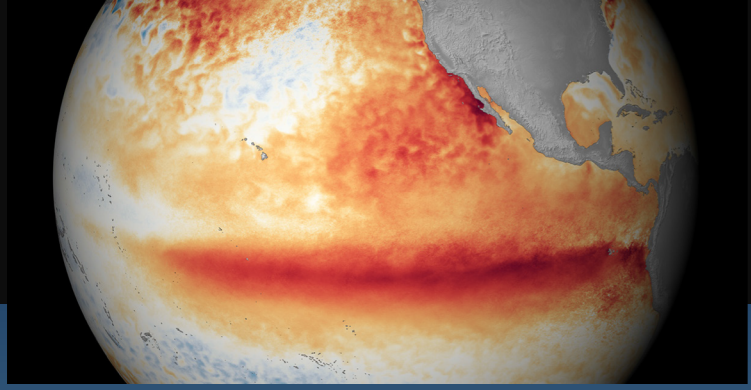
Physical Sciences Division (PSD)

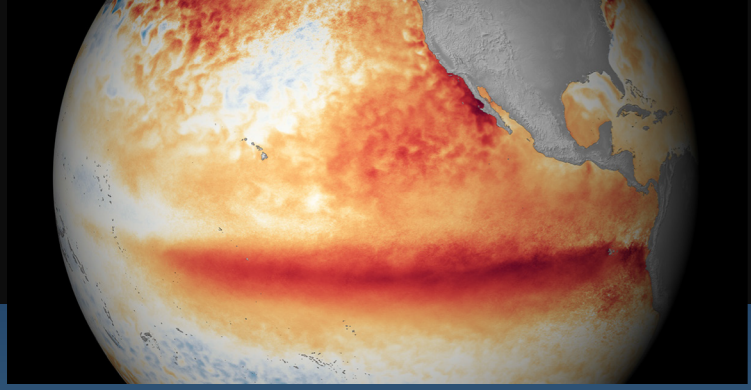


PSD analyzes and interprets physical processes that influence weather and climate from hours to decades to provide scientific information to support NOAA's mission.

PSD research strives improve predictions on weather-to-climate time scales (days to decades) by identifying early warning indicators in atmosphere and ocean patterns that cause extreme events (such as floods, droughts, and heat waves).

PSD conducts research to improve observations, understanding, modeling and predictions of weather, water and climate variations and extremes, and their related impacts.

Physical Sciences Division (PSD)



VISION: ***An informed society that uses science-based environmental intelligence to effectively anticipate and respond to threats and opportunities related to weather, water and climate extremes***

MISSION: ***Conduct scientific research to observe, understand, model, predict and forecast weather, water and climate extremes and their impacts***

PSD Selected capabilities

- Deploying existing observing technologies, and develop new technologies, to advance observation-based process understanding
- Analyzing data and information to provide diagnostic explanations and to advance predictive understanding of weather, water and climate extremes
- Developing and applying models to transform predictive understanding into capabilities to forecast and predict weather, water and climate extremes
- Transforming science-based knowledge into actionable science that is readily available to support operations, applications and decision making

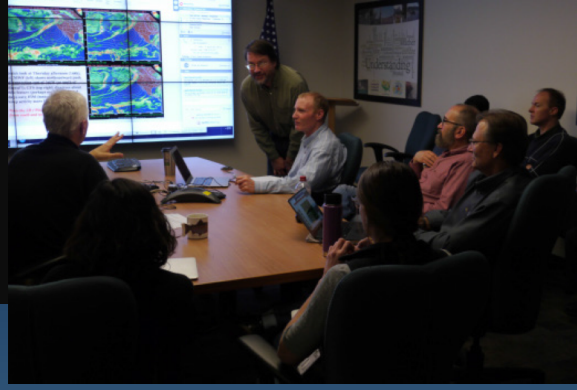
PSD Overarching Science Goals

- Develop new knowledge and capabilities to explain observed weather, water and climate extremes and their impacts to inform risk management and adaptation decisions.
- Identify new sources of predictive skill and improve predictions of weather, water, and climate extremes through observations, understanding and modeling of physical processes and phenomena of the coupled Earth system.

