NOAA Observations in the NE Pacific

Meghan Cronin – *NOAA PMEL Ocean Climate Stations*

(NOAA Station Papa surface mooring)

With contributions from

Adrienne Sutton ..... *NOAA PMEL Carbon Group*
Bob Dziak, Holger Klinck ..... *NOAA PMEL Acoustics Group*
Bill Chadwick, Dave Butterfield ..... *NOAA PMEL Earth-Ocean Interactions Group*
Eugene Burger ..... *NOAA PMEL Science Data Integration Group*

And Non-NOAA Papa partner

Jim Thomson ..... *UW APL Papa Waves*

www.pmel.noaa.gov/ocs/Papa/

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Ocean Climate Stations

Pacific Marine Environmental Laboratory

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

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Research

- Overview
- Kuroshio Extension Observatory
  - KEO Background
- Ocean Station Papa
  - Papa Background
  - Other Research at Papa
- Agulhas Return Current
  - ARC Background
- Air-Sea Fluxes

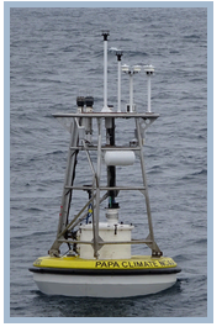
Related

Data Overview
It is the OCS project policy that timely, free, and unrestricted access shall

Moorings

Measurement Heig...
The tables below describe the nominal heights of meteorological measurements,

Ocean Station Papa



Current Anchor Position: 50° 3.3'N, 144° 52.4'W

Nominal Location: 50.1°N, 144.9°W

Mooring Type: Taut-Line

Scope: 0.965 (2015 -), 0.985 (2007 - 2014)

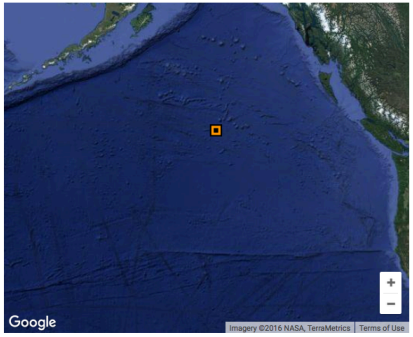
Watch Circle: 1.25km Radius

Avoidance Area: Ships working in the area are requested to observe an avoidance area of *at least 3NM radius (5.5km)* from the stated anchor position.

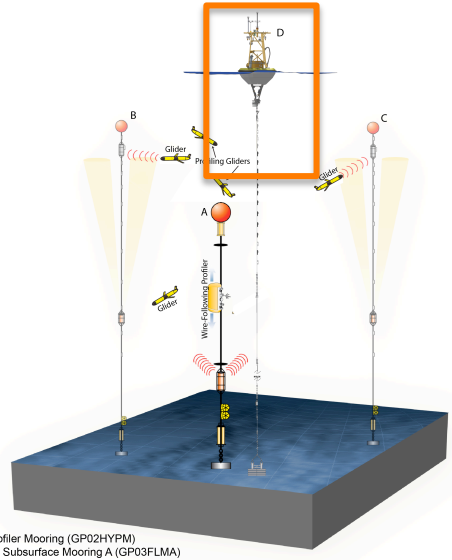
PMEL Metadata by Project

- Acoustic Monitoring Program
- Arctic Climate Dynamics
- Argo
- Atmospheric Chemistry
- Carbon Program:
  - Coastal and Regional
  - Moorings
  - Repeat Hydro
  - VOS
- EcoFOCI
- EOI:
  - MAPR
  - Colville Ridge
  - Chile Rise
  - Geotraces Research
  - Lau Basin
  - Mariana Arc
  - NE Pacific
  - Pacific Antarctic Ridge
- GTMBA
- NCTR
- Ocean Climate Stations
- Ocean Tracer
- Solomon Sea Glider

