NOAA'S Ocean Climate Observation Program

David M Legler

david.legler@noaa.gov

Climate Observation Division

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

www.oco.noaa.gov

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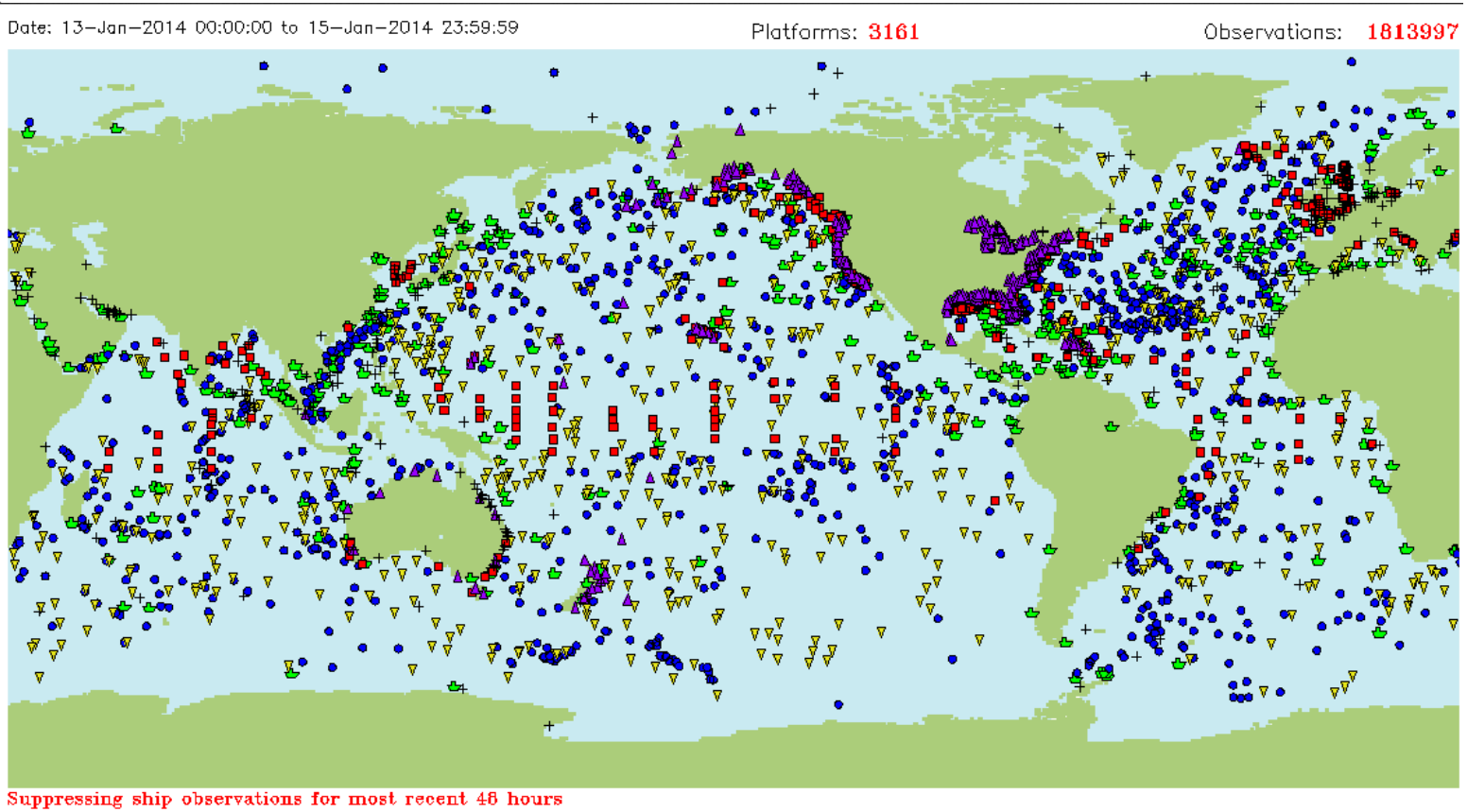
Ocean Climate Observation Program
Global In-Situ Ocean Observing



www.osmc.info

Argo: 34 countries
OceanSITES: 20 countries
Global Sea-Level System: 57 countries

