



The Next Wave: The Ocean Observatories Initiative (OOI) in the International Context

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Ocean Obs09
Lido, Italy
September 25, 2009



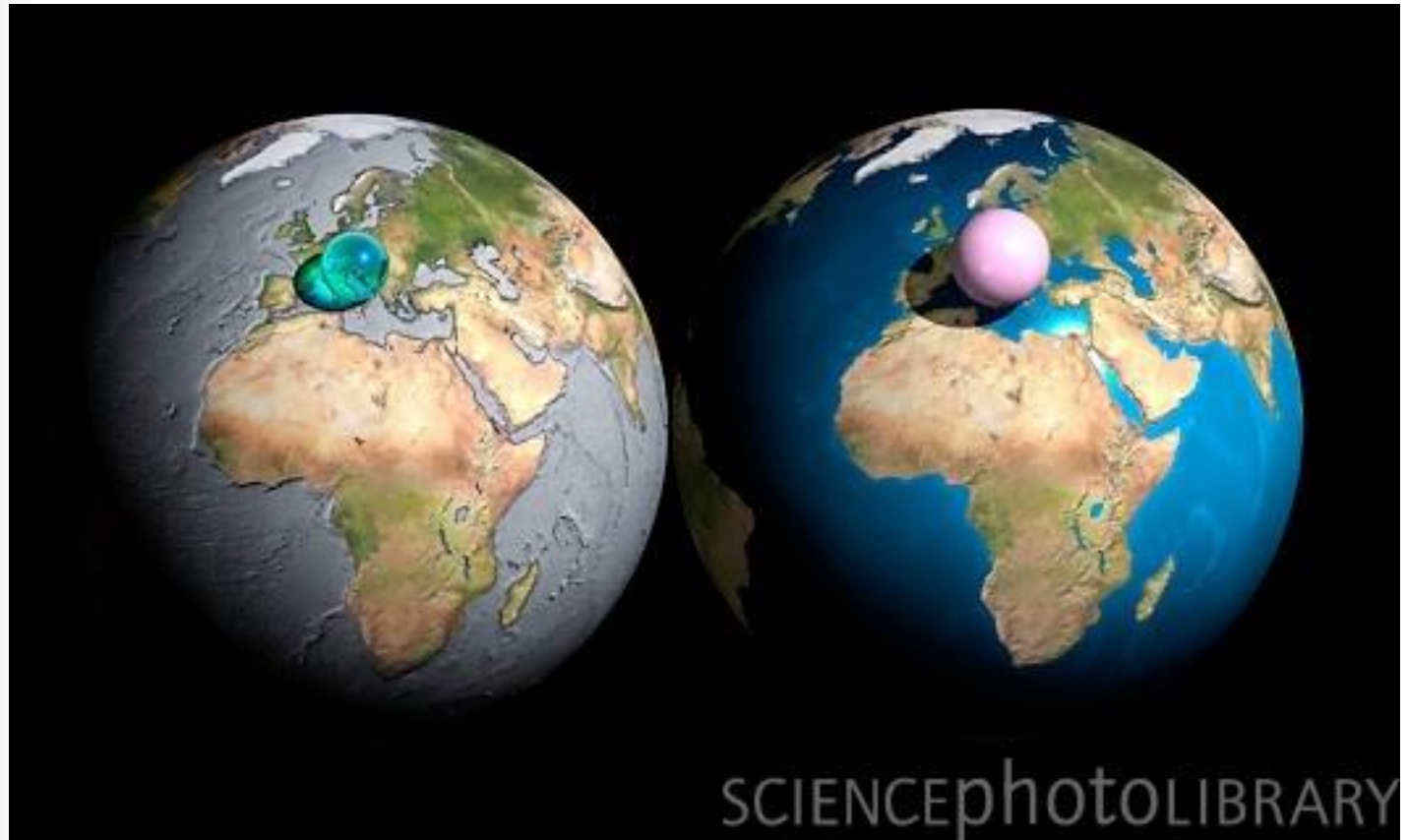
Presidential Task Force: National Ocean Policy



Draft Delivered to President Obama, September 10, 2009; open for 30-day public comment period

“Support for embracing science-based decision-making and investing in ecosystem-based science, research, and ocean observations, including comprehensive research on the linkages among ecosystem health, human health, economic opportunity, national and homeland security, social justice, and environmental change, including climate change”

Science Drivers: *Earth Systems*

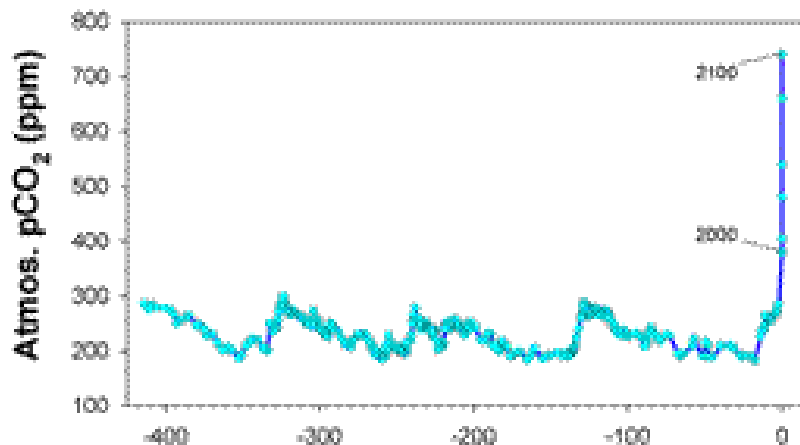


Regional/decadal climate, Water, Impacts, Carbon, Biogeochemistry, Ocean Function, ecosystems and acidification, etc.