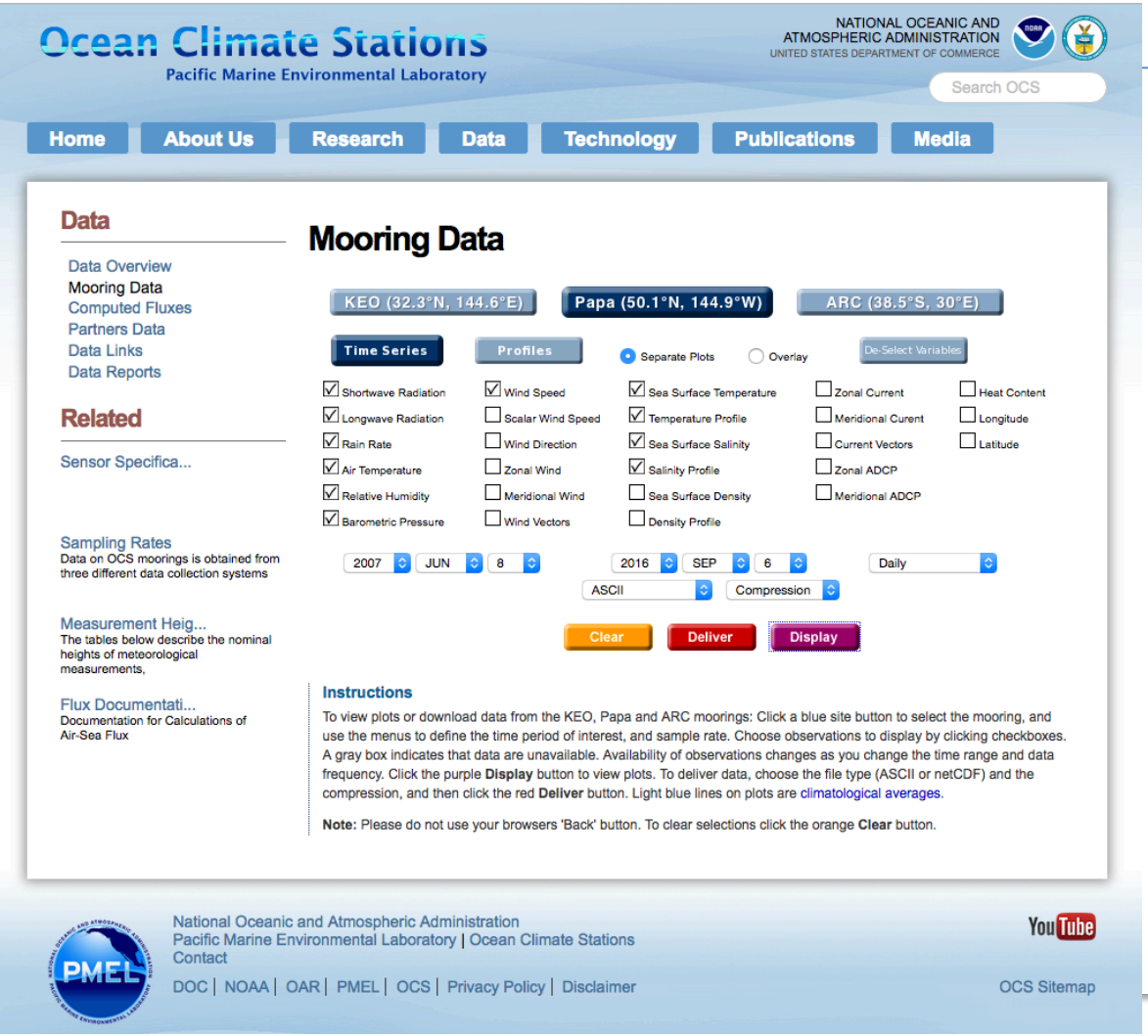
Data may take a few seconds to load, depending on your bandwidth.

