Dollars in Millions)

	Prior Years	FY 2017 Actual	FY 2018 Estimate	FY 2019 Request	ESTIMATES				
					FY 2020	FY 2021	FY 2022	FY 2023	FY 2024
<i>R&RA:</i>									
Concept and Development	\$18.20	\$2.97	\$1.80	\$0.37	-	-	-	-	-
Implementation	-	-	-	103.70	75.00	75.00	60.00	41.25	-
TOTAL	\$18.20	\$2.97	\$1.80	\$104.07	\$75.00	\$75.00	\$60.00	\$41.25	-

Backup slides

- Backup SLIDES

U.S. Global Change Research Program (USGCRP)

- 13 federal agencies, including NSF, in a variety of research, observational, and decision support activities. NSF supports basic research that underpins USGCRP activities.
- *Our Changing Planet*, the annual report to Congress, identifies proposed global change research activities and the portion of each Agency's requested appropriation allocated to those activities.

U.S. Global Change Research Program (USGCRP)					
	FY 2017 Actual	FY 2018 (TBD)	FY 2019 Request	FY 2019 Request change over FY 2017 Actual	
				Amount	Percent
BIO	\$79.26	-	\$90.00	\$10.74	13.6%
GEO	130.00	-	120.00	-10.00	-7.7%
MPS	0.50	-	-	-0.50	-100.0%
SBE	17.98	-	13.18	-4.80	-26.7%
OPP	15.15	-	15.15	-	-
R&RA	\$242.89	-	\$238.33	-\$4.56	-1.9%
EHR	-	-	-	-	N/A
NSF Total	\$242.89	-	\$238.33	-\$4.56	-1.9%

Newest funding profile not consistent with 19 CJ

Appropriated and Requested MREFC Funds for the Regional Class Research Vessel Project

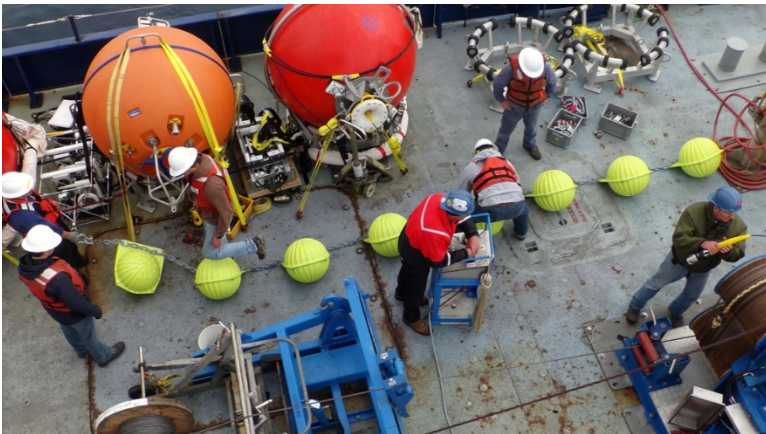
(Dollars in Millions)

	FY 2017 Actual	FY 2018 Estimate	FY 2019 Request	FY 2020 Estimate	Total Project Cost
One Ship Scenario	\$121.88	\$14.04	-	-	\$135.92
Two Ship Scenario ¹	121.88	105.00	18.64	-	\$245.52
Three Ship Scenario	121.88	105.00	99.50	27.59	\$353.97

¹ Two Ship Scenario TPC varies from FY 2017 and FY 2018 Request due to updated information obtained through the cooperative agreement process.

Ocean Observatories Initiative (OOI Program)

- Networked system of instruments, platforms, and arrays enables researchers to examine complex, physical, chemical, biological, and geological processes over short and long periods of time.
- Delivers data/metadata and education tools to the public via the internet at www.oceanobservatories.org.
- Re-competition for Operations and Maintenance underway



Ocean Observatories Initiative Funding (Dollars in Millions)

FY 2017	FY 2018	FY 2019	Change over	
			FY 2017 Actual	Amount
Actual	(TBD)	Request	Amount	Percent
\$0.34	-	\$40.00	\$39.66	11639%

AIMS – Future Operations Cost Savings

- Material reduction of cost to maintain and operate McMurdo station including an estimated \$3.50 million in fuel and \$2.40 million in labor per year (based on current costs).
- Fuel savings of about 340,000 gallons per year will be possible due to greater energy efficiency of the consolidated station.
- Labor savings will accrue through efficiency of consolidated warehousing, co-locating work areas, and lowering residence time of science projects.



GEO Funding Profiles

GEO Funding Profile			
	FY 2017 Actual Estimate	FY 2018 (TBD)	FY 2019 Estimate
Statistics for Competitive Awards:			
Number of Proposals	4,088	-	4,100
Number of New Awards	1,296	-	1,300
Funding Rate	32%	-	32%
Statistics for Research Grants:			
Number of Research Grant Proposals	3,762	-	3,800
Number of Research Grants	1,130	-	1,200
Funding Rate	30%	-	32%
Median Annualized Award Size	\$149,623	-	\$150,000
Average Annualized Award Size	\$189,006	-	\$190,000
Average Award Duration, in years	2.8	-	2.8

OPP Funding Profile			
	FY 2017 Actual Estimate	FY 2018 (TBD)	FY 2019 Estimate
Statistics for Competitive Awards:			
Number of Proposals	707	-	650
Number of New Awards	226	-	190
Funding Rate	32%	-	29%
Statistics for Research Grants:			
Number of Research Grant Proposals	673	-	620
Number of Research Grants	196	-	160
Funding Rate	29%	-	26%
Median Annualized Award Size	\$152,717	-	\$140,400
Average Annualized Award Size	\$199,542	-	\$183,500
Average Award Duration, in years	2.6	-	2.6