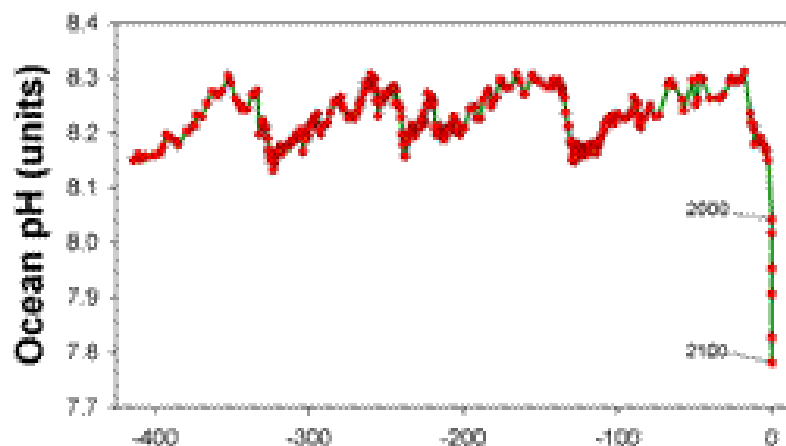




Time-series to recognize, understand, predict and adapt to change

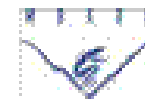


Atmosphere



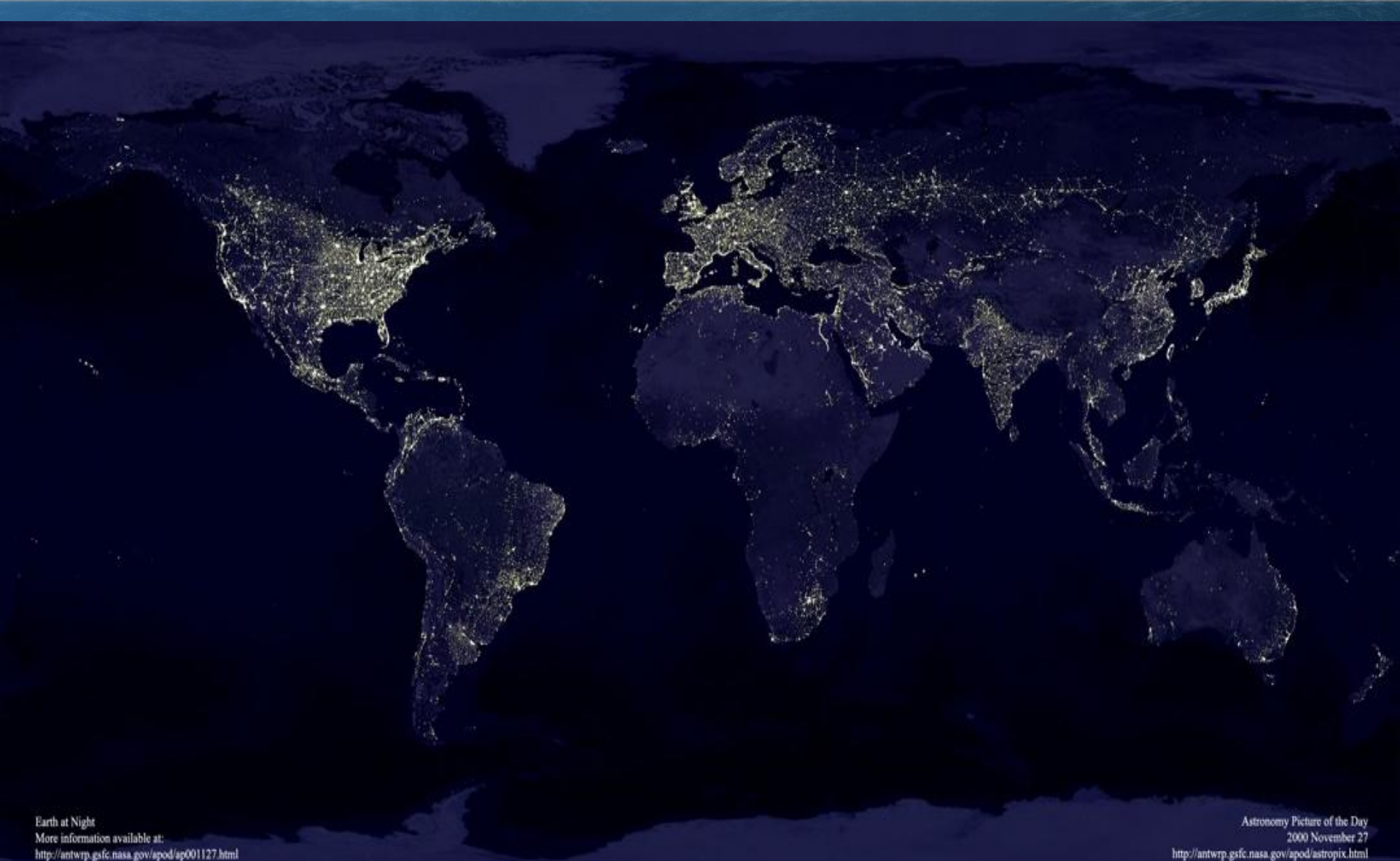
Ocean

Years from Present (1000s)





Today



Earth at Night
More information available at:
<http://antwrp.gsfc.nasa.gov/apod/ap001127.html>

Astronomy Picture of the Day
2000 November 27
<http://antwrp.gsfc.nasa.gov/apod/astropix.html>