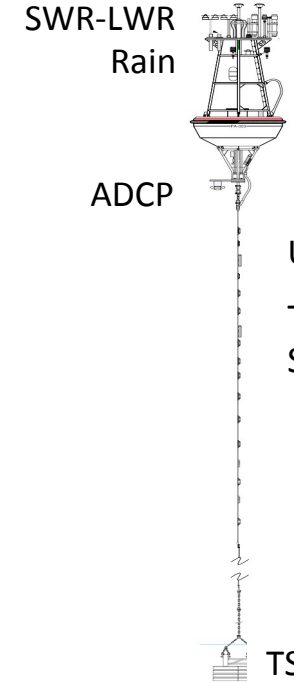


Global Station Papa



(A) Apex Profiler Mooring (GP02HYPM)
(B) Flanking Subsurface Mooring A (GP03FLMA)
(C) Flanking Subsurface Mooring B (GP03FLMB)
(D) NOAA PMEL Station Papa Surface Mooring
Mobile - Open Ocean Glider (GP05MOAS-GL)
Mobile - Global Profiling Glider (GP05MOAS-PG)





Met and physical sensors – Cronin

http://www.pmel.noaa.gov/ocs/

Ocean Climate Stations

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Data

- Data Overview
- Mooring Data
- Computed Fluxes
- Partners Data
- Data Links
- Data Reports

Related

- Sensor Specifica...

Sampling Rates
Data on OCS moorings is obtained from three different data collection systems

Measurement Heig...
The tables below describe the nominal heights of meteorological measurements,

Flux Documentati...
Documentation for Calculations of Air-Sea Flux

Mooring Data

KEO (32.3°N, 144.6°E) | Papa (50.1°N, 144.9°W) | ARC (38.5°S, 30°E)

Time Series | Profiles | Separate Plots | Overlay | De-Select Variables

☑ Shortwave Radiation	☑ Wind Speed	☑ Sea Surface Temperature	☐ Zonal Current	☐ Heat Content
☑ Longwave Radiation	☐ Scalar Wind Speed	☑ Temperature Profile	☐ Meridional Current	☐ Longitude
☑ Rain Rate	☐ Wind Direction	☑ Sea Surface Salinity	☐ Current Vectors	☐ Latitude
☑ Air Temperature	☐ Zonal Wind	☑ Salinity Profile	☐ Zonal ADCP	
☑ Relative Humidity	☐ Meridional Wind	☐ Sea Surface Density	☐ Meridional ADCP	
☑ Barometric Pressure	☐ Wind Vectors	☐ Density Profile		

