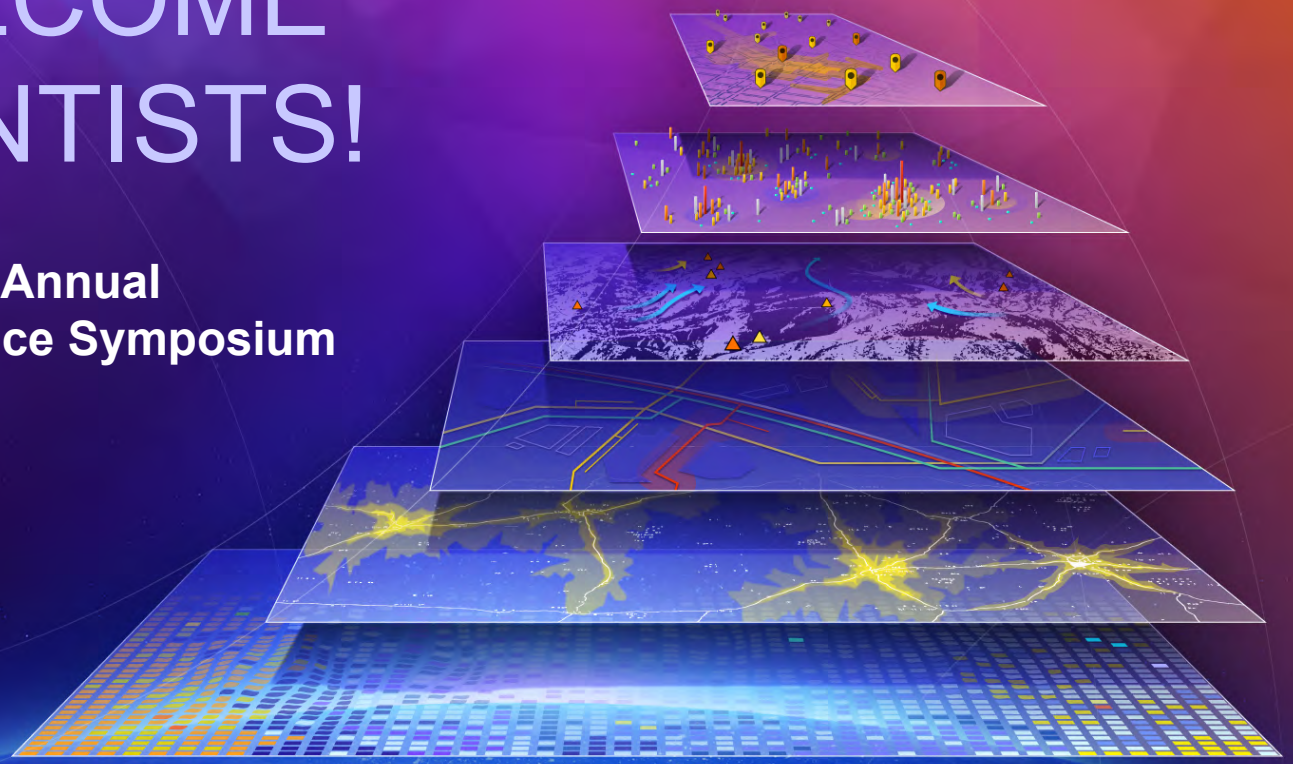
2016 Esri Science Symposium

Special keynote address, discussion panel, and reception to engage and enlighten scientists at the UC on the hot topics and pressing issues of the day such as climate change, sustainability, visualization and geodesign of Earth futures, and related growth in geospatial technology for the betterment of both science and society. The symposium seeks to "broaden the tent" of participation at the UC beyond the traditional geographers and GIScientists, to those working in the *domain* sciences (e.g., ocean science, hydrology, ecology, forestry, climate science, geology/geophysics, agricultural science, conservation biology, sustainability science and/or geodesign, health sciences, and the social sciences). A further aim is to (re)crystallize a community of scientists normally scattered throughout the week in disparate sessions, by providing a special venue at the UC for them to network with and sharpen each other accordingly.

The symposium will start with a keynote address delivered by a world renowned environmental scientist, followed by a conversational response panel of distinguished speakers, who will react to the keynote, and discuss further how best to implement its vision from an information technology/informatics/GIS perspective. The symposium will end with a brief open discussion/Q&A with the audience and followed immediately by hosted reception with delicious appetizers and drinks.

WELCOME SCIENTISTS!

1st Annual
Esri Science Symposium



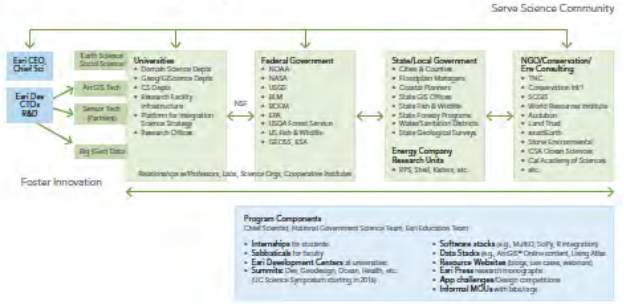
Esri & the Scientific Community, *esriurl.com/scicomm*

Esri and the Scientific Community

by Dawn Wright, Esri Chief Scientist

In addition to supporting the science community (e.g., scientists within universities, research institutes, government agencies, NGOs), we seek to perform good science at Esri, as it underpins much of what we do as an organization. This is helping us evolve ArcGIS® software into a comprehensive geospatial platform for science; that supports research project management and collaboration, spatial analysis, visualization, open data, and communication of science—all at multiple scales (i.e., from individual researcher to lab workgroup to multidepartment, multiuniversity, university-to-agency collaboration to citizen engagement).

Esri Science Community Program



Main Components of Esri's Program to Support the Scientific Community

The diagram above shows the various aspects of our comprehensive program to support the science community, showing the interlinkages between and among universities; government agencies; and various consultancies, nonprofit, forprofit, and other organizations focused on science. Program components include:

- Paid internships for graduate and undergraduate students, many positions with a science focus. Many of these lead to immediate employment with Esri thereafter. Consult esri.com/careers.
- **Visiting Faculty/Sabbatical Program.** If considering an extensive time in residence at Esri headquarters, please see the guidelines at esriurl.com/sabbatical.
- **A new site license** (also known as the science kit) for stand-alone research organizations in the United States. See esriurl.com/sciencakit.
- Informal collaborations or partnerships on a range of research projects. See recent examples at esriurl.com/scicomm.

New Global Content Challenge

go.esri.com/content-challenge

The Prizes

There will be winners in each of three categories—**land**, **ocean**, and **population**—who will receive the following:

First place: $10,000 or software equivalent

Second place: $5,000 or software equivalent

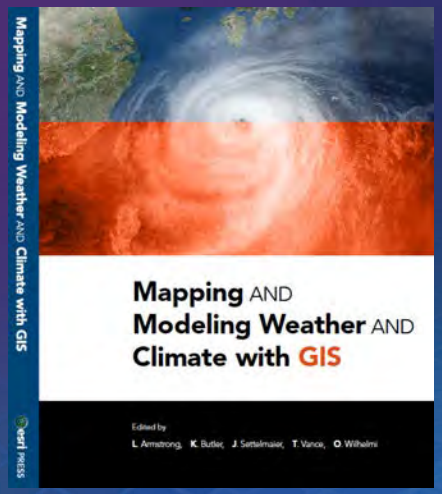
Third place: $2,000 or software equivalent

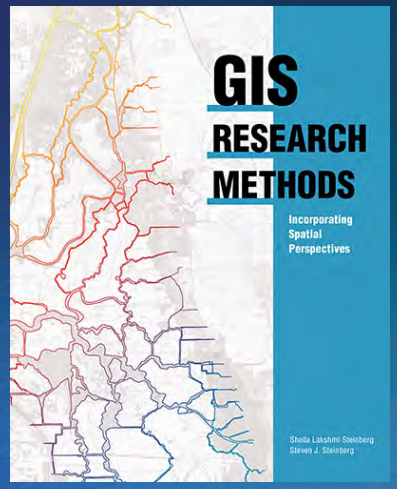
View the full judging criteria at:
go.esri.com/content-challenge

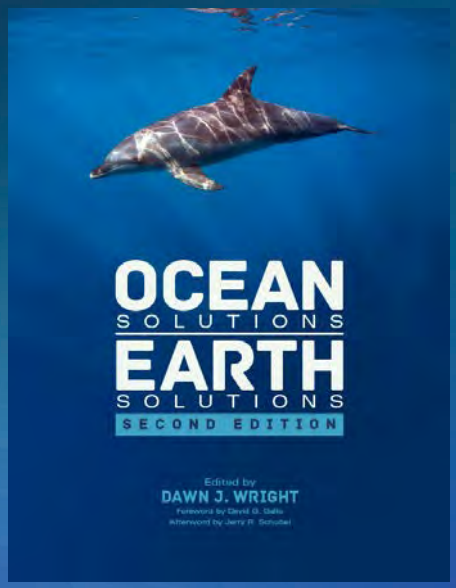
Key Dates

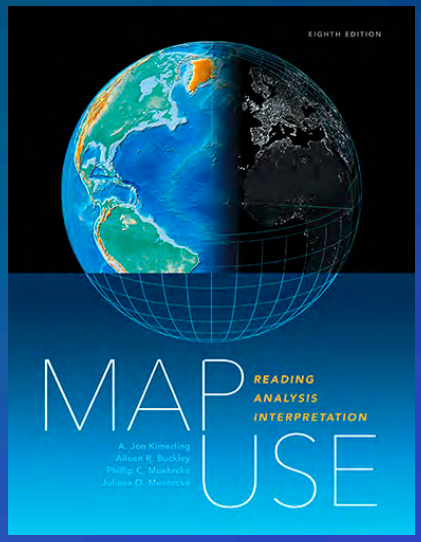
Aug. 29, 2016	Competition opens
Nov. 11, 2016	Competition closes at 5:00 p.m. (PST)
Dec. 5, 2016	**Winners announced**
2017	Top winners will be honored at:
	Esri Federal GIS Conference Washington, DC
	Esri Education GIS Conference San Diego, CA