www.jcommops.org

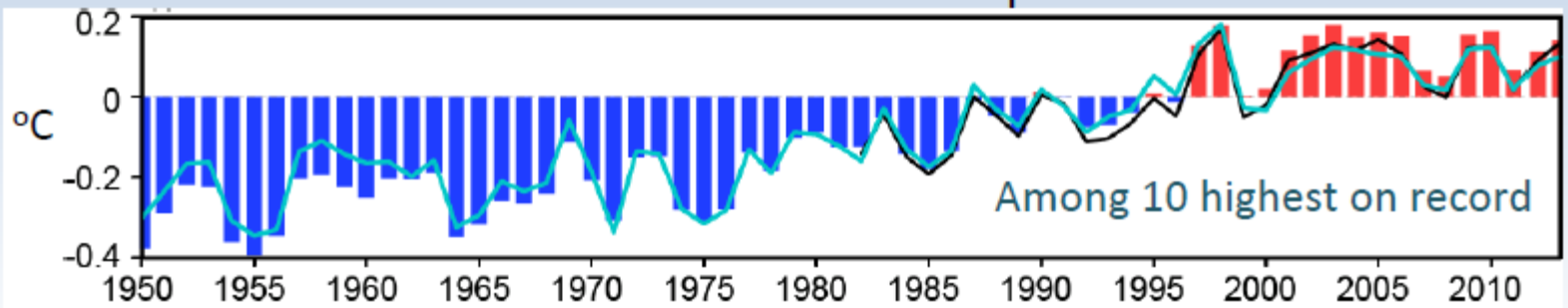
Surface Drifters: 14 countries
Tropical Moored Buoy Arrays:
RAMA (15) and PIRATA (3)
GO-SHIP (11) +pCO2 (17)

Global Ocean Observing System program
Without NOAA's Ocean Climate Observation Program

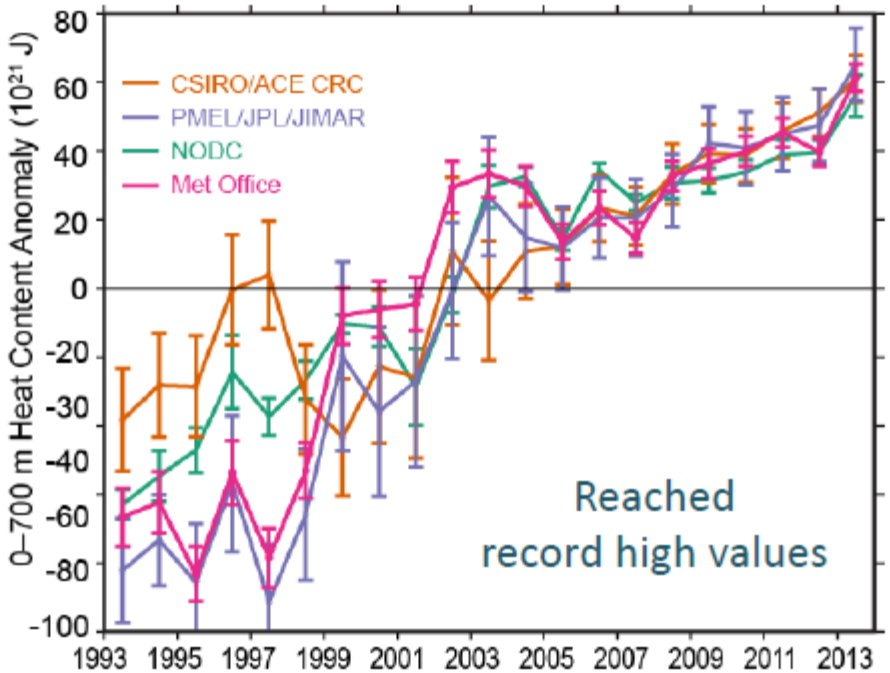
- There would be no *global* ocean observing system: NOAA is the foundation of ocean observing
- Ocean boundary conditions for weather forecasts would not be known.
- Intra-seasonal to decadal time scale predictions would not be as skillful due to lack of ocean initial conditions
- We would not be able to detect and monitor ENSO, impacting hurricane outlooks and regional decisions in multiple socio-economic sectors
- Ocean nowcasts and forecasts for defense, coastal, weather, and climate would be very crude
- We would not know if the ocean is warming, where it is warming, and how much heat the ocean is sequestering
- We would not know if the ocean is storing anthropogenic carbon, where it is storing this carbon, and how much carbon the ocean is sequestering (and may sequester in the future)
- We would be less confident about changes in the global hydrological cycle
- Surface temperatures of 75% of the earth's surface would not be validated (NOAA alone invests $2B in satellite missions); large uncertainties of satellite SST would not allow for detection of climate signals
- Global sea-level trend estimates from satellites would have very large uncertainties due to biases from satellite to satellite
- There would be very few sea-level measurements from undeveloped countries
- Decadal changes in critical regions of the ocean would be unknown
- There would be far less information about the ocean on which to support scientific research to prove/disprove hypotheses regarding climate variability and change