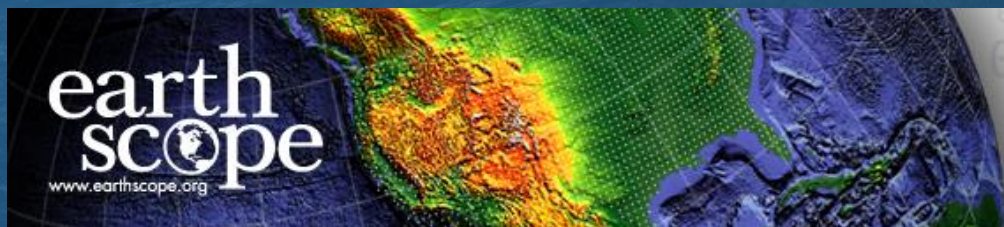
2030



We must listen to the
voice of our planet



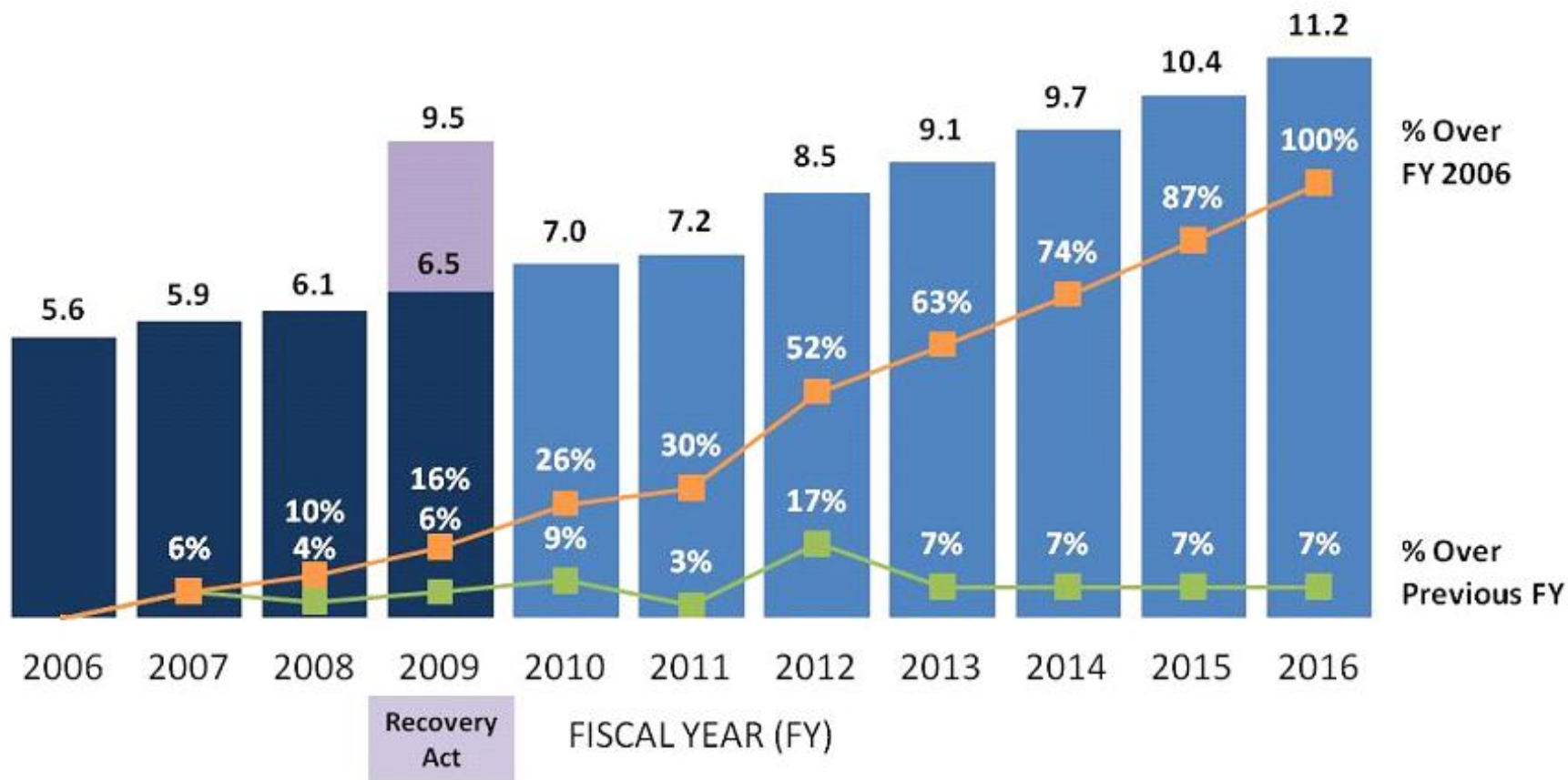
In-situ sensors reporting 24/7 will allow us to hear





President's Plan for Science and Innovation

Total NSF Funding: President's Plan for Science and Innovation
FY 2006-FY 2016 (dollars in billions)





Alaska Region Research Vessel (ARRV)



Approved by US National Science Board in March 2009.

\$148.1M to complete project in hand

Science operations in late 2013-14

First new ship for academic fleet in decades, custom designed for science, American Disabled Act compliant.

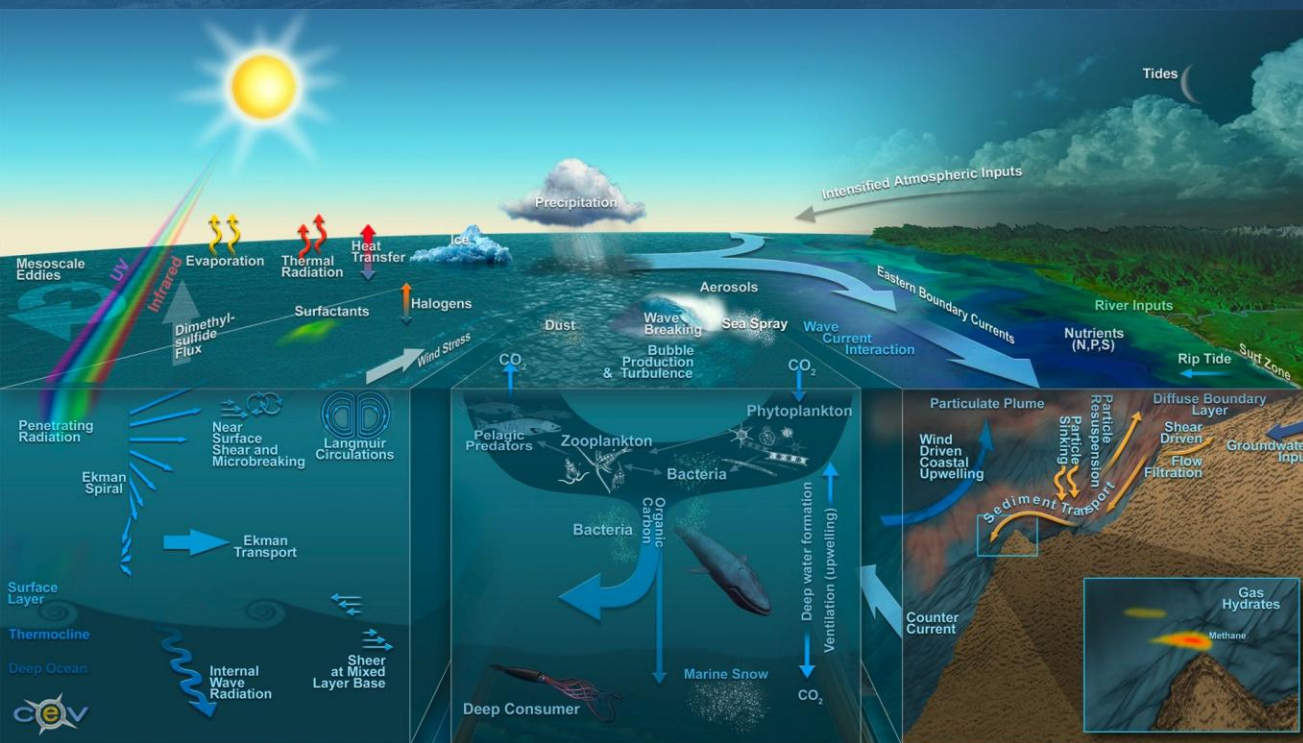
Ice-strengthened vessel purpose-built for interdisciplinary science at ice edge