Esri Press Scientific Monographs, *Esri Store*

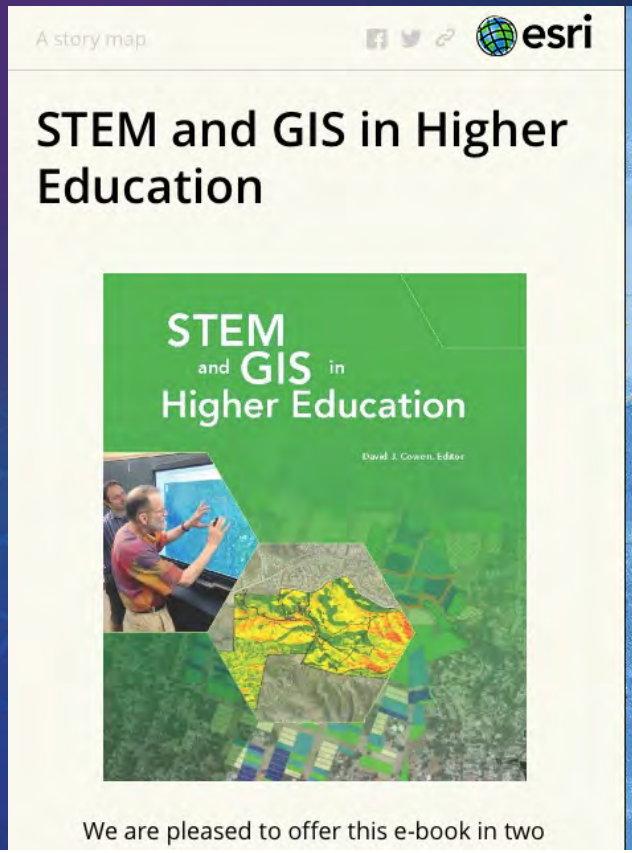


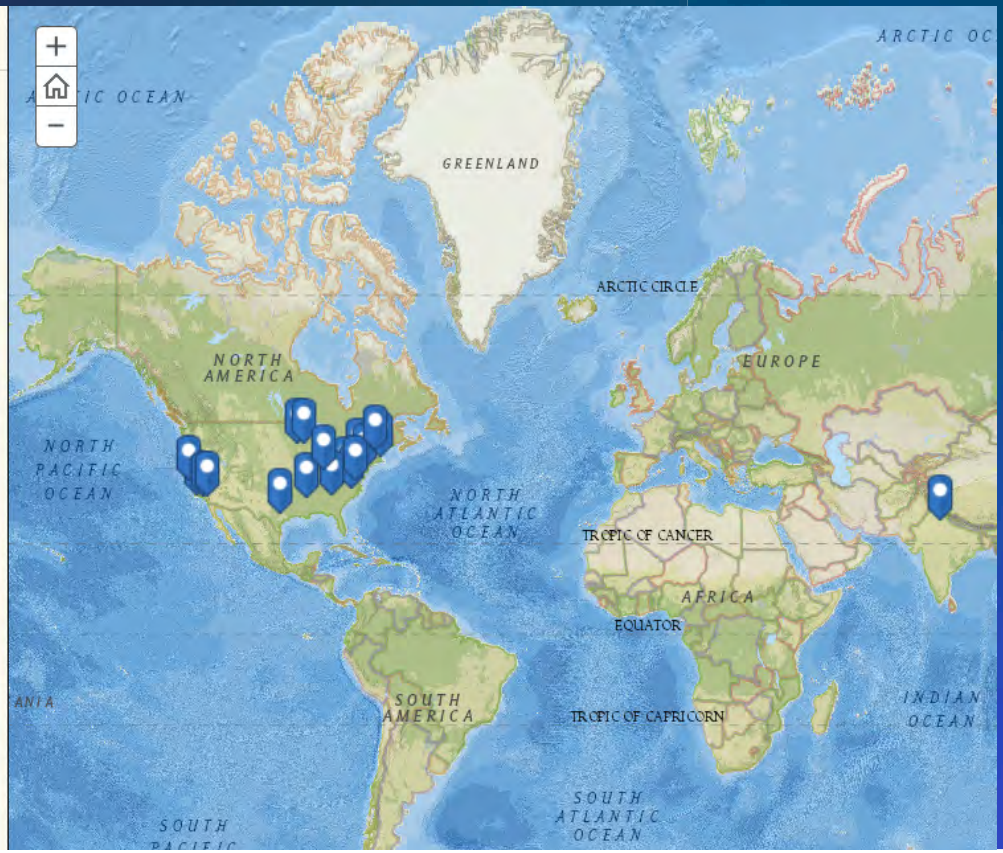






STEM and GIS E-Book, *esriurl.com/stemgis*





AGU Calls for Abstracts, *fallmeeting.agu.org/2016*

- Exploiting Big Earth Data: GIS and Beyond
- Communicating Science through Data Driven Storytelling
- Architecture and Integration Testbed for Earth/Space Science Cyberinfrastructures
- Spatial Data Infrastructure for Earth and Space Sciences: Analyzing, Visualizing, and Sharing Multidimensional Earth Science Data

2016 Esri Science Symposium Keynote Speaker Bio:

Margaret Leinen, a highly distinguished national leader and oceanographer, is the director of the Scripps Institution of Oceanography at UC San Diego, UC San Diego's vice chancellor for marine sciences and dean of the School of Marine Sciences. She is also President of the American Geophysical Union (the world's largest scholarly organization for solid Earth, oceanic, atmospheric, hydrologic, space, and planetary sciences), a member of the distinguished Leadership Council of the Joint Ocean Commission Initiative, past chair of the Atmospheric and Hydrospheric Science Section of the American Academy for the Advancement of Science, and past president of The Oceanography Society.

Prior to joining Scripps in 2013 as its 11th director, she served as Vice Provost for Marine and Environmental Initiatives and Executive Director of Harbor Branch Oceanographic Institute, a unit of Florida Atlantic University. Prior to that she served for seven years at the National Science Foundation (NSF) as Assistant Director for Geosciences and Coordinator of Environmental Research and Education. She oversaw a budget of $700 million, led government-wide planning for climate research, and co-led government planning for ocean research. While at NSF, she presided over and directly influenced some of the most consequential programs in marine, atmospheric, and Earth science.

Leinen received a doctorate in oceanography from the University of Rhode Island (1980), a master degree in geological oceanography from Oregon State University (1975), and a bachelor degree in geology from the University of Illinois (1969). She has received distinguished alumna awards from all three institutions.

What will be necessary to understand and protect the planet…and us?

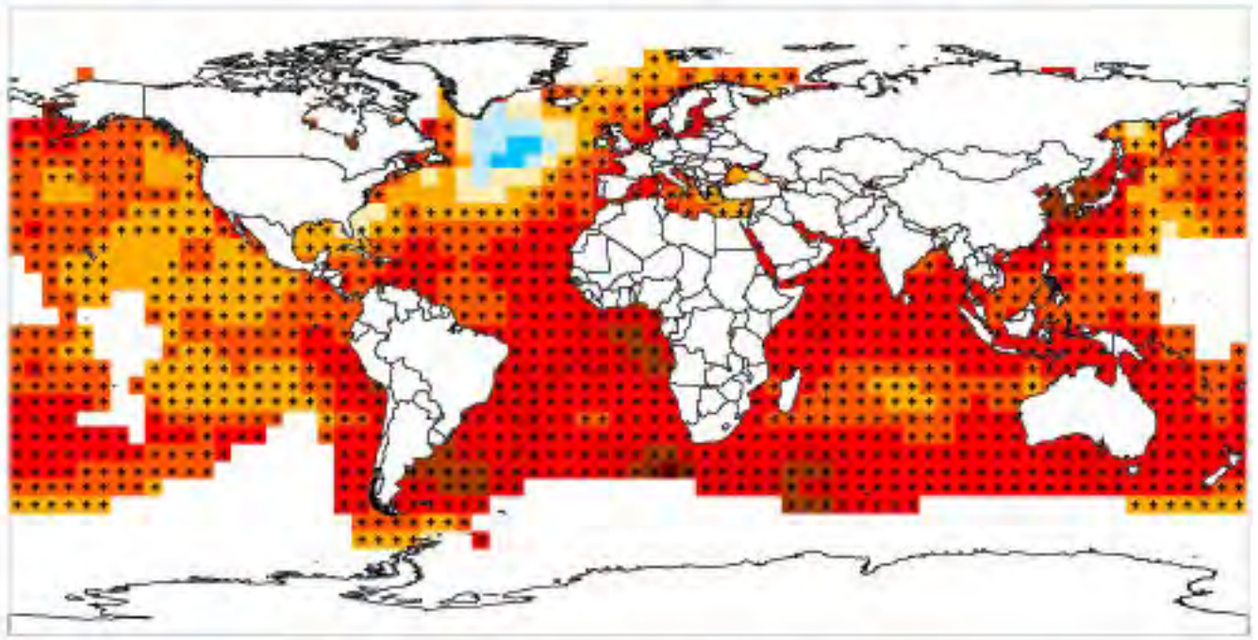
ESRI User Conference Science Symposium
June 28, 2016

Margaret Leinen
Director, Scripps Institution of Oceanography and
Vice Chancellor for Marine Science, UC San Diego

SCRIPPS INSTITUTION OF OCEANOGRAPHY
UC San Diego

Japan Times

Figure 2. Change in Sea Surface Temperature, 1901–2012

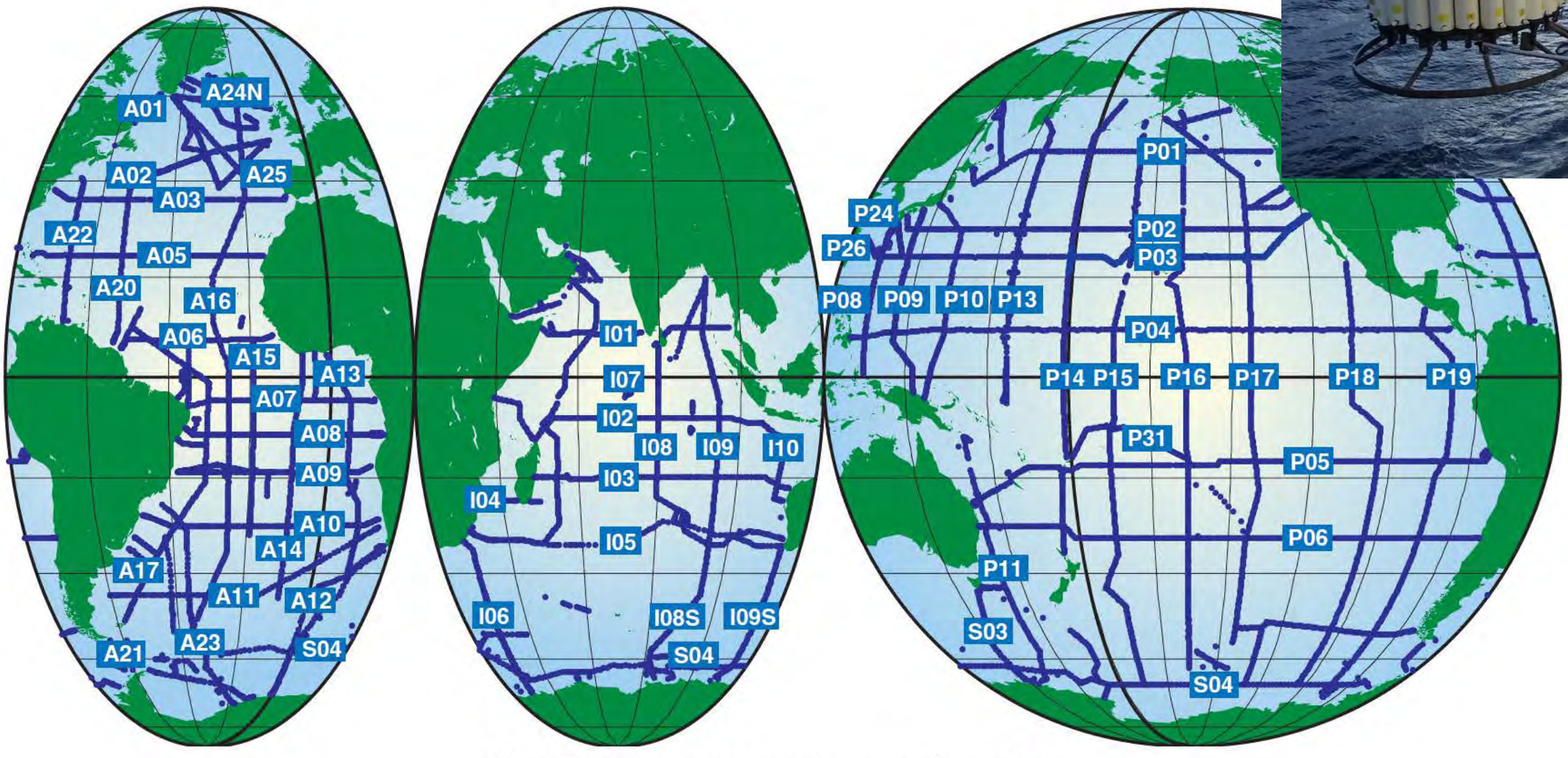


IPCC, 2013

Flickr: Joe Dyndale

Jim Wilkinson, SIO

Karen Stock, SIO



WOCE One-Time Survey Sections

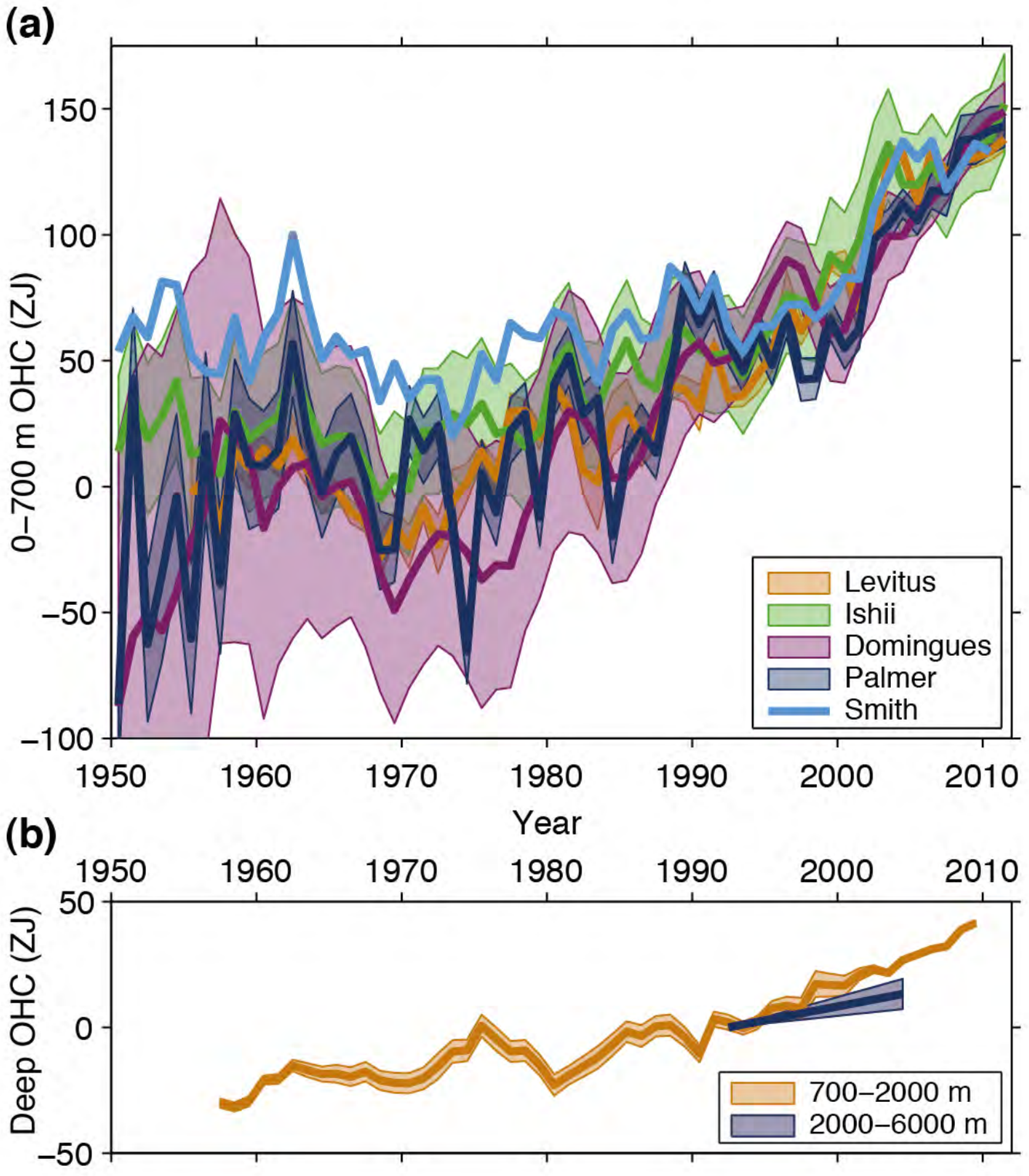
Understanding the physical ocean in the 1990s