2013: Oceans Warm; Key Indicators Reach New Records

Global Ocean Surface Temperature



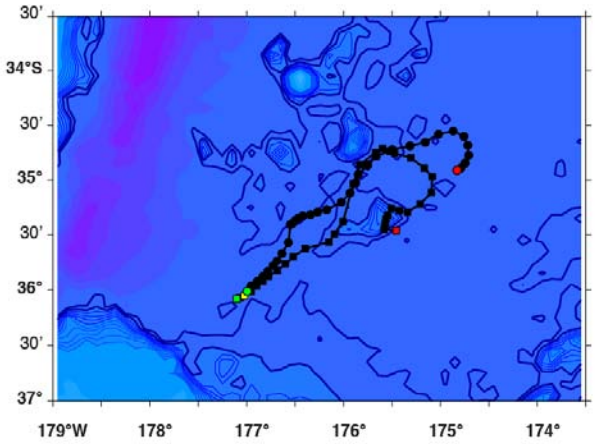
Upper Ocean Heat Content

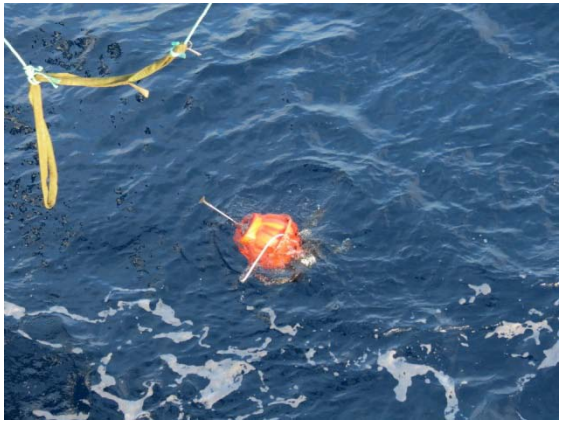


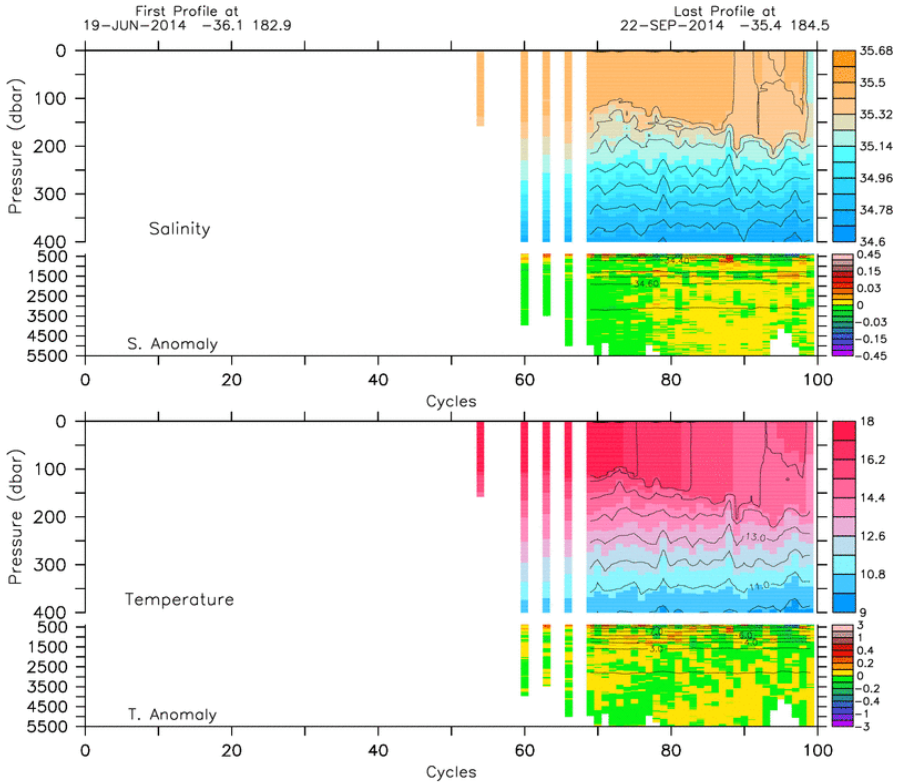
2013 State of the Climate Report

Ocean Climate Observation Program

Deep Argo initial deployments



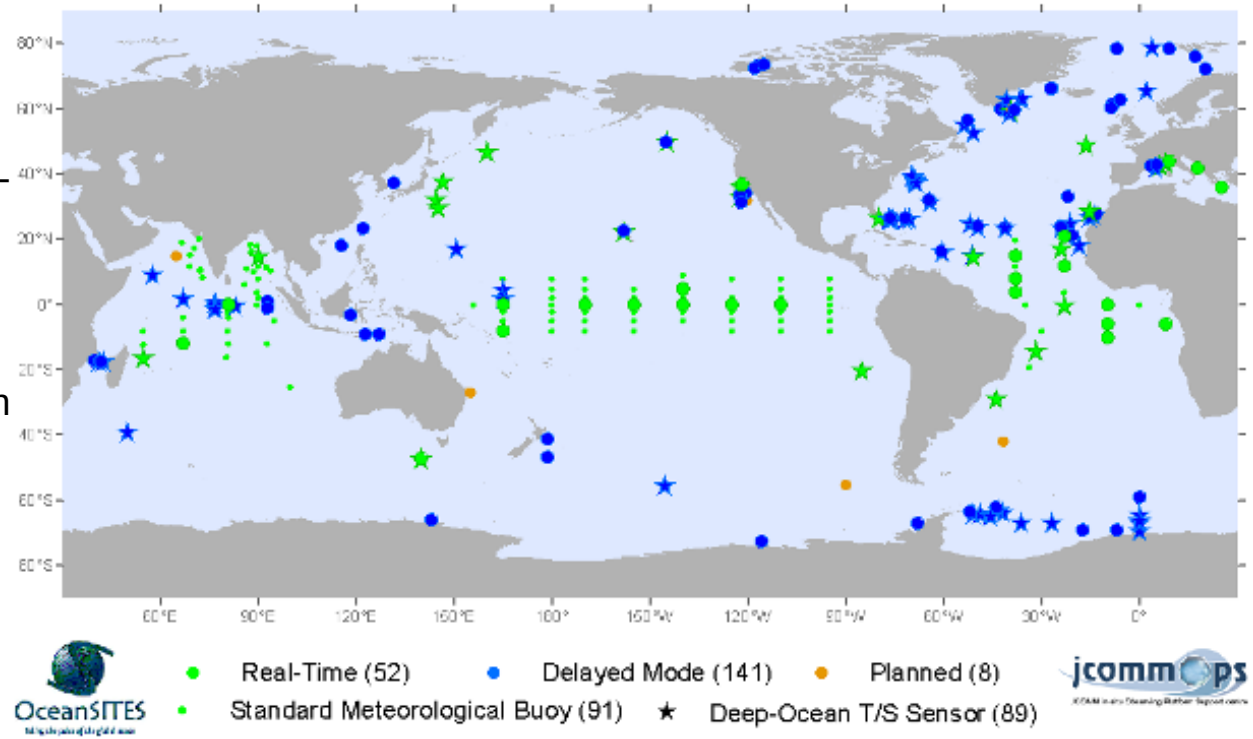




OceanSITES

http://www.OceanSITES.org/index.html

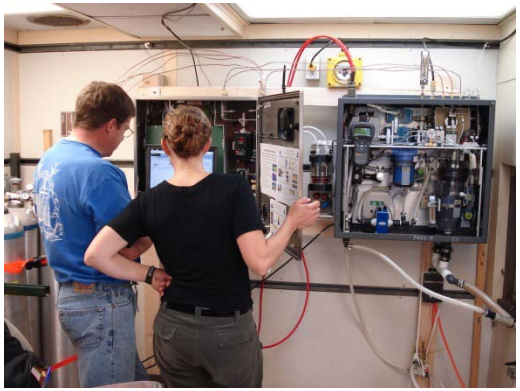
OceanSITES is a worldwide system of long-term, open-ocean reference stations measuring dozens of variables and monitoring the full depth of the ocean from air-sea interactions down to the seafloor. The network consists of ~30 surface and ~30 subsurface arrays.