PSD Priority Research Foci

- Characterize and advance prediction of subseasonal-to-seasonal (S2S) extreme weather and climate to help NOAA meet mission responsibilities to provide early warning and informed preparedness.
- Enhance monitoring, observation-based understanding, and modeling capabilities to forecast hydrologic extremes (too much or too little water) critical to manage water resources.
- Increased monitoring, process understanding and prediction of environmental conditions impacting the marine resources.

PSD – What We Do



- Lead national and international field programs to observe and understand atmospheric behavior over land, oceans, ice, and snow.
- Identify early warning indicators in the Earth system to improve predictions of weather, water and climate extremes.
- Study and explain weather, water and climate extreme events by evaluating observed conditions and model simulations.
- Develop observing technologies, data analyses, and applications to support decision making for resource management
- Advance numerical representations of physical processes in forecast system models and evaluates performance to predict weather, water and climate extremes.

What is next for PSD

During the next five to ten years advancing prediction:

- Explain the underlying causes of recent weather, water and climate extremes and assess their predictability
- Advance the use of hydrometeorology observations and modeling in watersheds to improve scientific information for managing water resources
- Improve understanding of the physical processes underlying subseasonal-to-seasonal variability and extremes to improve predictive skill and forecast reliability
- Improve physical understanding of the causes of regional weather, water and climate extremes, their impacts, and evaluating model forecast performance
- Develop regionally-specific environmental information and forecast products to protect and manage marine resources

NOAA El Niño Rapid Response Field Campaign

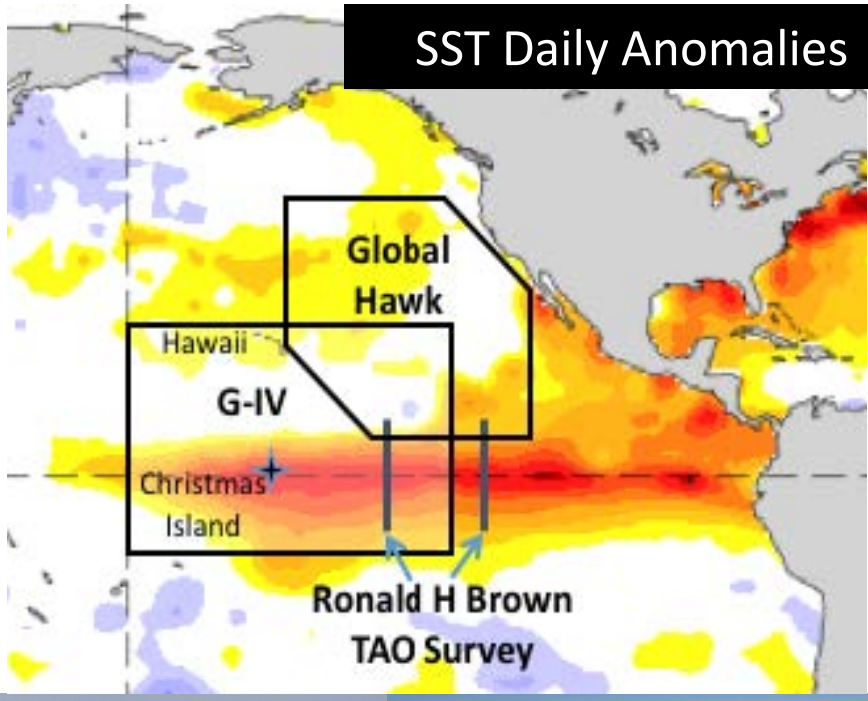
The 2015-2016 El Niño represented an unprecedented opportunity to accelerate advances in understanding and predictions of a major extreme climate event and its impacts.

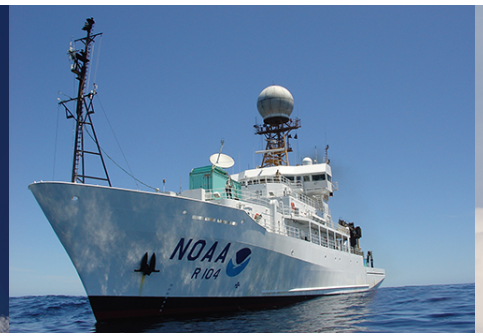
The multiplatform field campaign examined the response of the atmosphere to the warm ocean water at the heart of the very strong El Niño.