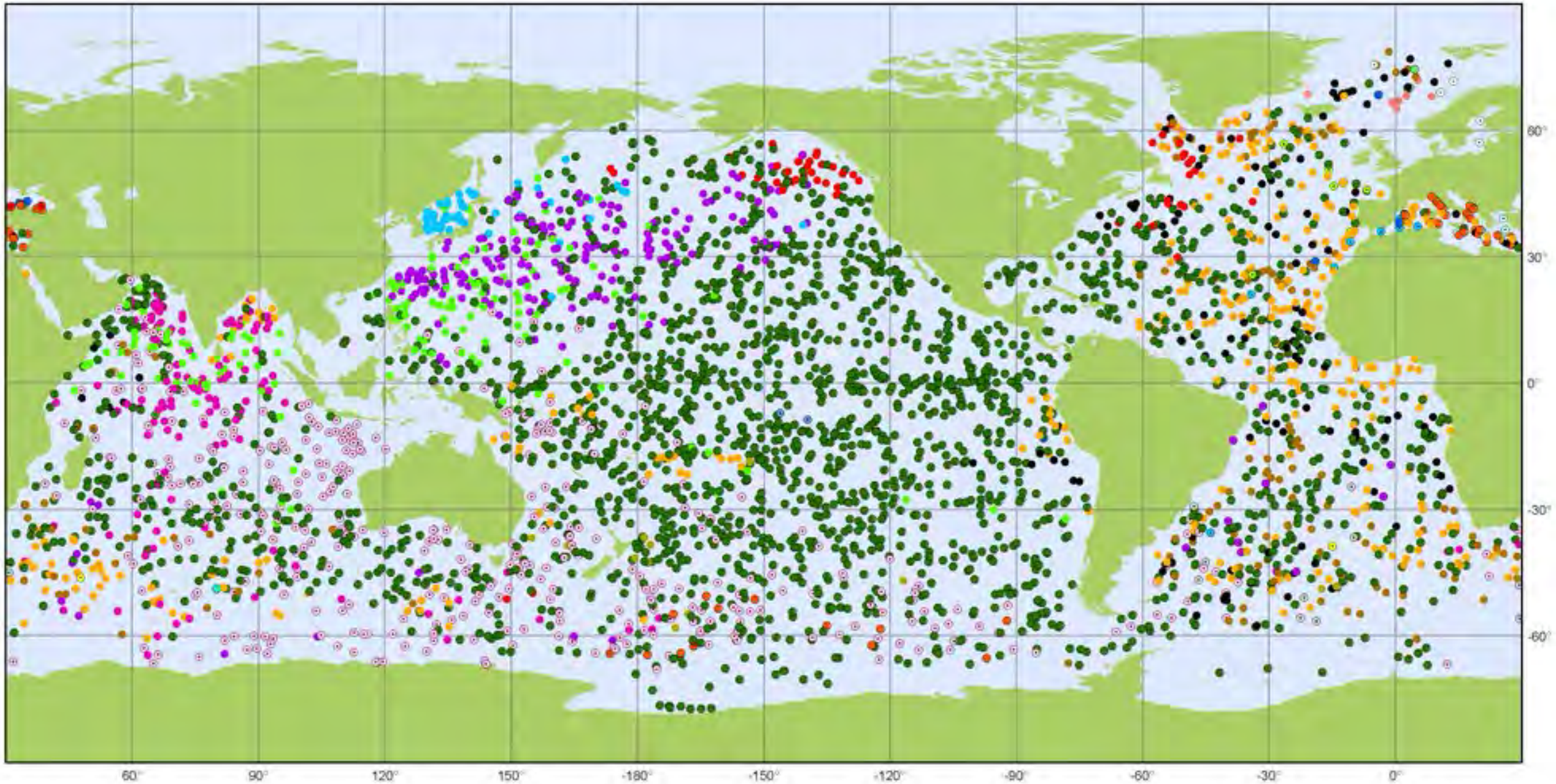
Ocean heating: our view from ship records

- hand compilations of all available temperature data from cruises from five different scientists averaged at two year time intervals

- substantial error, but…

- clear increase in heating over last 40 years





Argo

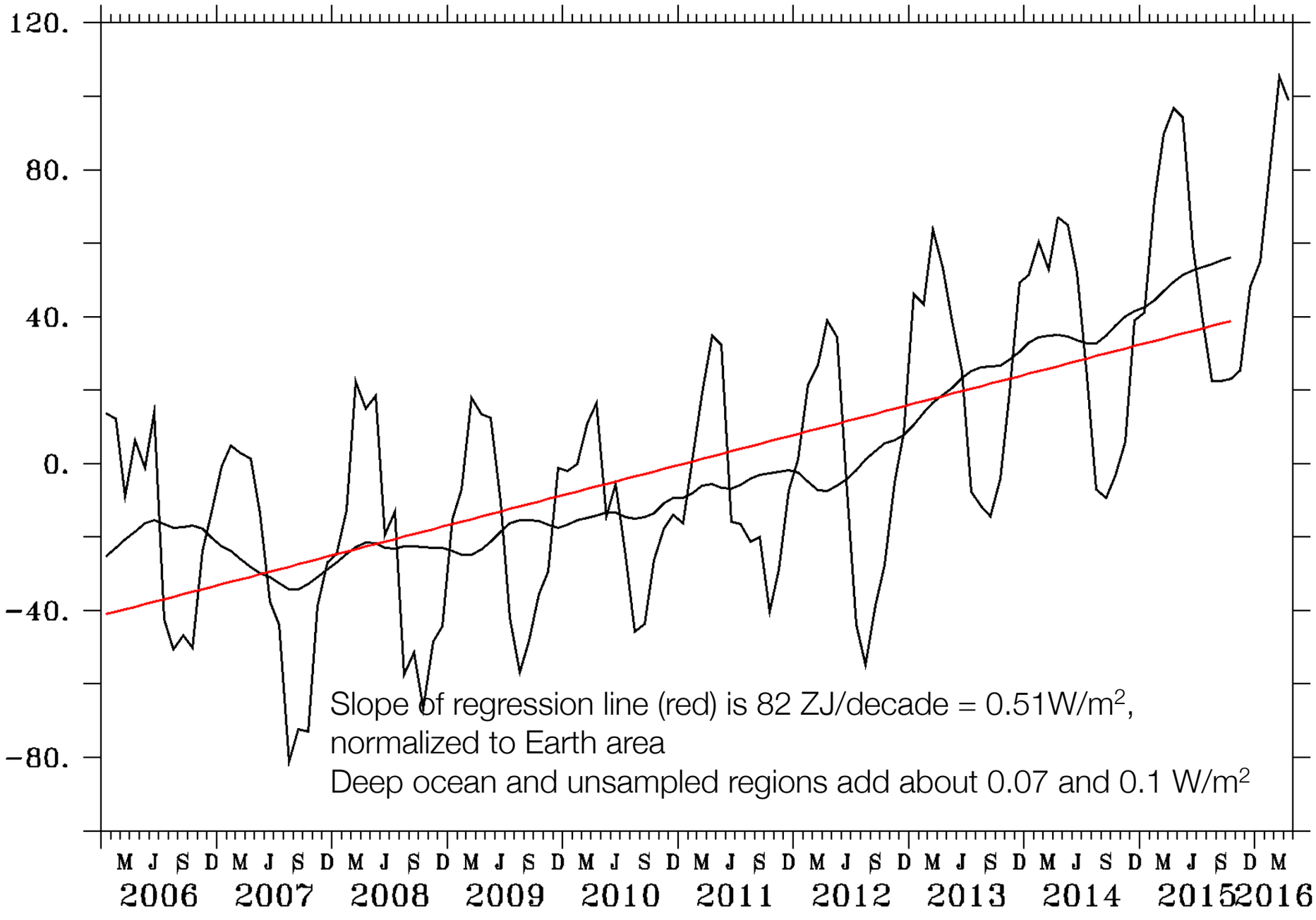
National contributions - 3839 Operational Floats

March 2016

Latest location of operational floats (data distributed within the last 30 days)

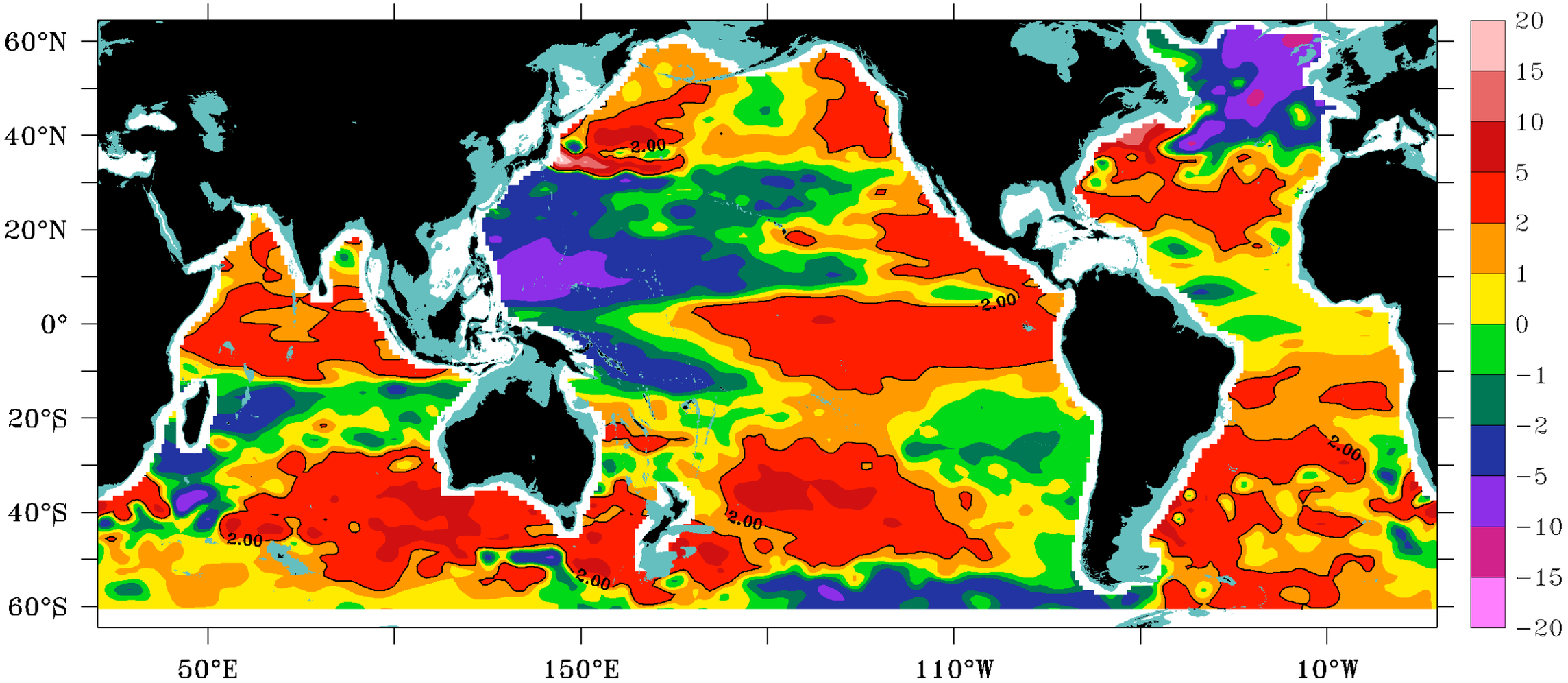
- ARGENTINA (2)
- AUSTRALIA (378)
- BRAZIL (11)
- BULGARIA (2)
- CANADA (55)
- CHINA (156)
- ECUADOR (2)
- EUROPE (6)
- FINLAND (5)
- FRANCE (333)
- GERMANY (123)
- GREECE (7)
- INDIA (125)
- IRELAND (7)
- ITALY (47)
- JAPAN (199)
- KENYA (1)
- MAURITIUS (3)
- MEXICO (2)
- NETHERLANDS (12)
- NEW ZEALAND (12)
- NORWAY (10)
- POLAND (3)
- SOUTH AFRICA (1)
- SOUTH KOREA (56)
- SPAIN (9)
- TURKEY (3)
- UK (134)
- USA (2136)