- Climate and ecosystem change at high latitudes, ocean acidification
- Natural hazards and anthropogenic environmental change
- Under-ice ROV and AUV support



Ocean Observatories Initiative

Real-time interaction with the ocean from anywhere on Earth, for research & education



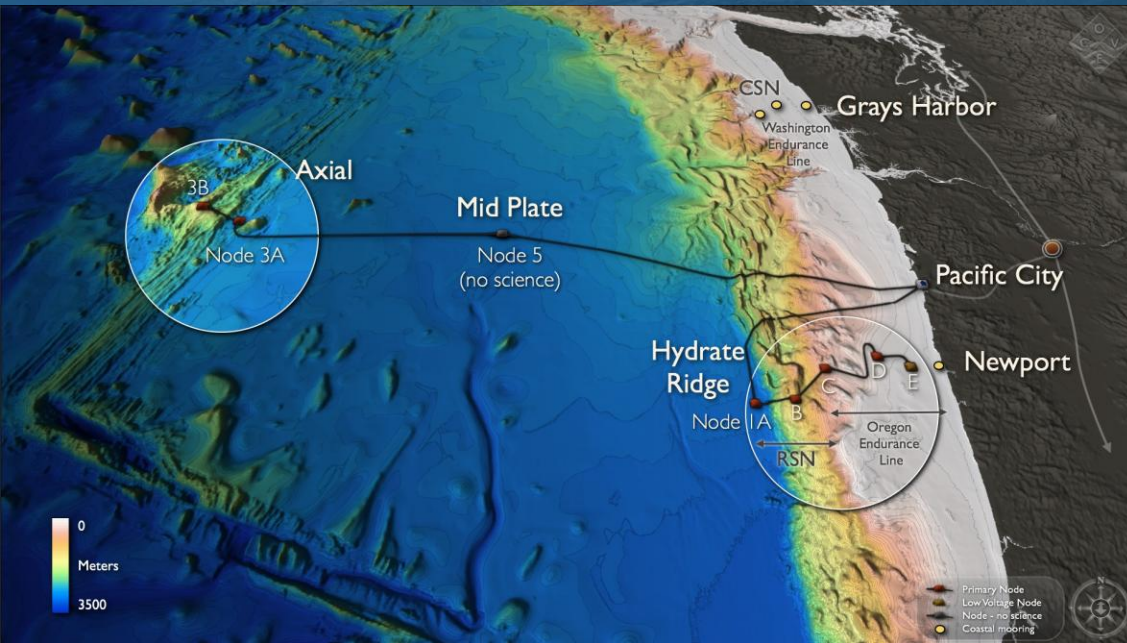
A major new NSF investment in the basic science of climate change and the oceans

Partnerships are Essential

- Neptune Canada
- Euro-Sites
- Chile
- NOAA



NSF Ocean Observatories Initiative



- Designed for basic research
- \$384M construction project
- First data 2013, completion 2016
- NSF – 25 year commitment to operations and maintenance



Global Moorings

Air-Sea Measurements
bulk meteorology
surface fluxes
wave spectra
CO₂ flux

Water Column Measurements
T, S, P
mean currents,
turbulent velocity
DO, pCO₂, pH, NO₃
optical attn, abs
spectral irradiance
chl-a, CDOM, backscatter