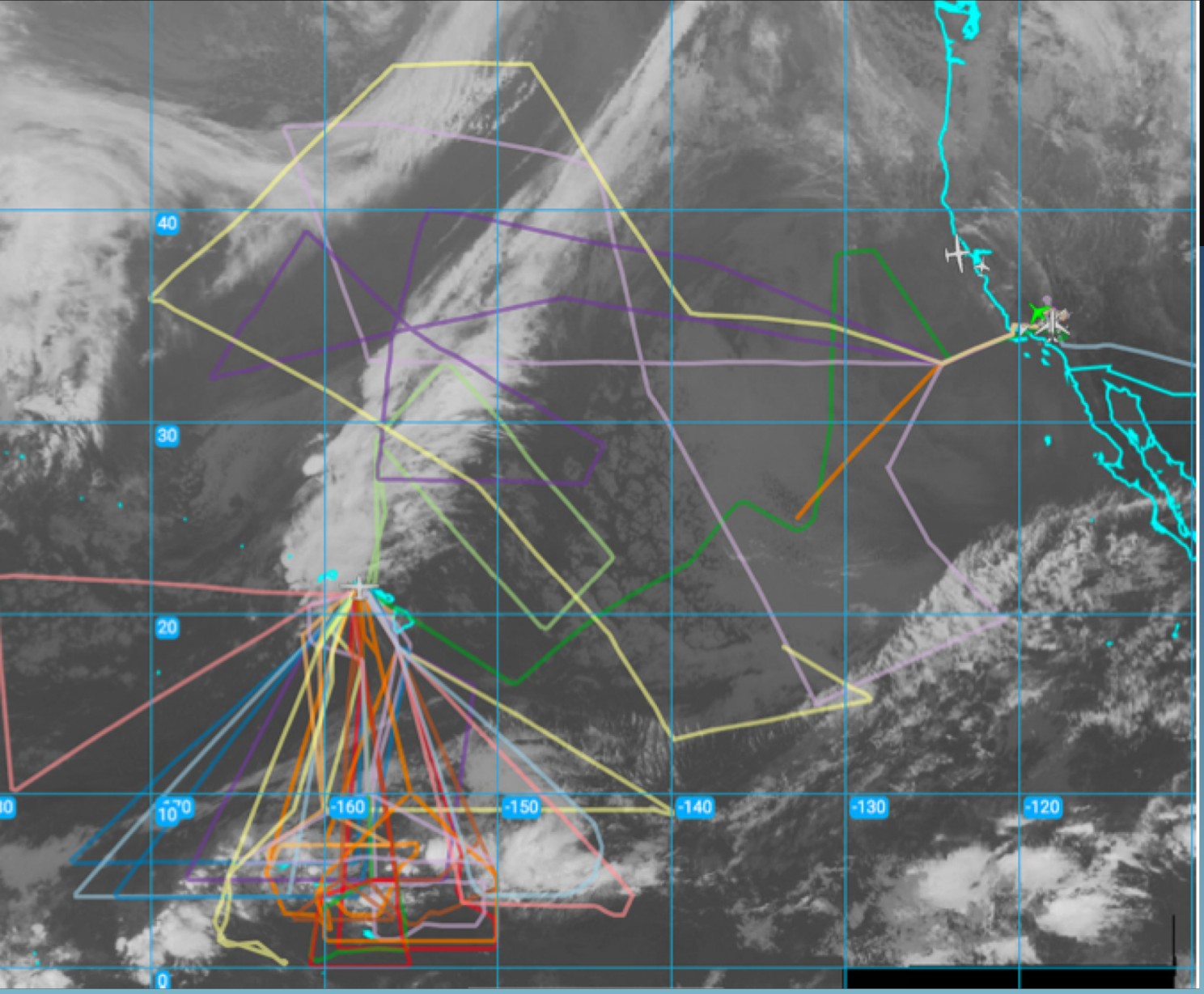
PSD-Led Field Campaign Observations:

- **sonde data were assimilated into NOAA's operational analyses and forecasts.**
- **will improve understanding of the chain of events leading to extreme weather.**
- **will be used by NOAA Research to guide weather forecast model development.**