2007 | JUN | 8 — 2016 | SEP | 6 — Daily

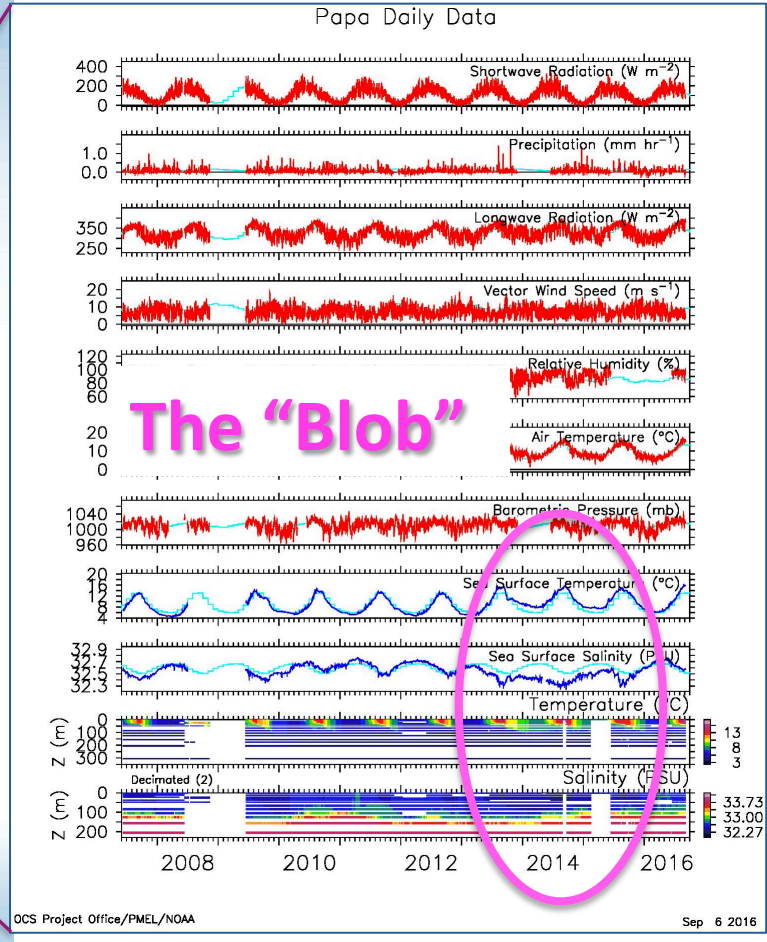
ASCII | Compression

Clear | Deliver | Display

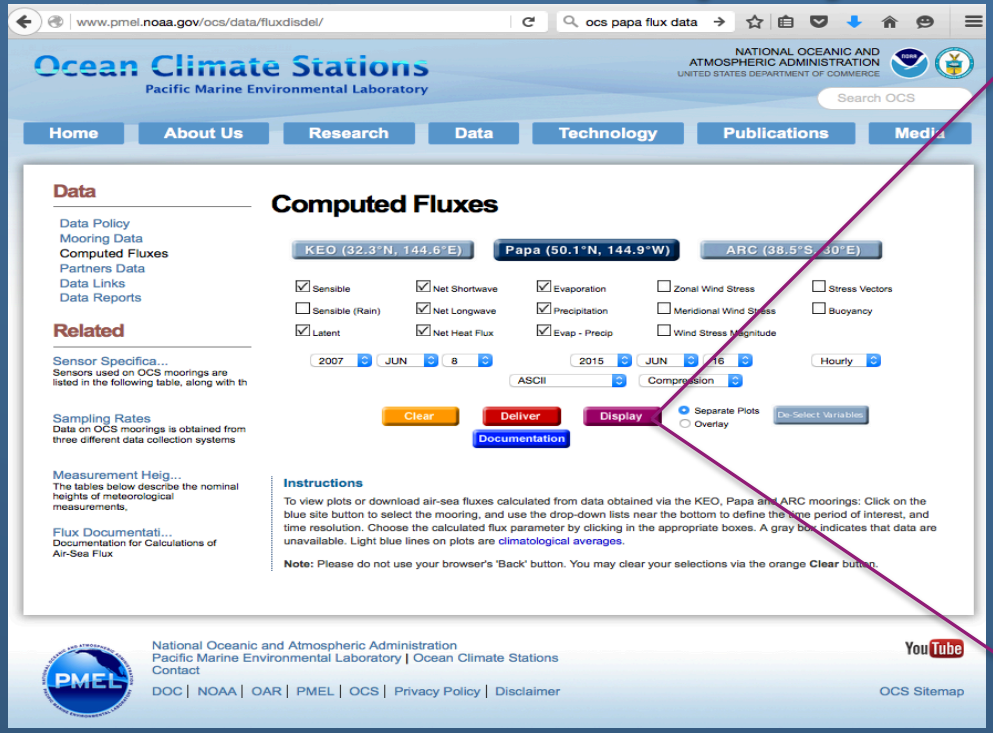
Instructions

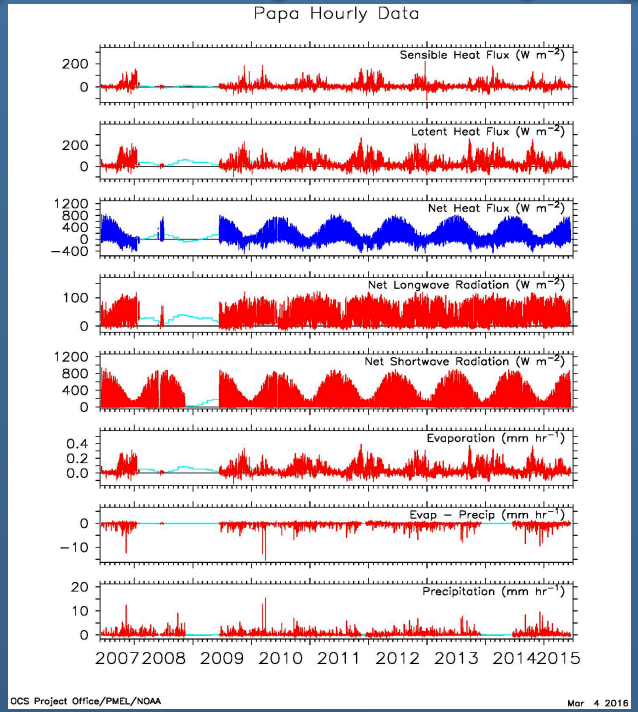
To view plots or download data from the KEO, Papa and ARC moorings: Click a blue site button to select the mooring, and use the menus to define the time period of interest, and sample rate. Choose observations to display by clicking checkboxes. A gray box indicates that data are unavailable. Availability of observations changes as you change the time range and data frequency. Click the purple **Display** button to view plots. To deliver data, choose the file type (ASCII or netCDF) and the compression, and then click the red **Deliver** button. Light blue lines on plots are climatological averages.

Note: Please do not use your browsers 'Back' button. To clear selections click the orange **Clear** button.



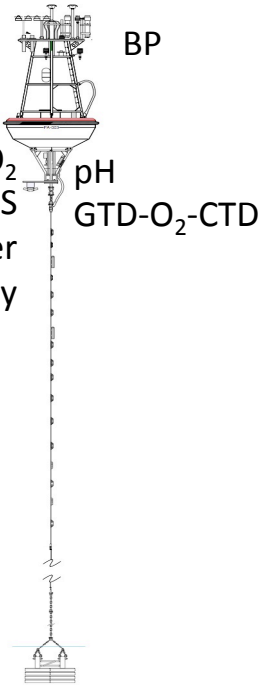
Surface Flux Display and Delivery Webpage





Hourly surface met data are used with COARE v3.0 bulk algorithm to compute all components of the air-sea fluxes of heat, moisture, and momentum.

NOAA Station Papa Mooring