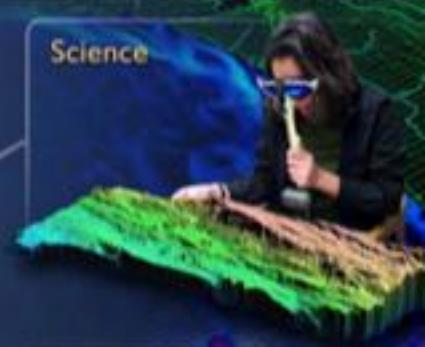
800 sensors at deployment



Cyberinfrastructure



Science



Education



General Public



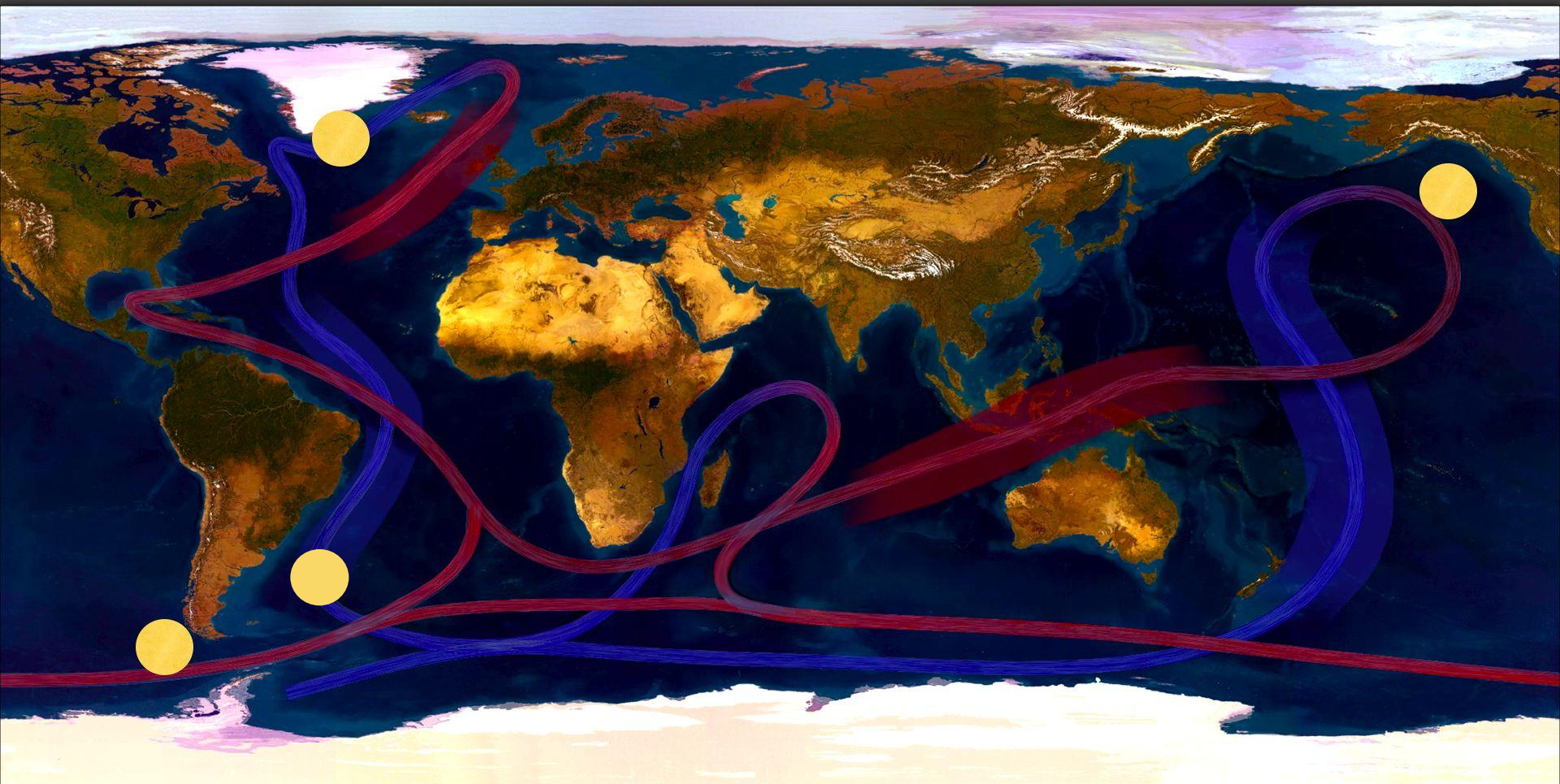


How is the OOI Different?

- Interactive network: closed-loop **processing & control**
 - **Near-real-time** (latencies of seconds), high bandwidth
 - Easy discovery of **data, sensors, and events**
- **Open** access to data—no proprietary periods
 - **Preserves qualified data** and metadata
 - Addresses **provenance** to develop scientific trust
- Connects science to educational and social **networks**