Generated by www.jcommops.org, 05/04/2016



Our view of ocean heating from ARGO

0-2000 heat gain (W/m^2), based on linear regression, 2006 – 4/2016

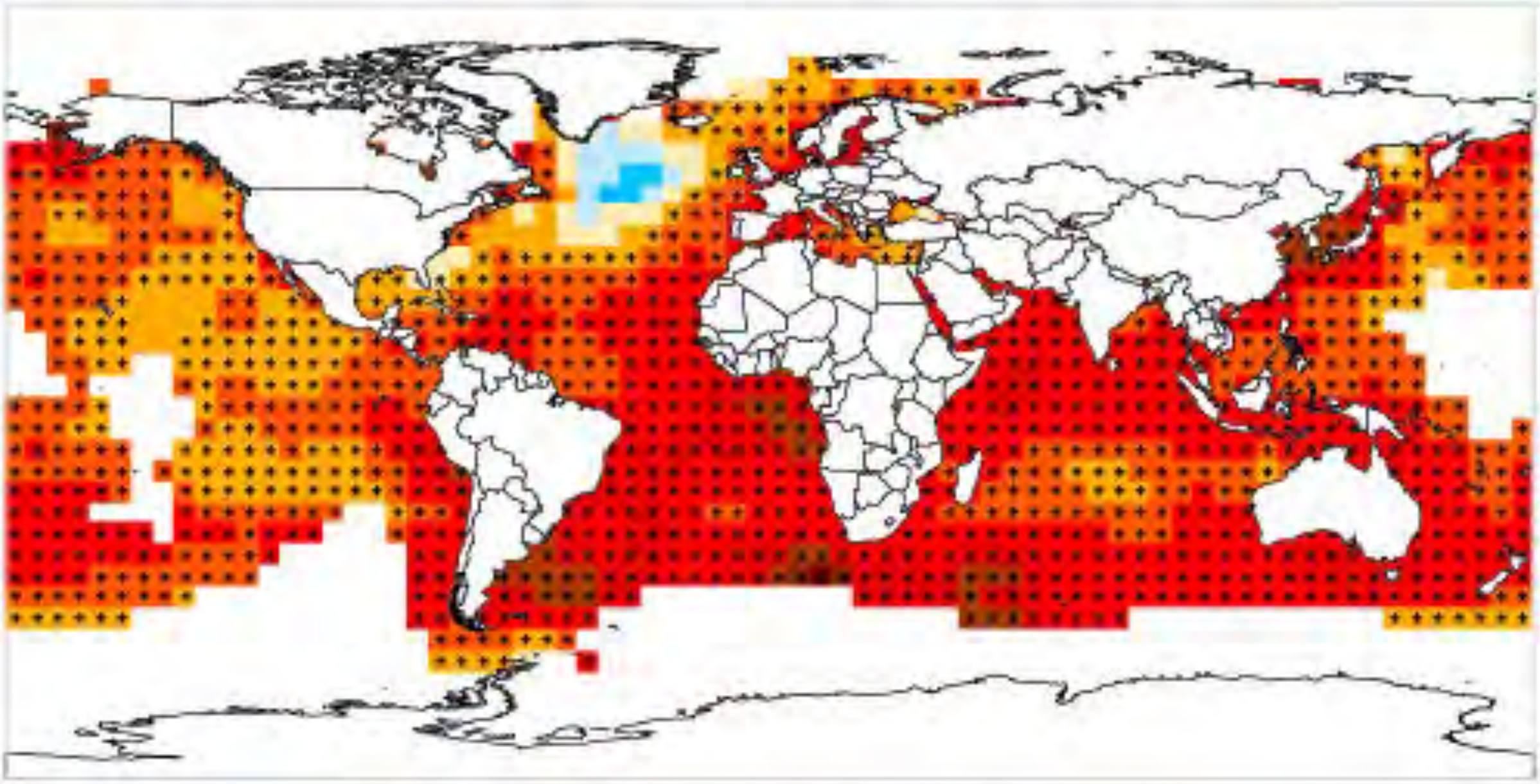


Roemmich, 2016

The contour lines indicate regions greater than 2 W/m^2
Note the strong warming in the mid-latitude Southern Hemisphere
Trends over the 10-year record are influenced by interannual variability

Our view of ocean heating from ARGO

Figure 2. Change in Sea Surface Temperature, 1901–2012



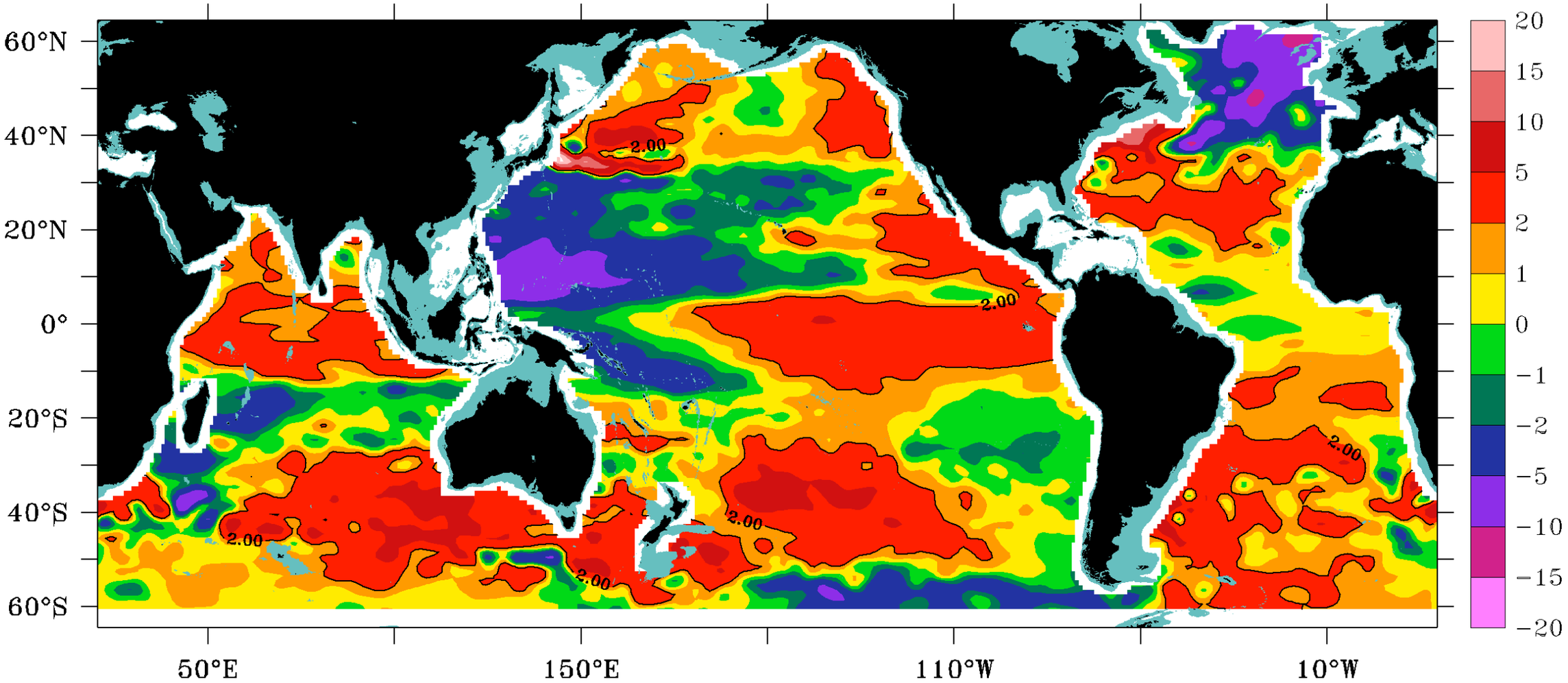
Change in sea surface temperature (°F):