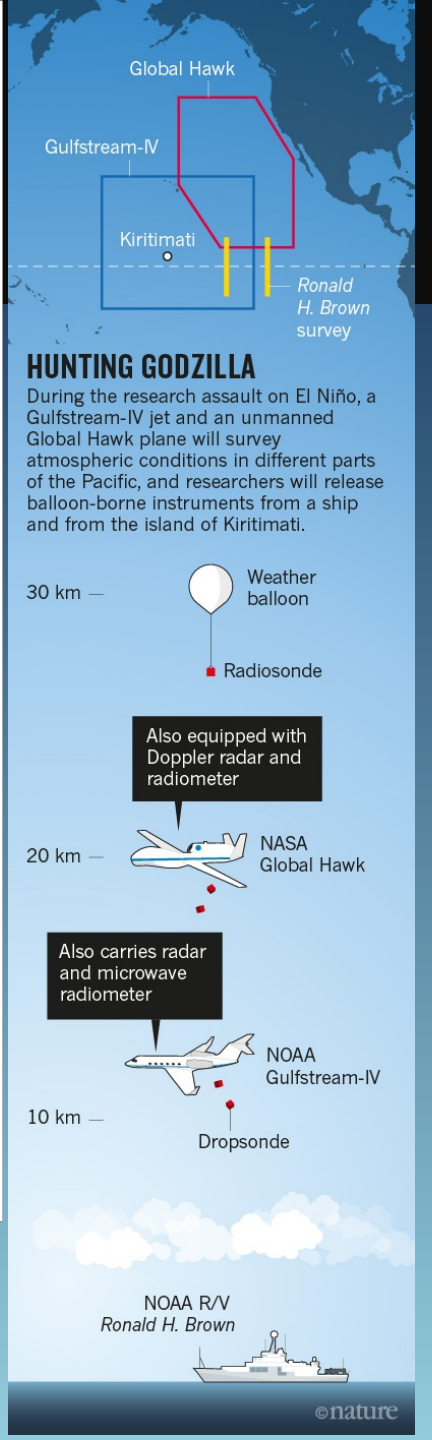
This NOAA effort was a prime example of cross-line collaboration and a pinnacle in Operations-to-Research supporting basic research.





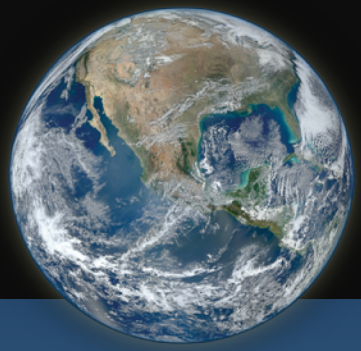


Tracks of all ENRR flights from
Jan 21, 2016 to Feb 25, 2016



PSD Water Resource Research Capabilities

- Analysis of atmosphere, cryosphere, land surface, and air- sea interface
  - Atmospheric profiling of clouds and precipitation
  - Soil moisture monitoring at a variety of scales (point to tens of kms)
  - Fluxes
- Use of observations to improve physical process understanding and guide model development for improved predictions
- Post processing and calibration of hydrologic forcings
- QPE algorithm development
- Data assimilation
- Assessment/evaluation of forcings used to drive the National Water Model
- Provision of scientific information necessary for cost-effective decision making
- Stochastic modeling of hydrological variables



PSD Water Resource Research Partnerships

Forecast-Informed Reservoir Operations (FIRO)

Collaborative research to develop prototype decision support resources to integrate the latest forecast techniques to help guide risk-based decision making for water management.

Advanced Quantitative Precipitation Information (AQPI)

Collaborative research to improve monitoring and forecasts of precipitation, streamflow, and coastal flooding in the San Francisco Bay Area.

National Integrated Drought Information System (NIDIS)

Collaborative research to examine the causes, predictability, and historical behavior of onset, duration, intensity and demise of drought in the U.S. and advance understanding what aspects of drought are predictable.

NOAA NWS National Water Center (NWC)

Collaborative research to enhance NOAA's water forecast capabilities for floods and droughts, improve preparedness for water-related disasters, and inform high-value water decisions at the local, state, and national levels.