cdiac.ornl.gov/oceans/Moorings/Papa_145W_50N.html

cdiac papa

Ocean CO_2
Carbon Dioxide Information Analysis Center

Oceans Home | General Information | Carbon Data | Data Search | Submit Data | Publications | Links

CO_2 Moorings and Time Series Project

Mooring: Papa_145W_50N (Buoy Position: 50.12°N, 144.83°W)

Data Set Name	Graphics	Platform	Place	Deployments	Carbon-related data Contributor	Variables ... Data Set	...	Project Link
Papa_145W_50N_Jun2007_Jun2008; Papa_145W_50N_Jun2008_Nov2008; Papa_145W_50N_Jun2009_Mar2010; Papa_145W_50N_Jun2010_Jun2011; Papa_145W_50N_Jun2011_Apr2012; Papa_145W_50N_Jun2012_Mar2013; Papa_145W_50N_Jun2013_Jun2014	See real time data graphics for this mooring	Papa_145W_50N	Pacific Ocean	Jun2007_Jun2008; Jun2008_Nov2008; Jun2009_Mar2010; Jun2010_Jun2011; Jun2011_Apr2012; Jun2012_Mar2013; Jun2013_Jun2014	Adrienne Sutton / PMEL	SST, SSS, Atm. press, xCO_2 water, xCO_2 air, fCO_2 water, fCO_2 air	Data files Metadata	PMEL Buoys and Autonomous Systems

... Series Line P (underway m...

Vessel	Country	Map
R/V *John P. Tully*, R/V *Quadra*, R/V *Vancouver*, CCGS *Parizeau* See cruise table	Canada	See map

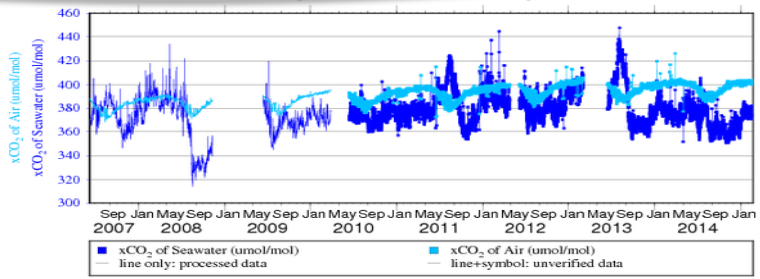
CLIVAR Repeat Section Line P (d...