-1 -0.5 0 0.5 1 1.5 2 2.5 3 3.5 4

Insufficient data

+ = statistically significant trend

0-2000 heat gain (W/m^2), based on linear regression, 2006 – 4/2016



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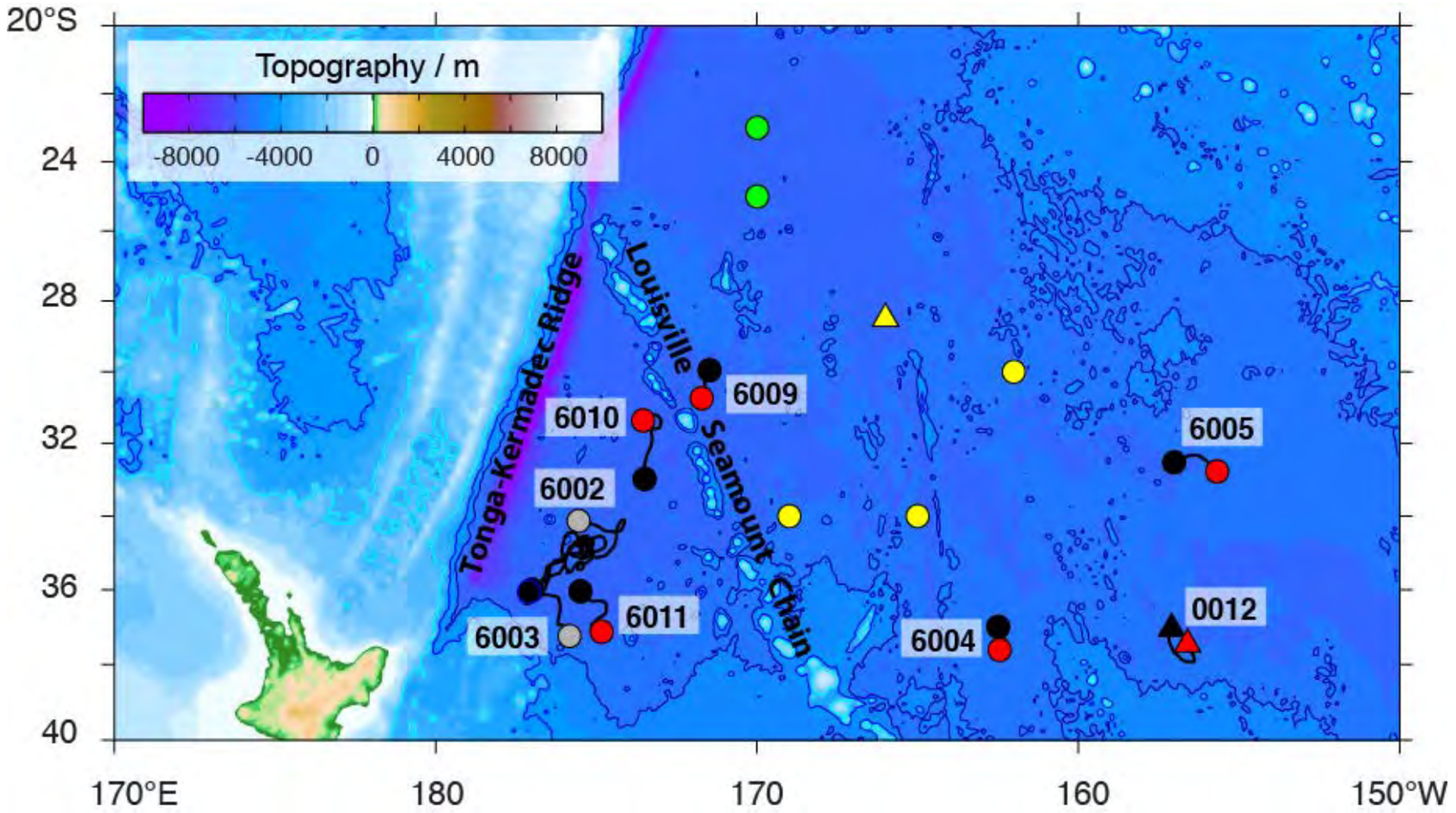
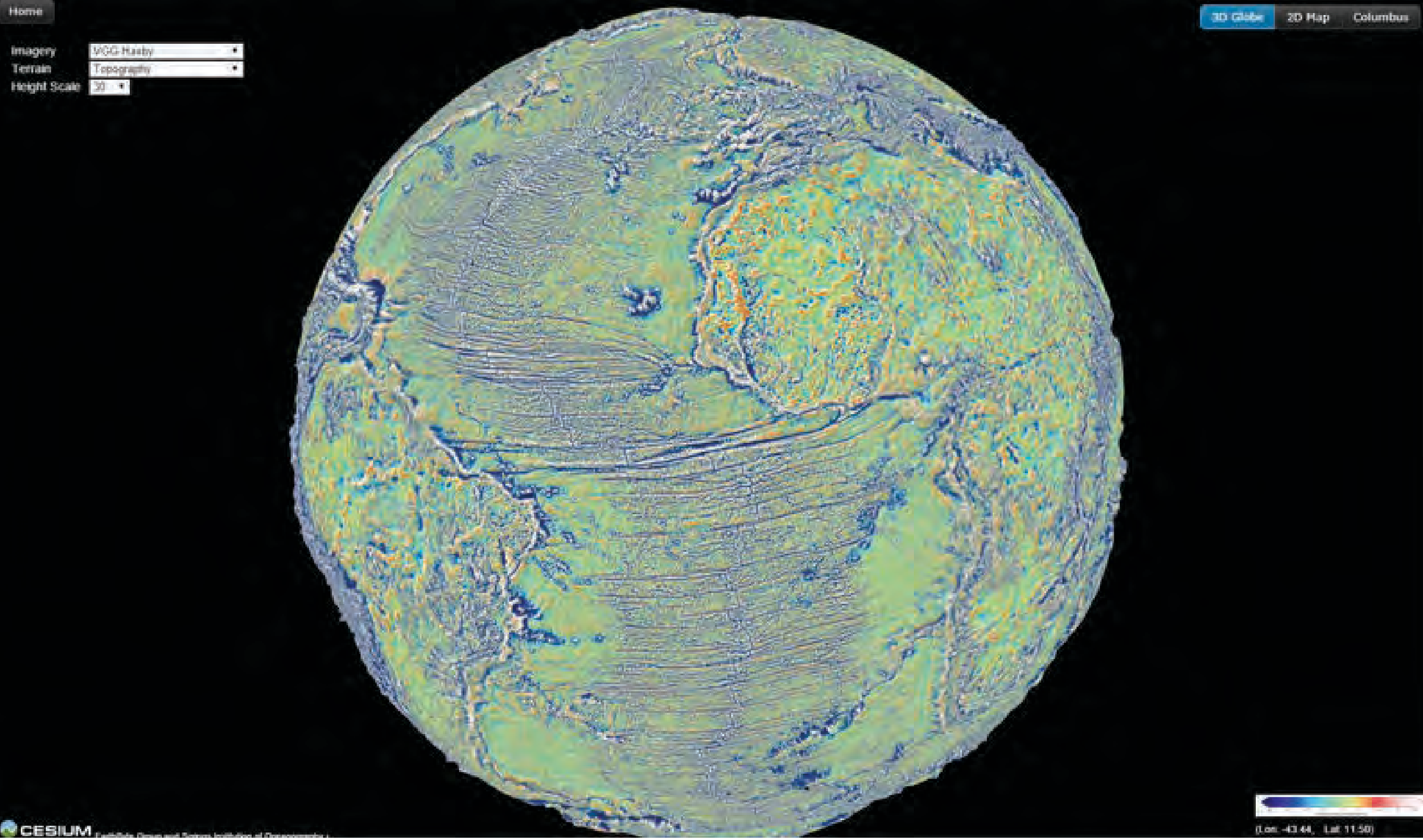


- Close the planetary budgets heat, freshwater, and steric sea level.
- Quantify the climate-critical deep ocean meridional overturning circulations.

Deep ARGO: extending global sampling to the ocean bottom



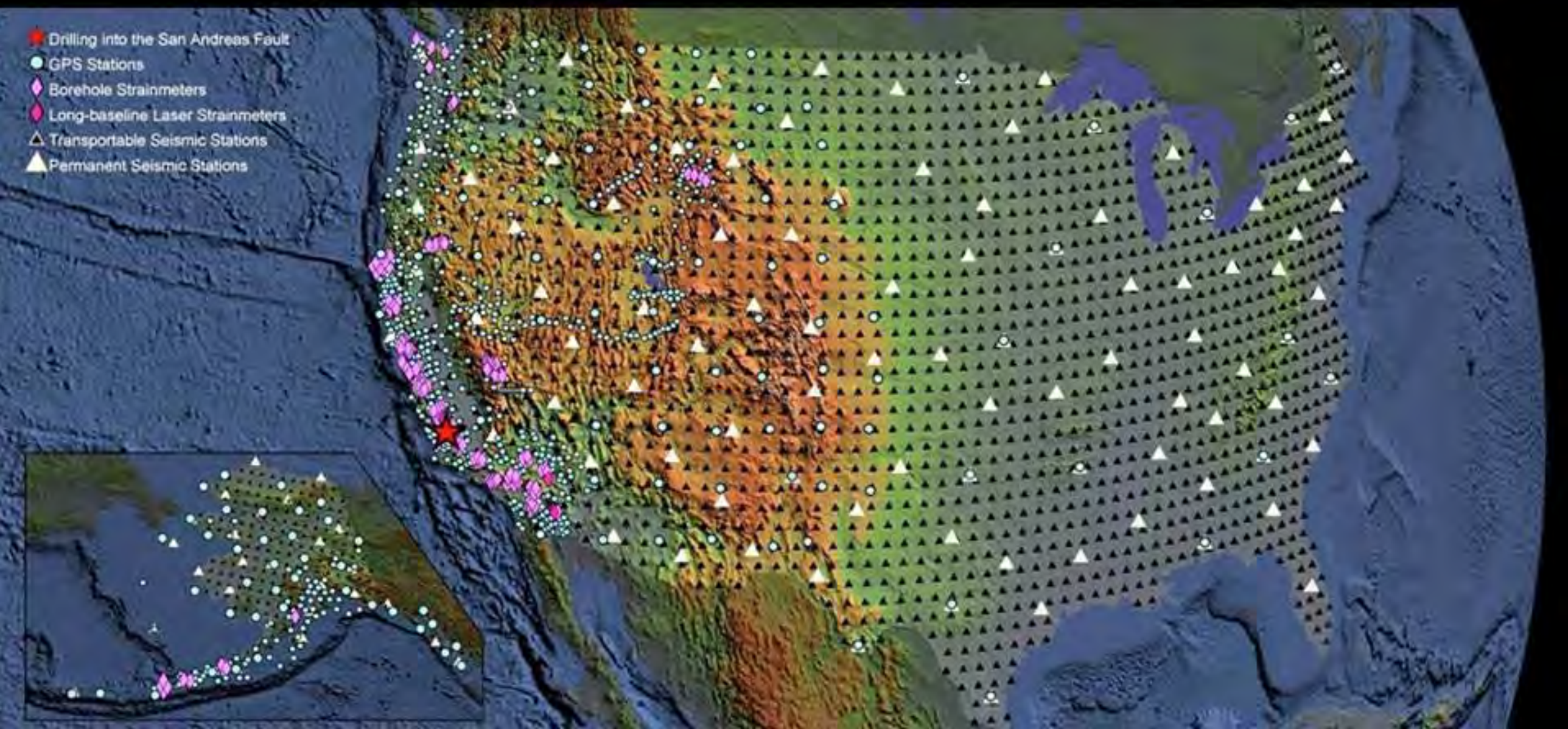
Understanding the solid Earth, its structure and movements

EarthScope Facilities

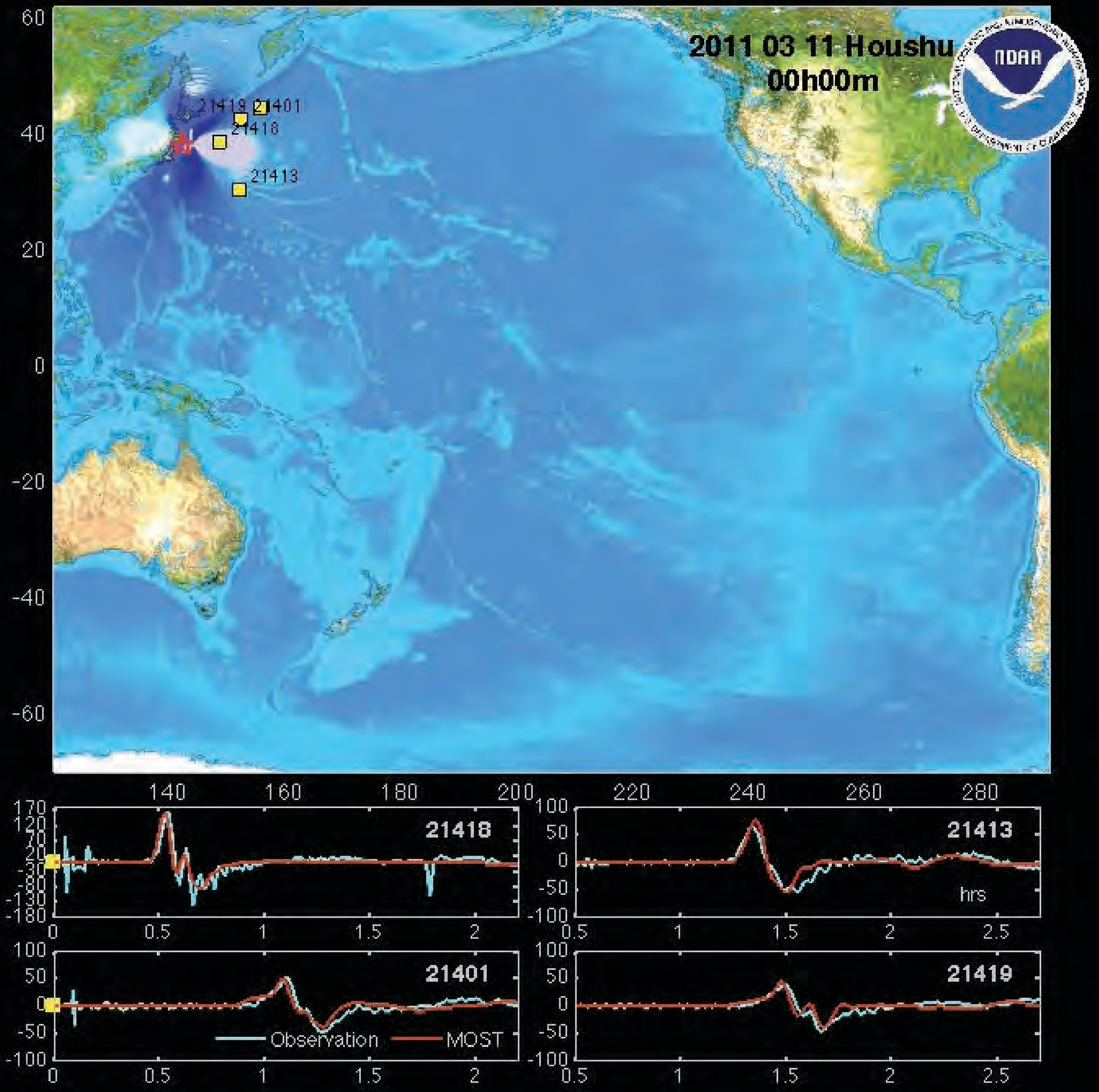
Earth Sciences version of Hubble Space Telescope