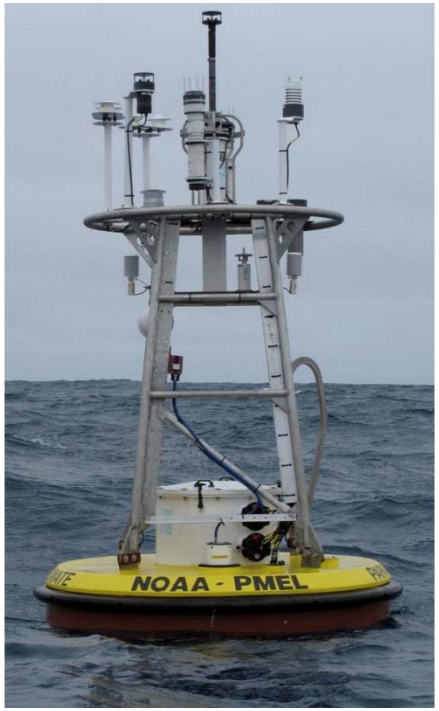


1. A "deep ocean observing strategy" is in place to make use of the many existing OceanSITES platforms in deep water (over 50 sites) to add deep temperature/salinity (T/S) sensors. This will help fill the gap in our measurement and understanding of deep ocean heat and salinity.
2. The OceanSITES format and Global Data Assembly Centers are being considered as one of the standard formats and international sites where long-term mooring and transport data are made available.
3. An OceanSITES scientific steering and data management meeting will be held in November 2014.

Ocean Carbon Highlight 2014

- **Release of Global Carbon Budget 2014** by the Global Carbon Program
- The ocean sequestered **2.9 Pg. Carbon** in 2013 or **29% of the total anthropogenic CO_2**
- **The first time** the Global Carbon Budget used ocean carbon data from **autonomous instruments on ships of opportunity** and **moorings**
- **Over half** of the data in international global ocean carbon databases attributable to **NOAA/COD researchers and collaborators.**

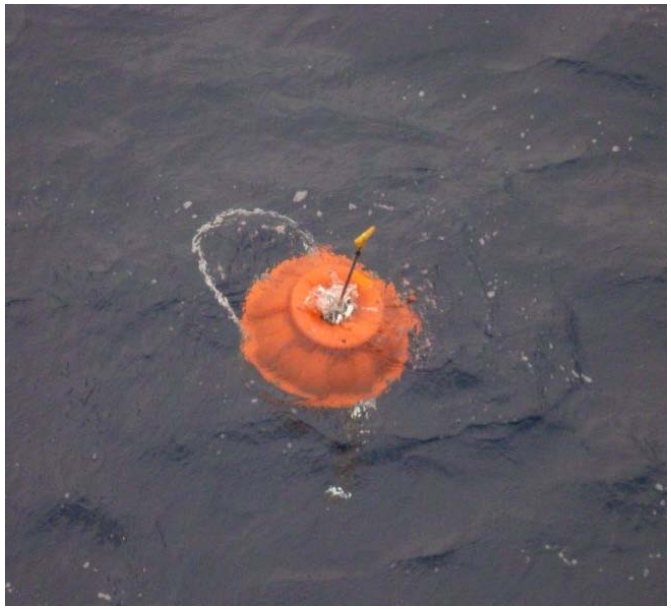




Global Carbon Budget 2014, C. Le Quere et al., 2014
www.globalcarbonproject.org

Opportunities for the next decade of global ocean observing

- Tropical Pacific
- Deep Ocean
- Rapidly changing Arctic
- Boundary Currents
- Increased use of autonomous vehicles and improved sensors
  - Gliders, wave-gliders, etc
  - Boundary currents (COD sponsored California Current gliders since 2007. These are the longest sustained glider lines in the US)
- Expanding the multi-disciplinary nature of the global ocean observing biogeochemical sensors (e.g. CO2, PH, etc), and marine ecosystem requirements (e.g. tracking, acoustics)



Deployment of SOLO 6000 m Argo float (2014)

Tropical Pacific Observing System for 2020

Scripps Institution of Oceanography

January 27-30, 2014

The creation of a focused **TPOS 2020 Project**

to achieve the transition from a loosely coordinated set of ocean observing activities in the tropical Pacific to a systematic and sustained TPOS by 2020.

Ocean Climate Observation Program
Budget

- FY14 restoration/small increase was very good news
- FY14 Budget Increases
  - Strategy: given future budget uncertainty, and increasing risks to current systems, no growth in long-term observing commitments
  - Inflationary increase to sustained observing activities to reduce risks of observing gaps
  - QC backlog for Argo and OceanSITES
  - Ship-time
  - Replacement lab equipment for next decade of repeat hydrography
  - Argo float acquisition
  - Tropical Pacific Observing System project (project support and OSE study)
  - JCOMM costs
  - Small investment in Arctic observing
- FY 15 plans under discussion (awaiting appropriation process to conclude)
  - Any increase would target overall reduction of risks and strategic foci

Ocean Climate Observation Program
Looking Ahead in FY15 - globally

- GOOS, OOPC, and JCOMM continue their important role in coordinating management of global ocean observing. Some activities to be aware of:
  - GCOS Status Report and Implementation Plan update process begins soon, important to identify new observing activities that should be included
  - GOOS developing updated ocean observing requirements organized by Essential Ocean Variable (EOV)
  - OOPC in early planning stages of a review/workshop on ocean observing needs of boundary currents (including their links with coastal/shelf waters).
  - JCOMM continues to coordinate many aspects of the ocean observing system
  - Multiple “resource fora” are envisioned (TPOS, Deep Ocean)….helpful to have closer ties between those supporting the ocean observing systems
- Preliminary discussions already taking place about Oceanobs’19 (!)