Data Set Name	Country/Status	Research Vessel
Line P (See map)	Canada / Completed	R/V *John P. Tully*

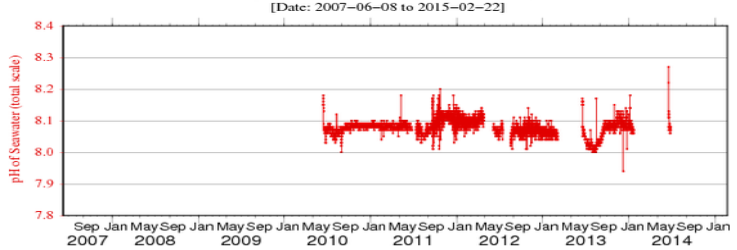
R/V *John P. Tully* 1989 Cruise

Vessel	Country	Map	Ports
R/V *John P. Tully*	Canada	See map	Sidney BC - ... Sea - Sidne...

xCO_2 of Seawater & xCO_2 of Air @ Papa (...50N)
[... 2007-06-08 to 2015-02-22]



pH of Seawater @ Papa (145W,50N)
[Date: 2007-06-08 to 2015-02-22]

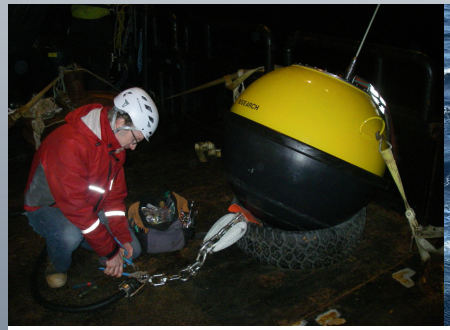


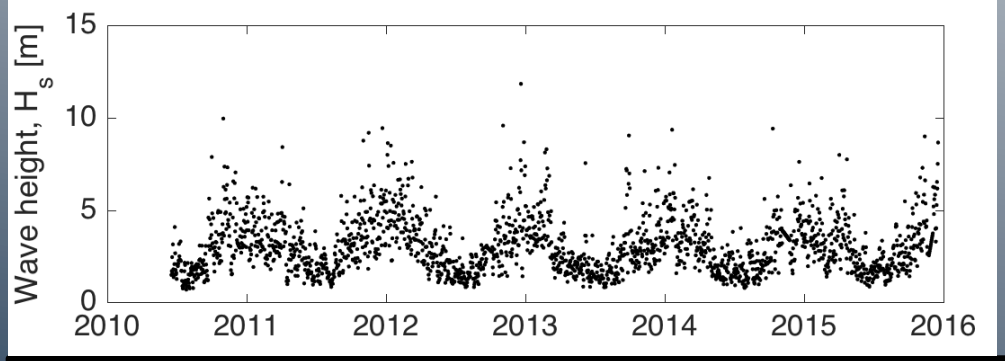
$pCO_{2\ (air\ and\ sw)}$, pH, Fluorometer-Turbidity -- A. Sutton
GTD-O_2-CTD -- S. Emerson