Enables comprehensive **survey of continent**

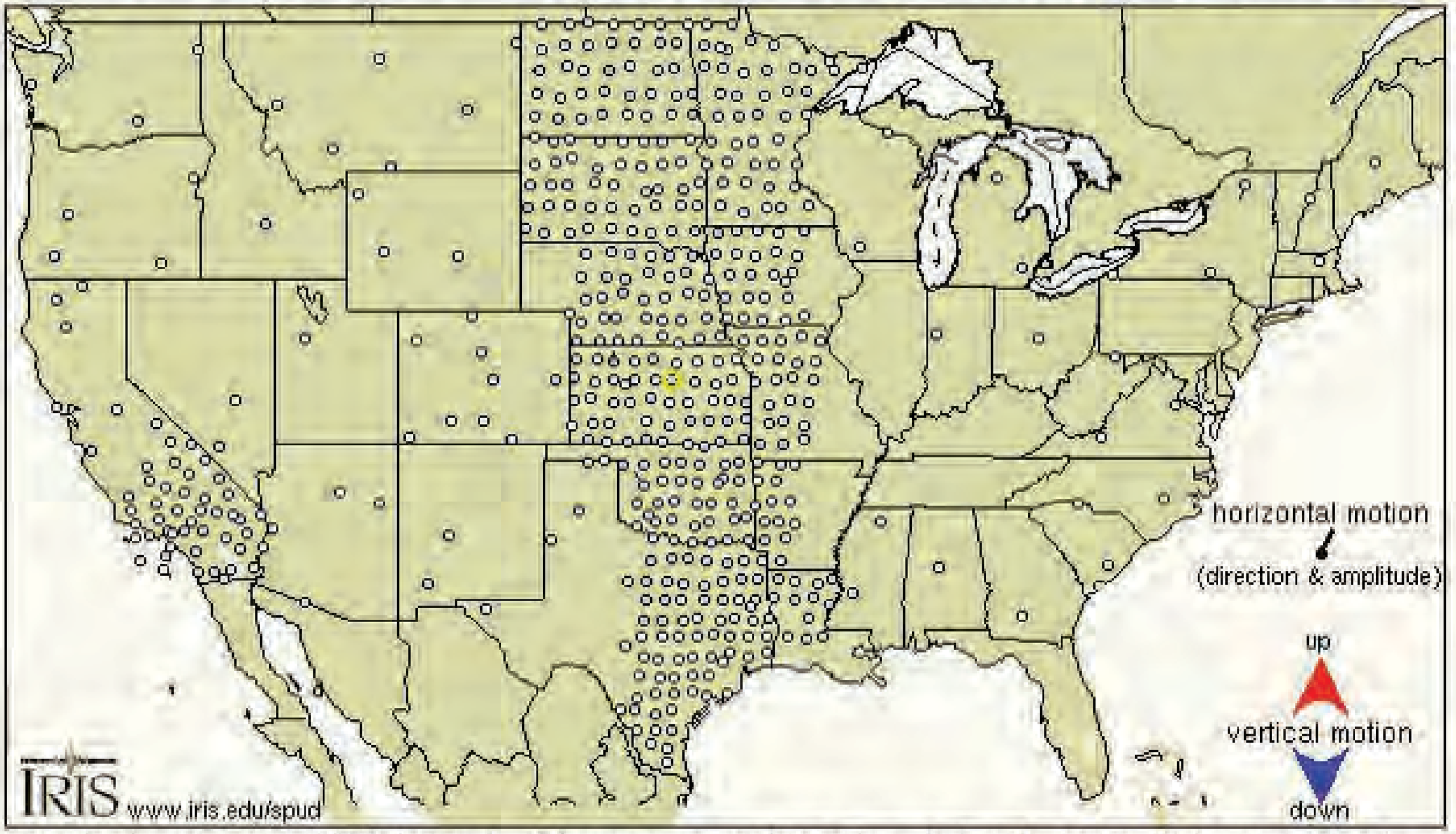
Named the #1 "Epic Project" by Popular Science in 2011



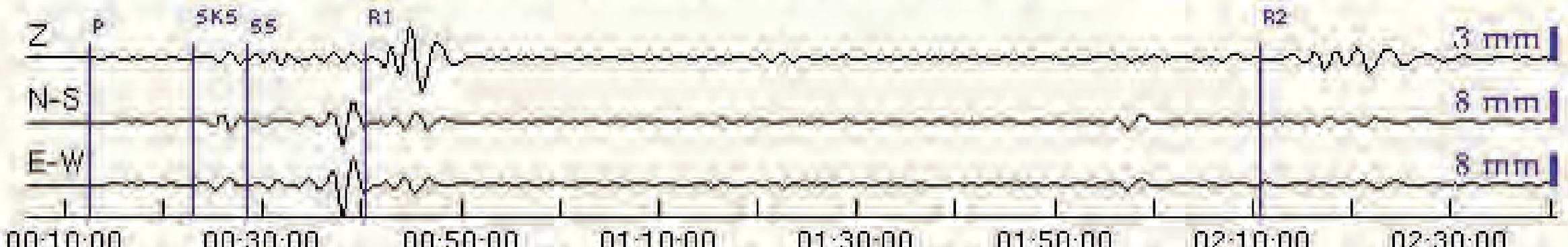
The US Array: a massive increase in the resolution of seismic measurement

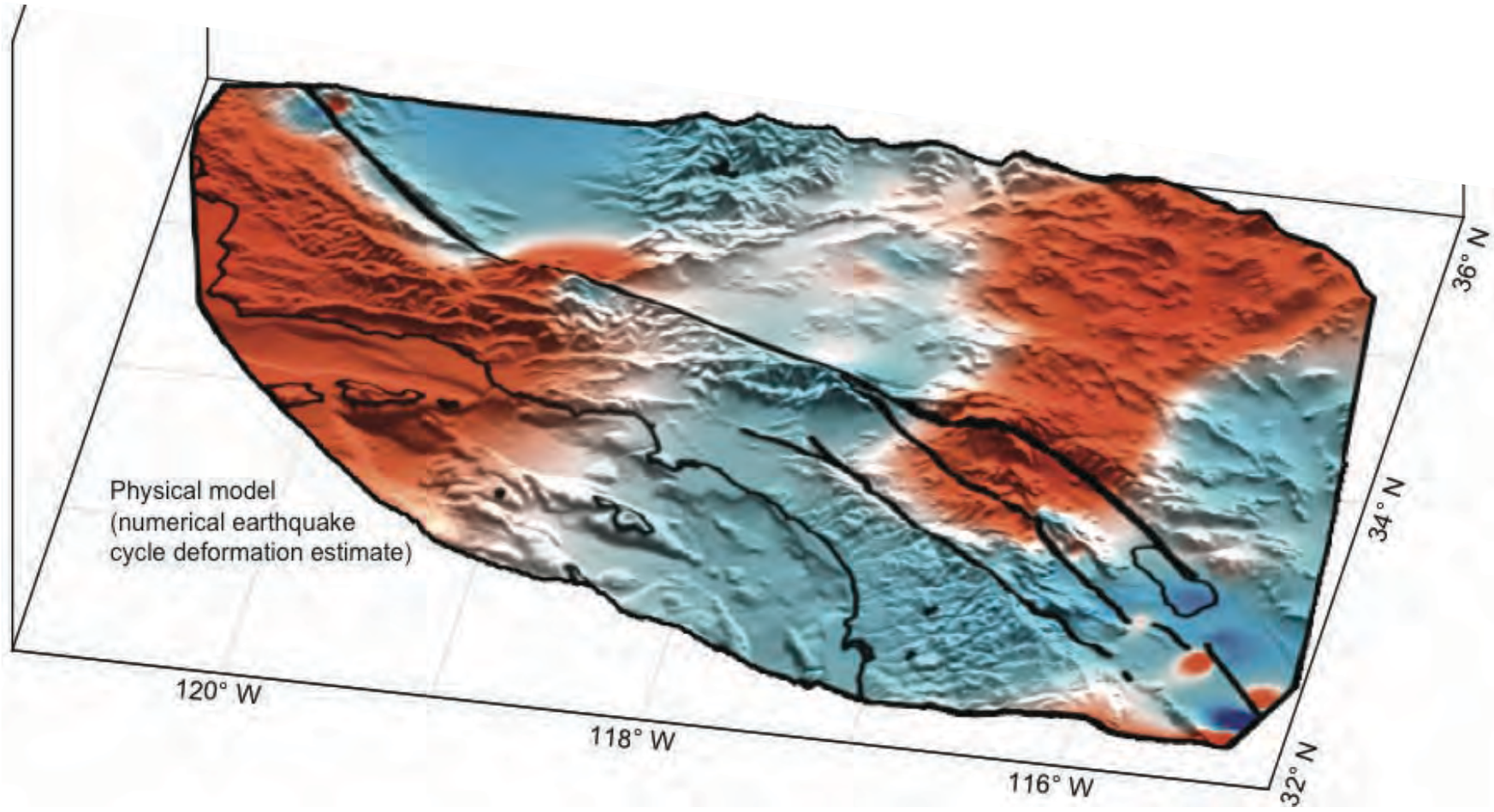

2011 03 11 Houshu
00h00m
NOAA
21419
21401
21418
21413
60
40
20
0
-20
-40
-60
140
160
180
200
220
240
260
280
21418
21413
21401
21419
hrs
Observation
MOST

March 11, 2011, NEAR EAST COAST OF HONSHU, JAPAN, M=8.9



2011/03/11 05:52:35 UTC (372 s) Distance 85.0°/9452 km Azimuth 42.7° Reference Q33A



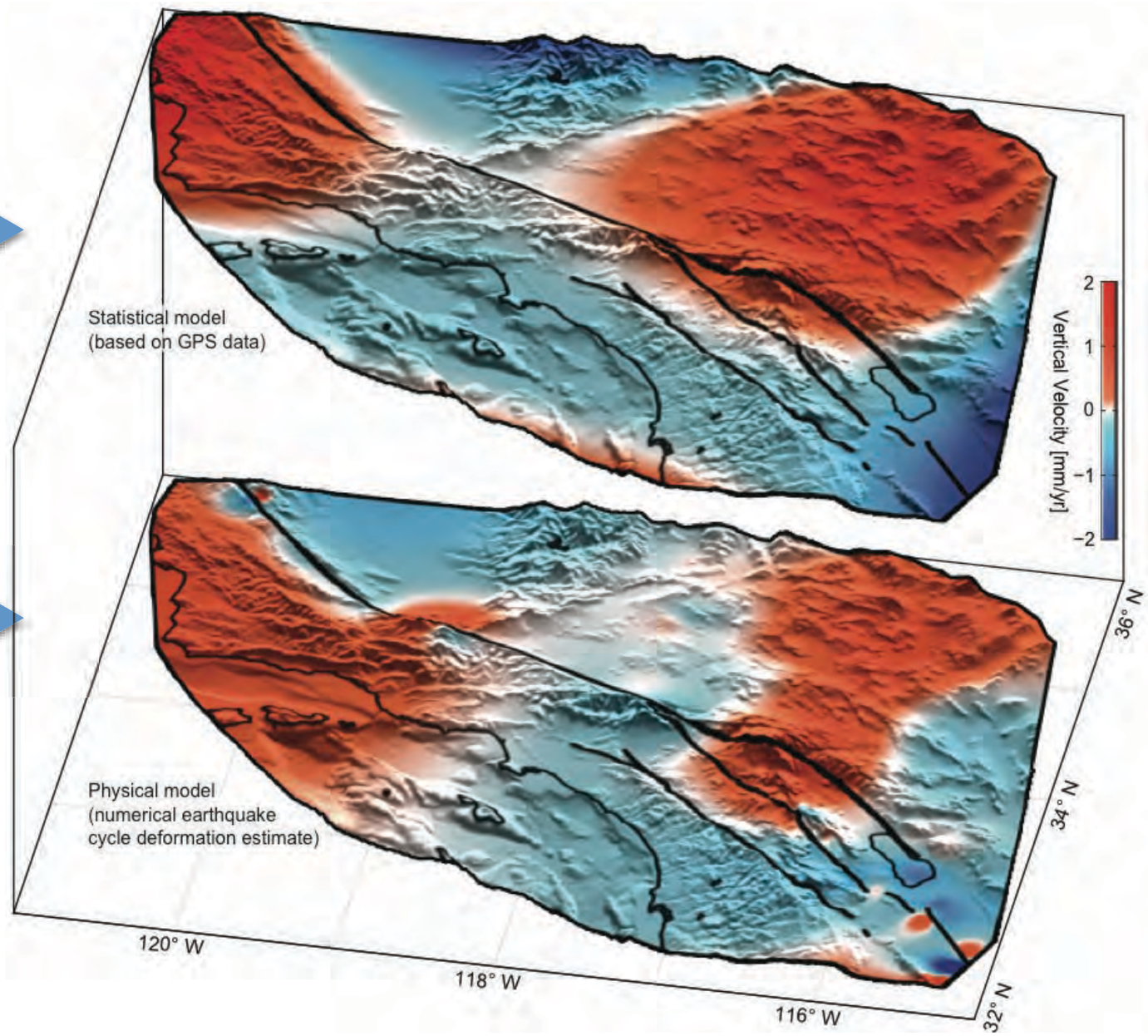


Vertical velocities of deformation along the San Jacinto fault system in southern California predicted by a 2006 numerical earthquake cycle deformation estimate