Ocean Climate Observation Program
Looking Ahead in FY15 - OCO

- Progress Reports for the past year: request will be issued soon
- FY15 Work Plans: request will be issued a little later
- OCO Staffing assignments: adjustments underway
- Areas of programmatic emphasis
  - TPOS-2020
  - Evaluation of observing systems in the context of
    - Research (e.g. published papers that utilize OCO observations)
    - Models (e.g. how much observational data is being received and utilized)
  - Improving program performance measures
  - Data management practices and response to NOAA directives
  - Increased communications/outreach from COD: telling our story
- **OCO System Review meeting in FY15. Early stages of planning (May/June time frame). Please include travel in your work plans to participate. Details to follow.**

Many challenges and opportunities ahead…

Thank You

Further Information:

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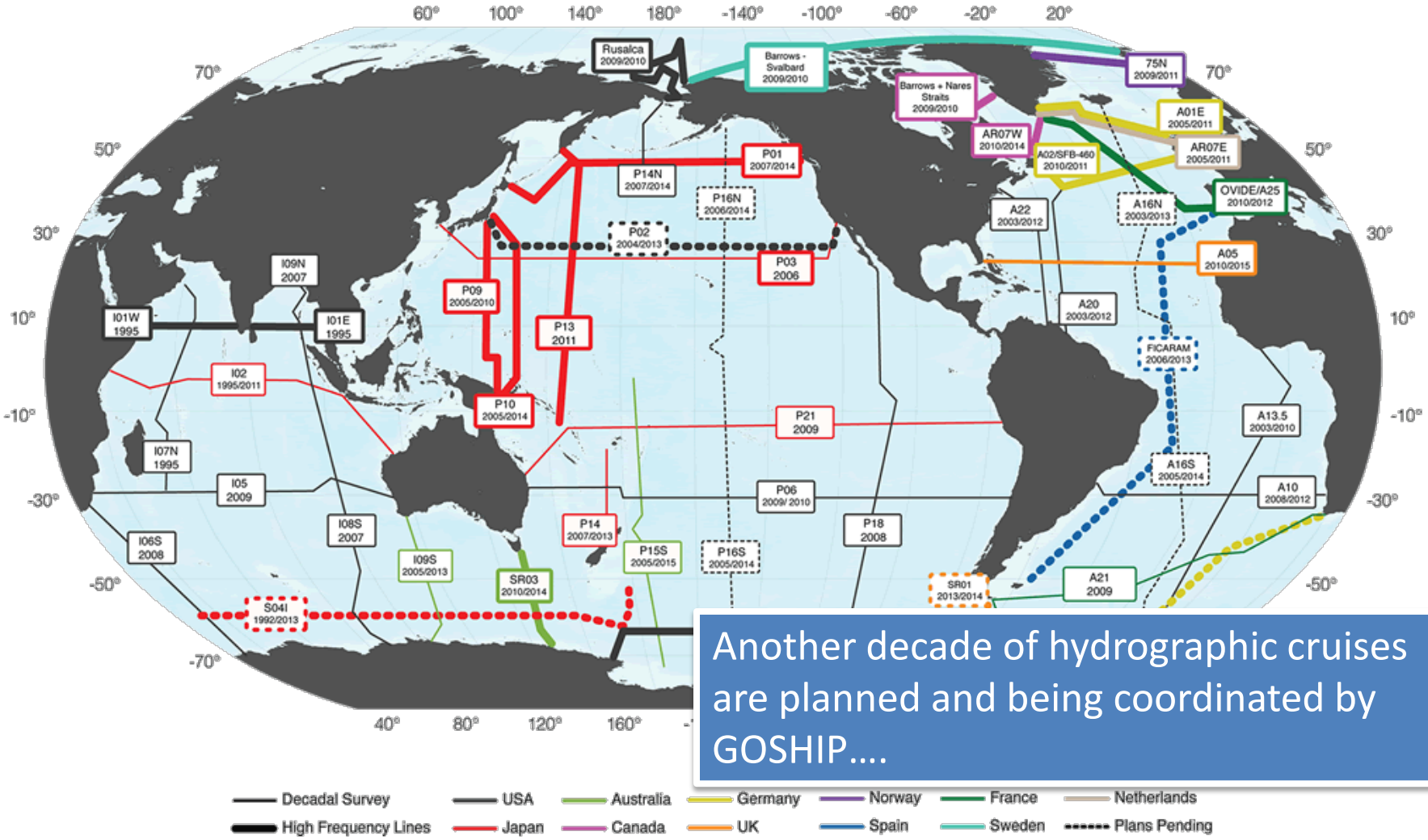
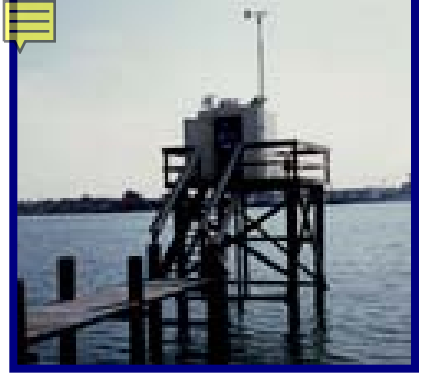
david.legler@noaa.gov