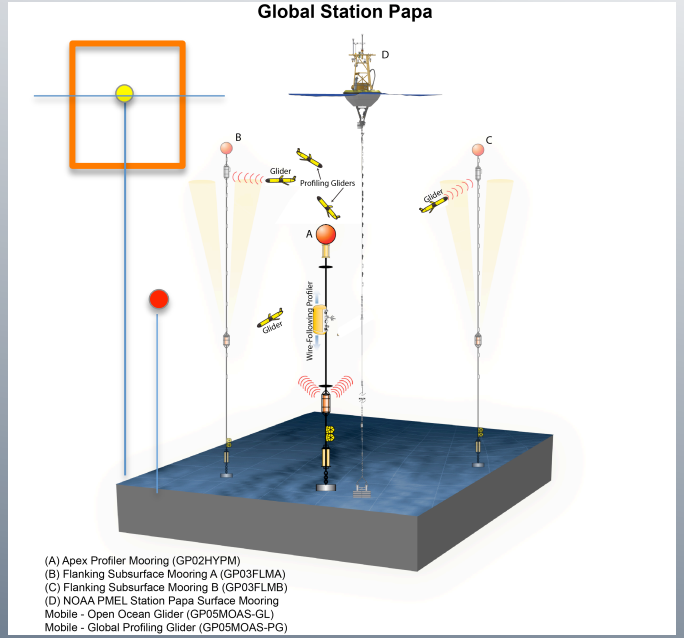
http://www.pmel.noaa.gov/co2/story/Papa

NSF-funded Directional Wave Measurements at Papa

PI: Jim Thomson (jthomson@apl.uw.edu)





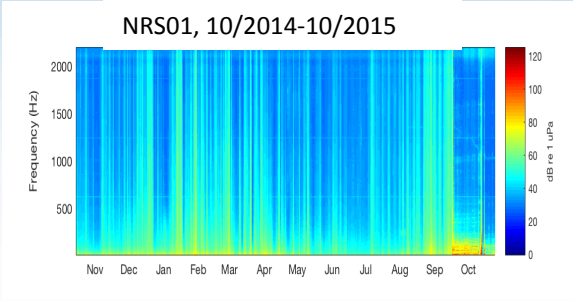


DATA AVAILABLE IN NEAR-REALTIME AS CDIP STATION 166:

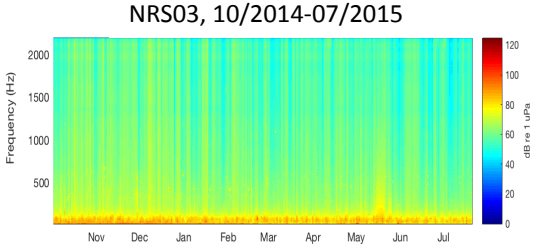
http://cdip.ucsd.edu/?stn=166&stream=p1&nav=recent&sub=observed&xitem=wwave

Long Term Spectrograms of Sound from 3 NE Pacific Hydrophones (Noise Reference Stations)

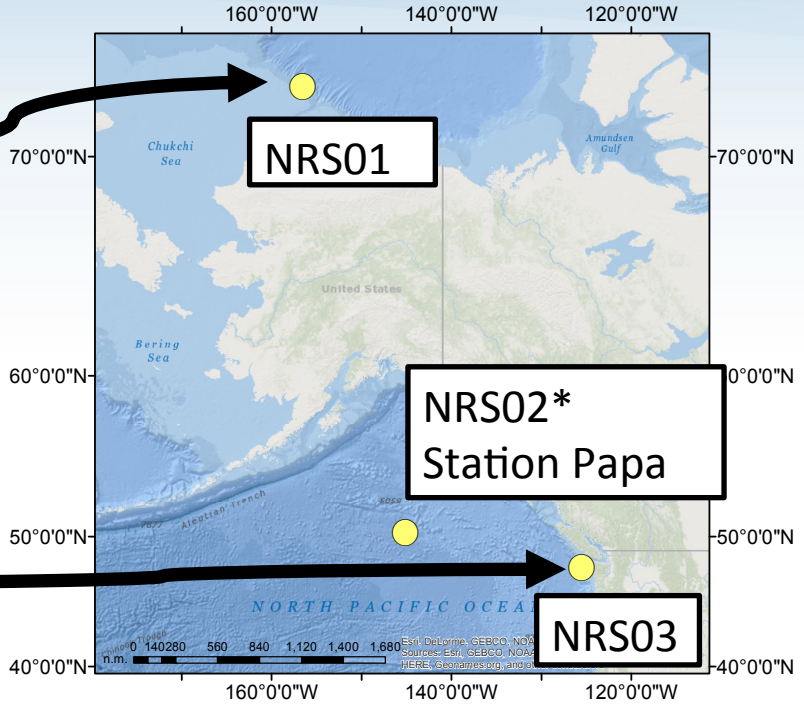
PIs: Bob Dziak and Holger Klink (NOAA PMEL)