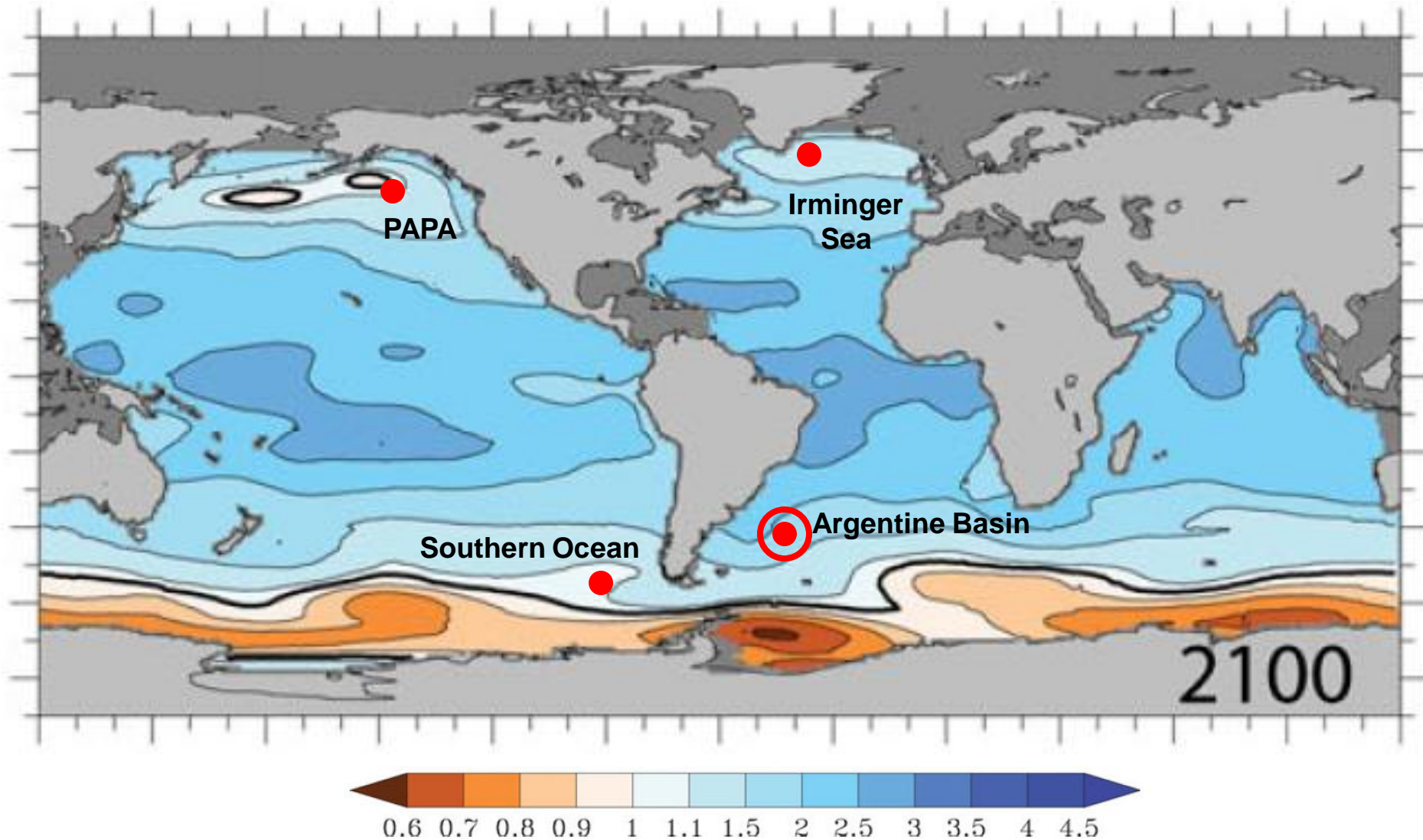


OOI and Ocean Circulation

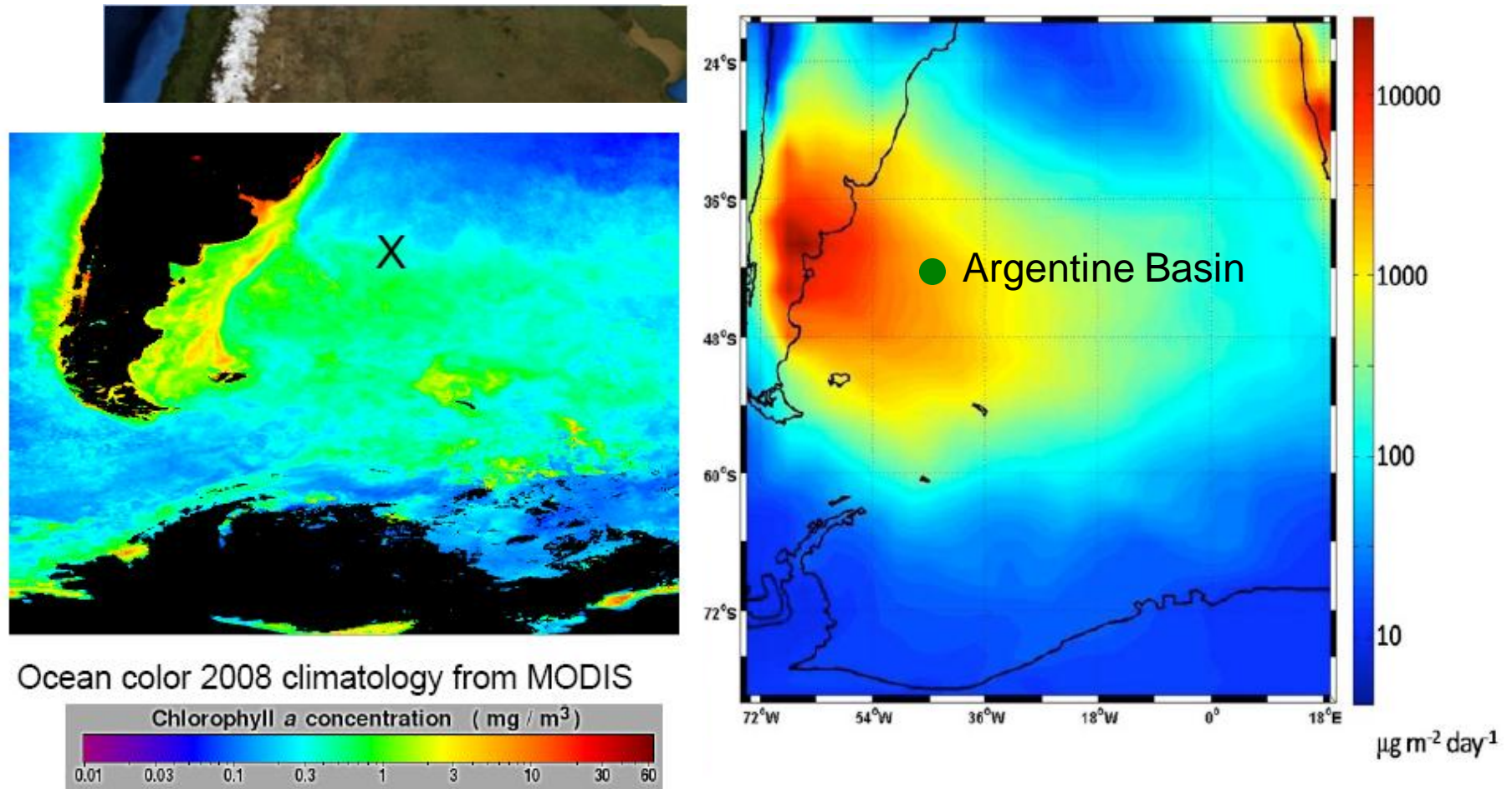


NOAA Science On a Sphere

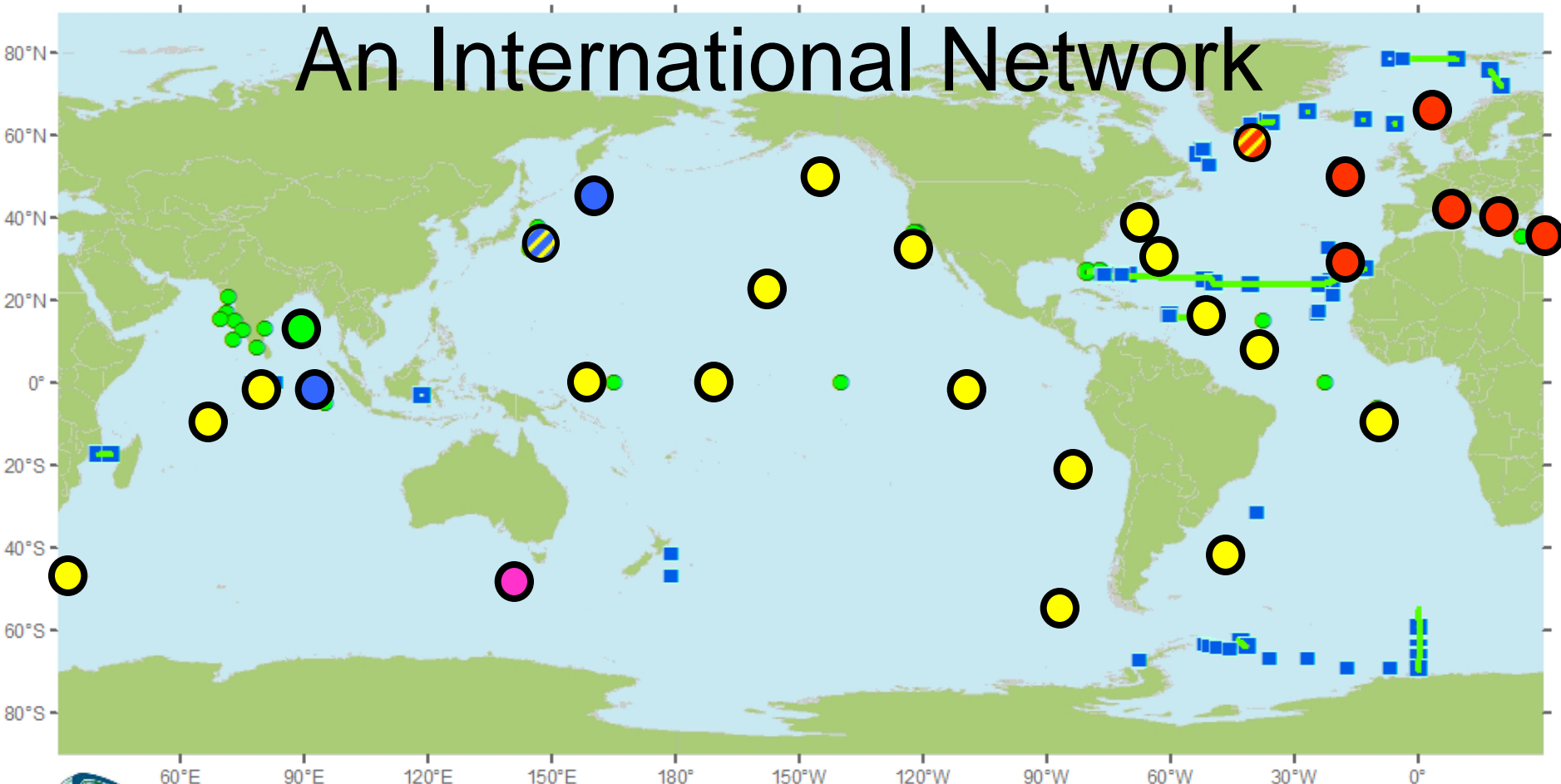
Values less than 1 are under-saturated.



GEOS-Chen Modeling of Soluble Fe Deposition to the Southern Atlantic Ocean



An International Network



OceanSITES Status Map 2009 - Operating Sites

OceanSITES Moorings and Observatories (91) Transport sites (16) Transport Stations (67)

- OPERATING Real time data (44)
- OPERATING Delayed Mode data (47)

— OPERATING

- OPERATING Real time data (2)
- OPERATING Delayed Mode data (65)

Note: This status was based on information provided in 2009.