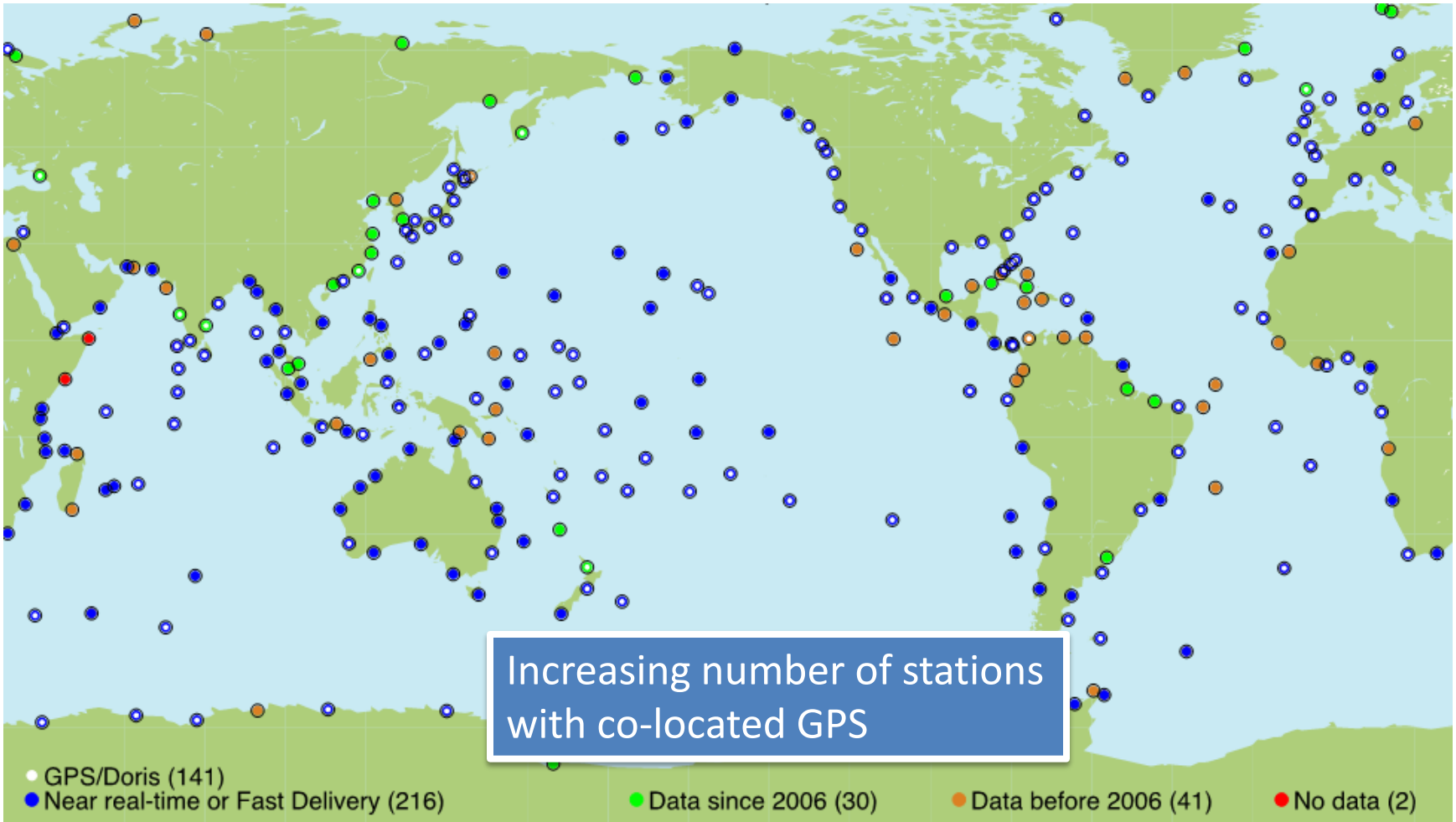
Global Ocean Ship-Based Hydrographic Investigators Program: GO-SHIP