-Smith-Konter and Sandwell, 2016

Filtered GPS vertical velocity

Vertical velocity from earthquake cycle model



Spatially-filtered vertical velocities from 1164 permanent GPS receivers of the EarthScope Plate Boundary Observatory show a good match to vertical velocity predicted from an earthquake cycle model published in 2006
- Howell, Smith-Konter, Frazer, Tong, and Sandwell, Nature Geosciences, 2016

HPWREN: High Performance Wireless Research and Education Network

A Wireless Safety and Education Network for Society and Science

http://hpwren.ucsd.edu/

HPWREN High Performance Wireless Research & Education Network

SDSC SAN DIEGO SUPERCOMPUTER CENTER

UCSD

SAN DIEGO STATE UNIVERSITY

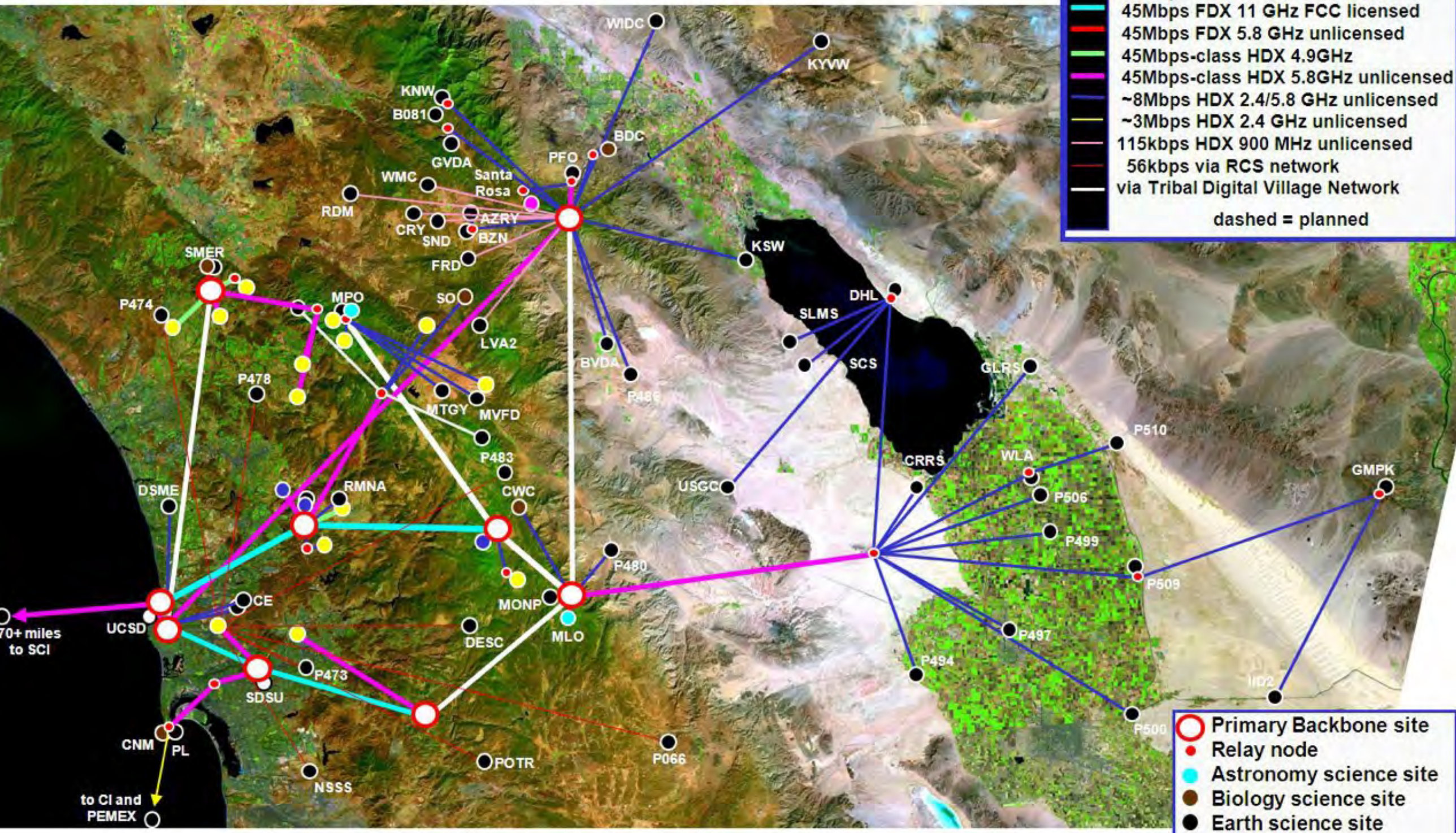
SCRIPPS INSTITUTION OF OCEANOGRAPHY UCSD

NSF

HPWREN:
environmental sensor networks

- sensors in remote sites
- communications
  - internet accessible
- real time
- research networks
  - high quality data
- public safety networks
  - reliable
  - resilient

HPWREN topology – January 2015



14 May 2014:
9 Simultaneous Active Fires in San Diego County

San Diego County Red Mountain Fire Cameras

Southeast (left)	“Highway” Fire
Southwest (center rear)	“Poinsettia” Fire
West (right)	“Tomahawk” Fire

Mountain fire near Idyllwild - July 2013

- San Diego Supercomputer Center, University of California San Diego
- Qualcomm Institute, University of California San Diego
- Dept. of Mechanical and Aerospace Engineering, University of California San Diego
- Fire Protection Engineering Dept., University of Maryland

Goal: Simulate fire growth in southern California

Run FARSITE and Firefly

Inputs:

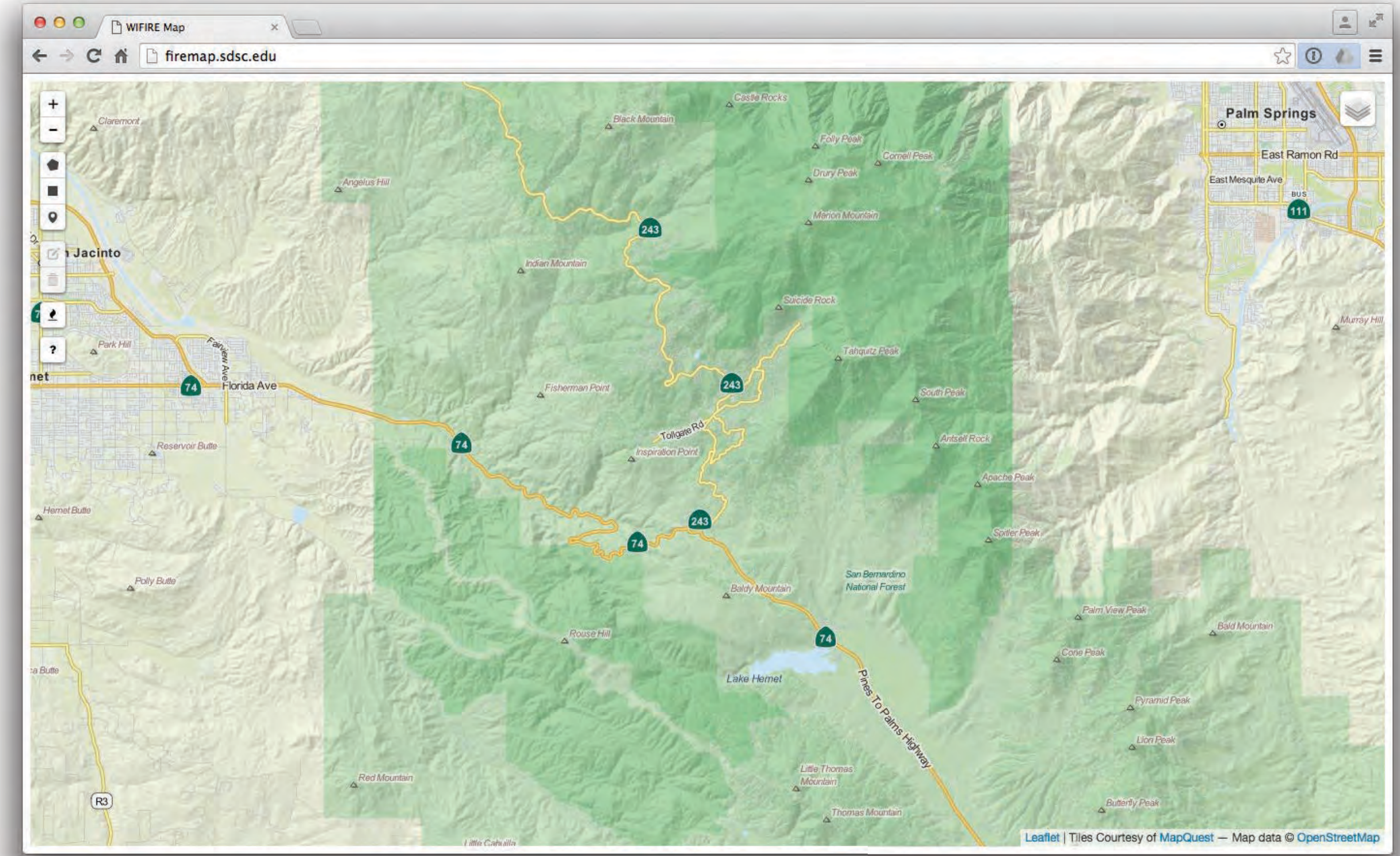
- Landscape (topography, fuel, etc.)
- Weather (wind, temperature, humidity, etc.)
- Ignition perimeter

Outputs:

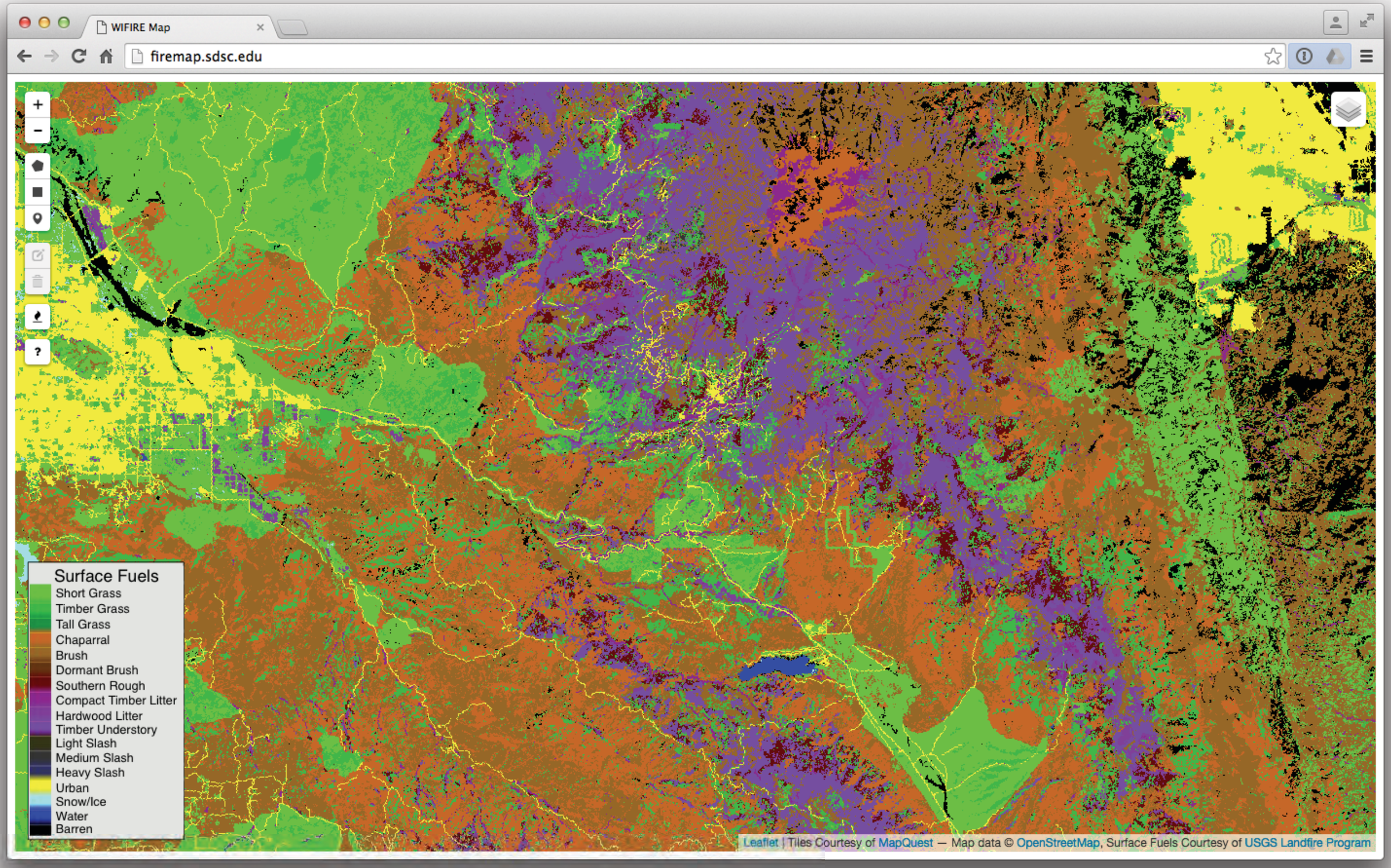
- Fire perimeters
- Intensity, flame length, spread rate, etc.