Courtesy, Bob Weller



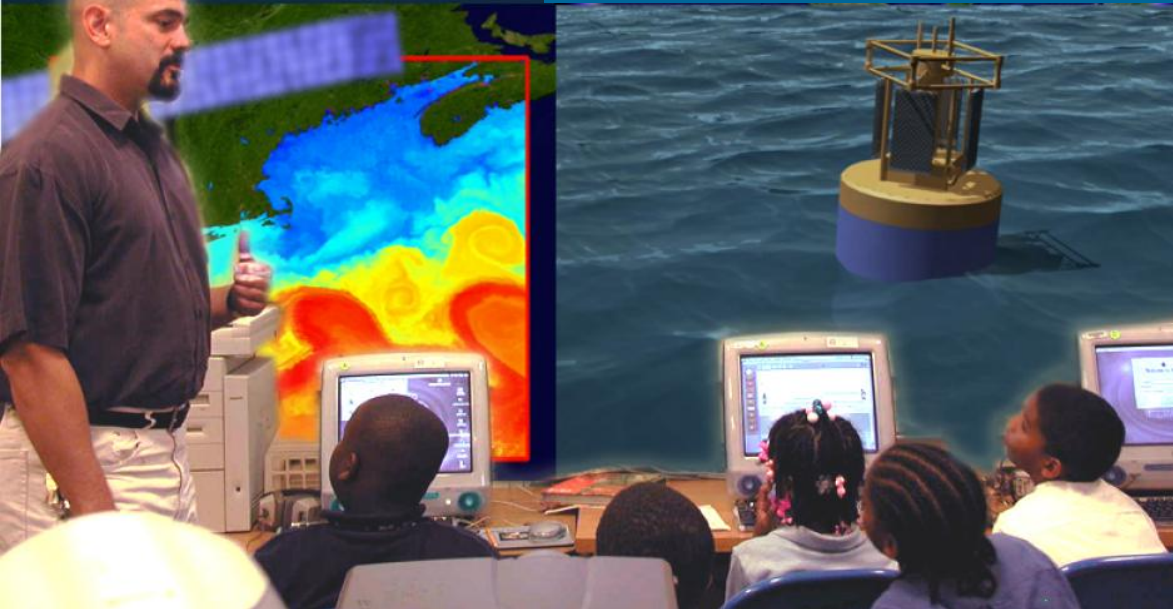
Education & Public Engagement

Anytime, Anywhere

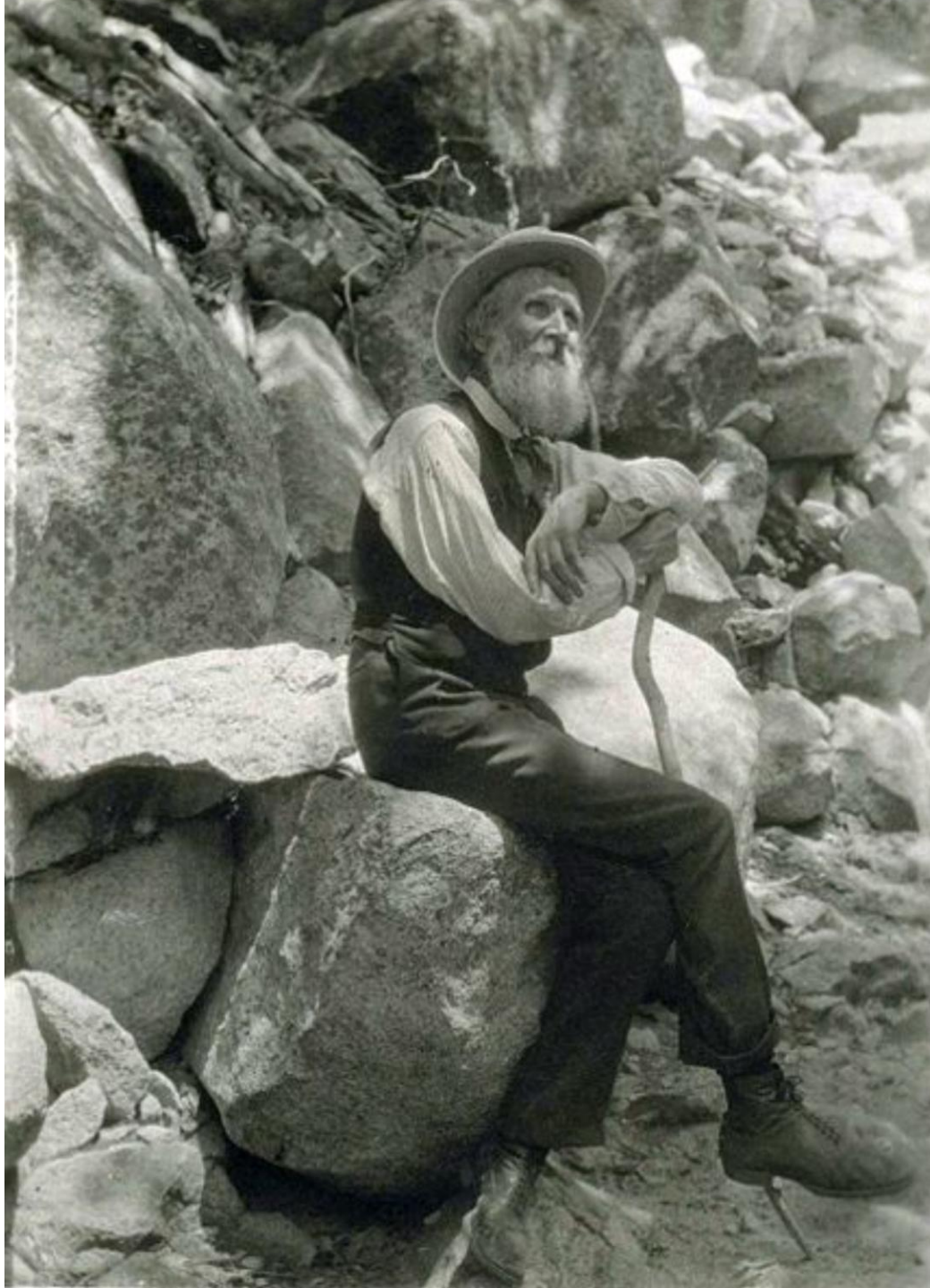




COSEE: Networked Ocean World



Combining innovative
ocean observing
technology and real
time ocean data to
inspire the public



“When we try to
pick out
anything by
itself, we find it
hitched to
everything else
in the universe.”

John Muir

“My First Summer in the Sierra”

1911





Background slides



Scientific Ocean Drilling Vessel



- \$25M in Stimulus Package for increased drilling
- 24 country international consortium
- Scientific Ocean Drilling Vessel (SODV) now refit and investigating:
 - ✓ Abrupt and extreme climate change
 - ✓ Past ocean acidification
 - ✓ Deepest biosphere and how it survives
 - ✓ Methane hydrate stability, hazards and climate change
 - ✓ Earthquake and tsunami generation



NSF/GEO Budgets



- FY 09 estimated: \$807.13m (+\$49.3/FY 08)
- FY 09 “Stimulus” Funding: \$601m (\$347m for Research and Education grants and \$254m for large facility projects)
- FY 10 request: \$909m (+\$101.9/FY 09)
- Supporting:

Research and education grants, upgrade of 22-ship academic fleet, new Arctic research vessel, scientific drilling program, initiation of **Ocean**



Ocean Observatories



Approved by US National Science Board May 2009.

Cyber-linked sensors in critical areas of the coastal & open ocean, measuring chemical, physical and biological properties 24/7



- Carbon cycling & ocean acidification
- Ocean circulation & climate change
- Coastal ecosystem health
- Deep methane fluxes to ocean
- Cascadia margin geodynamics, and seismic processes
- Education & public engagement

Construction start in Aug-Sept 2009

Construction funding = \$384.4M (\$105.9 M Stimulus)



Looking Forward



- Flagship experiments: ships, satellites, gliders, drilling and observing, OOI, IOOS and internationally
- Model verification, robust data integration across multiple scales, data assimilation, regional and global models for predicting ocean and climate change
- International data compatibility and free availability
- Building a true global network cooperatively
- IT Sensor & infrastructure innovation and cost reduction
- Work force development

Modeled Surface Aragonite Saturation 1994 – 2100