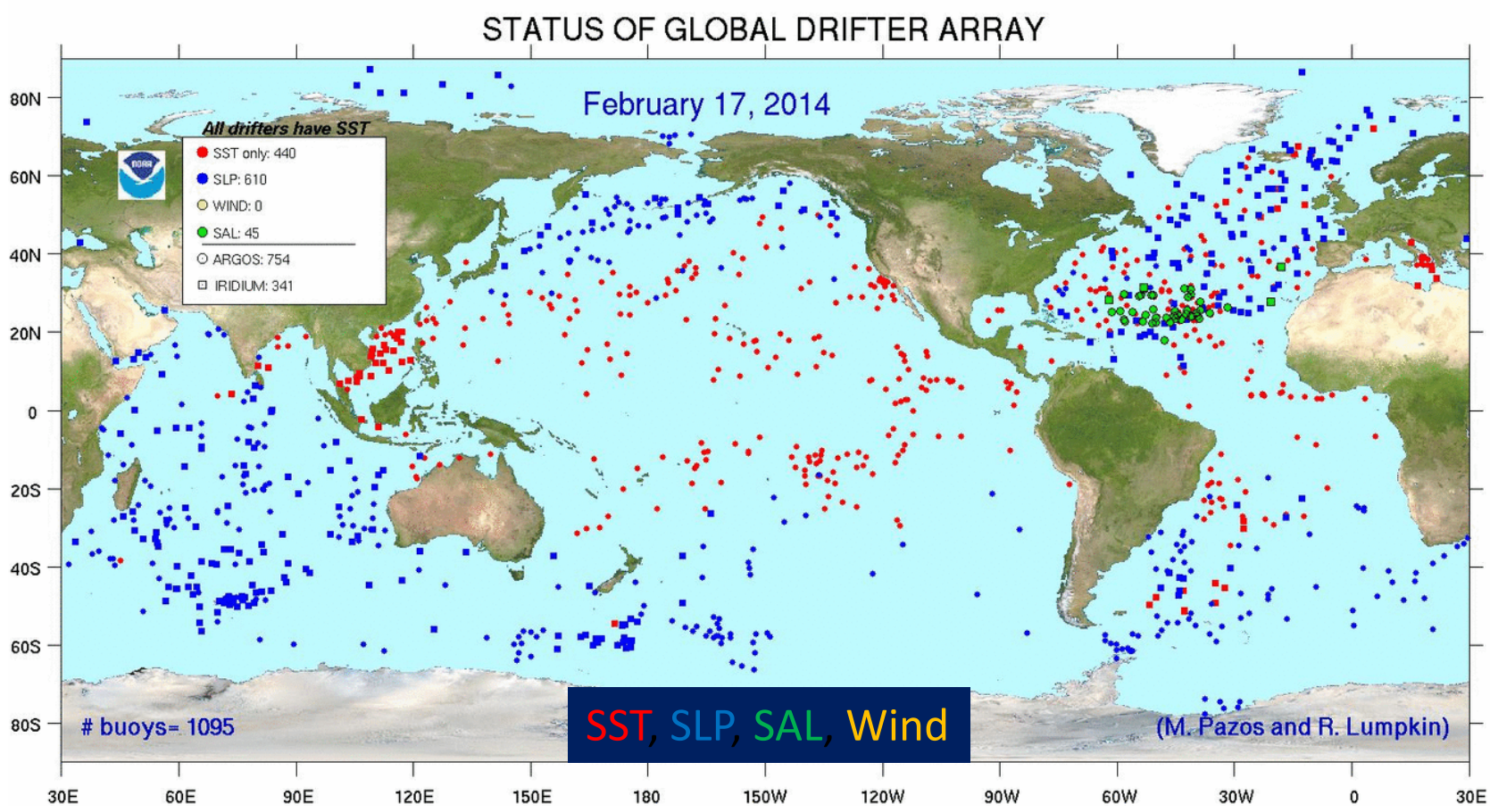
Another decade of hydrographic cruises are planned and being coordinated by GOSHIP….



Global Sea Level Observing System



Global Drifter Program



Providing critical in-situ information for SST calibration, ocean currents, and weather forecasting