Towards an Integrated Cyberinfrastructure for Scalable Data-Driven Monitoring, Dynamic Prediction and Resilience of Wildfires

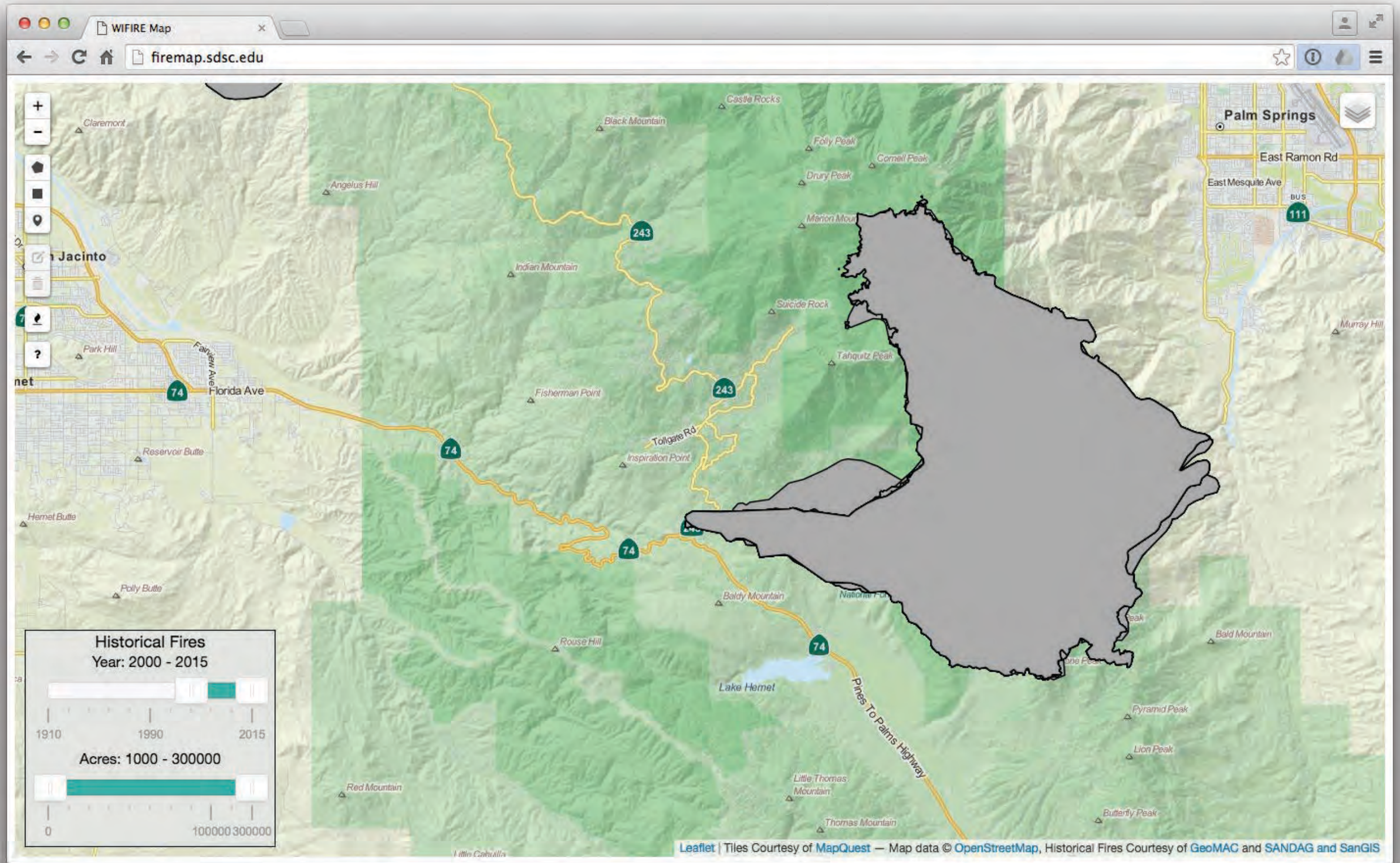
Use Case: Fire Growth



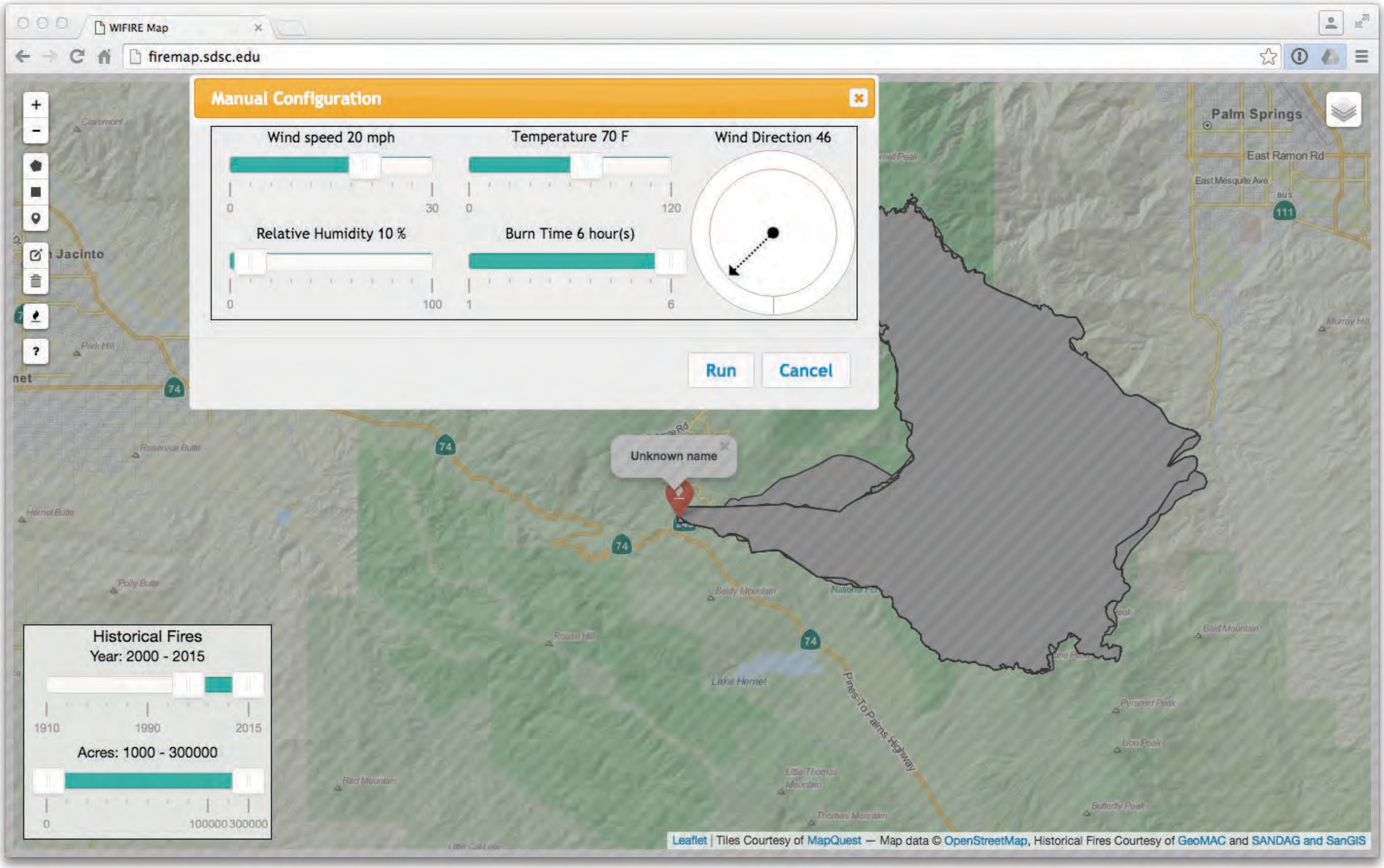
Surface Fuels



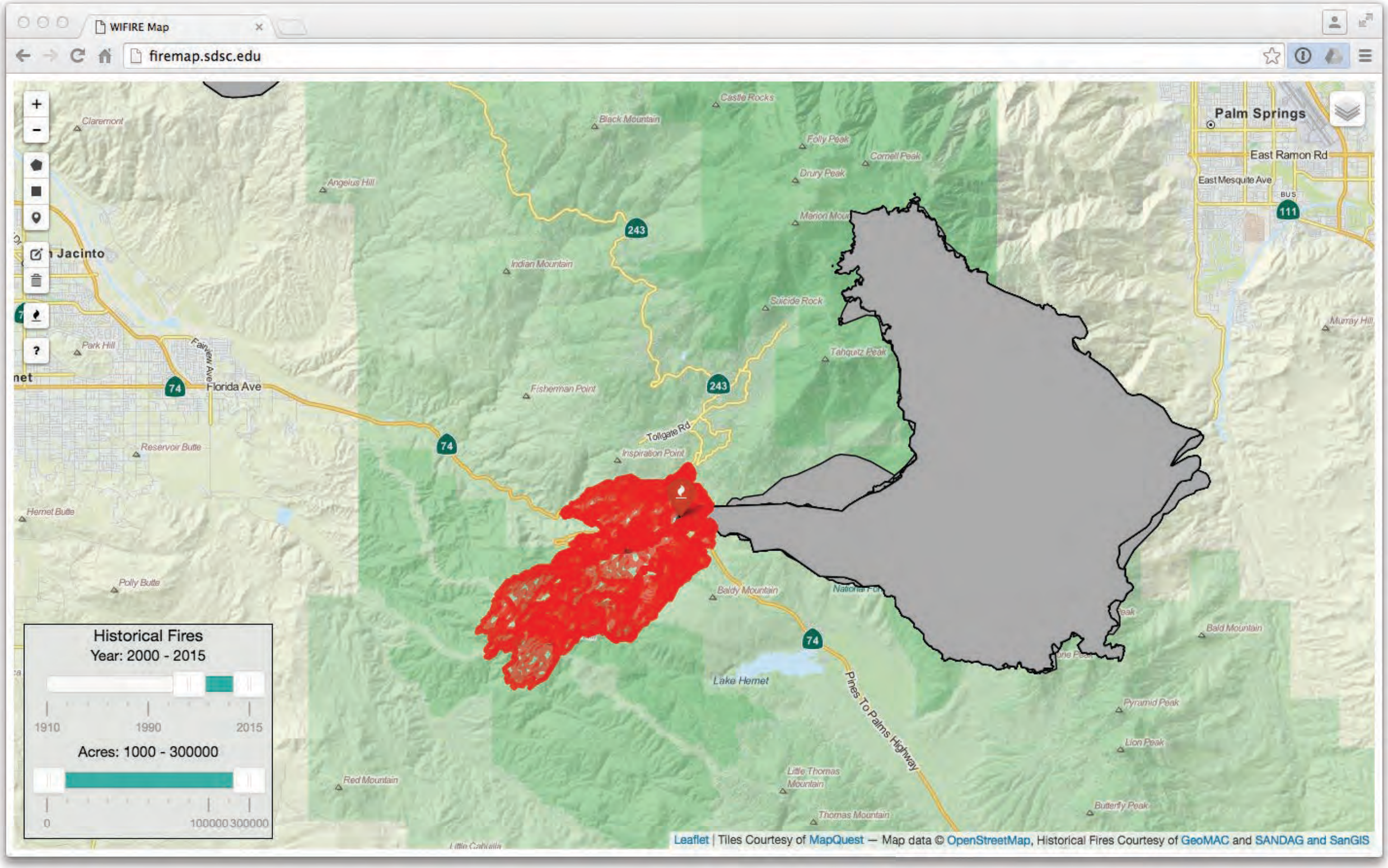
Historical Fires - 2013 Mountain Fire



Santa Ana Condition Parameters



Fire Growth Model- 6 Hour Burn



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UC San Diego

2016 Esri Science Symposium

For “Storify” of tweets captured during the keynote, Q&A, and the reception:
https://storify.com/deepseadawn/2016-esri-science-symposium

For a Flickr album of photos:
http://esriurl.com/sciphotos