- Lower sound levels overall
- Seasonal variation in levels likely due to sea ice



- Higher broadband noise levels
- Close proximity to a major shipping lane



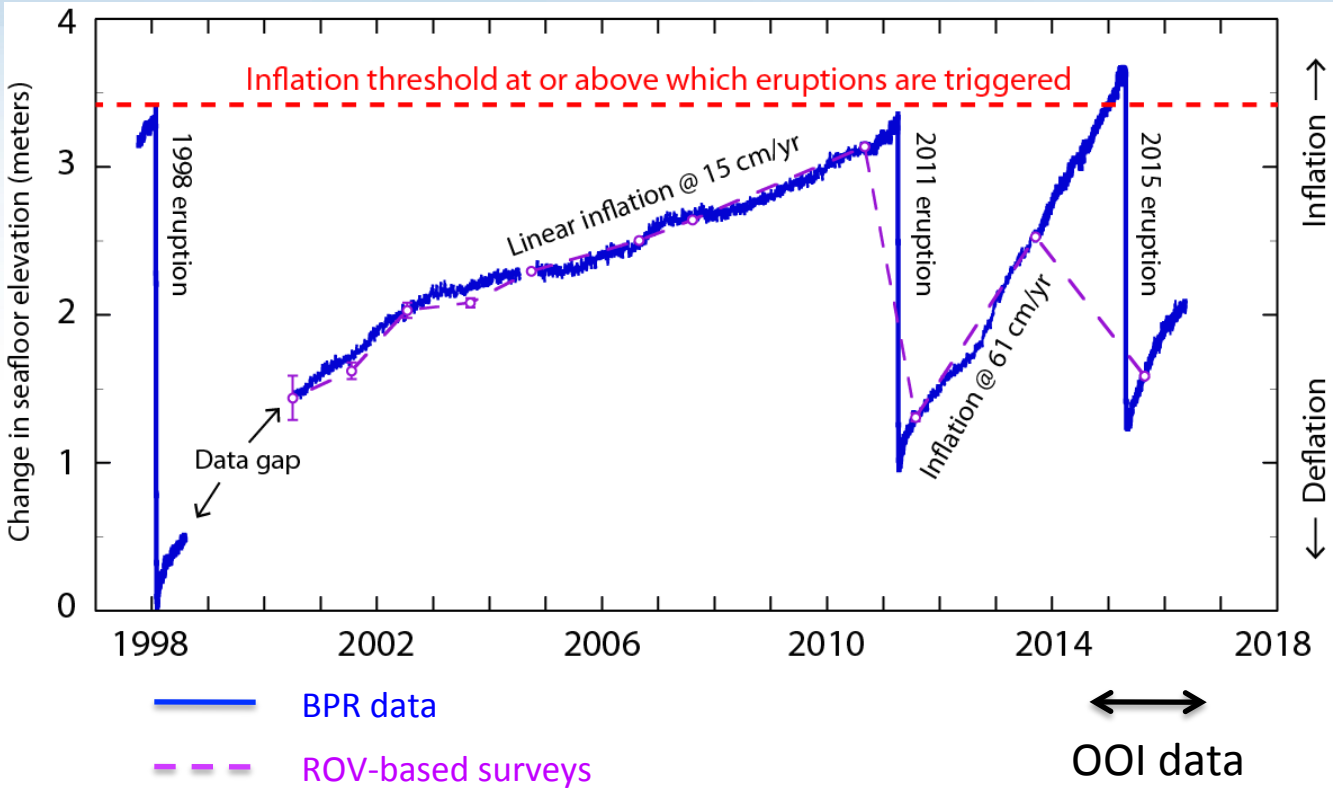
* NRS02 (OS Papa Mooring) data available soon

NOAA Observations in the Cabled Arrays

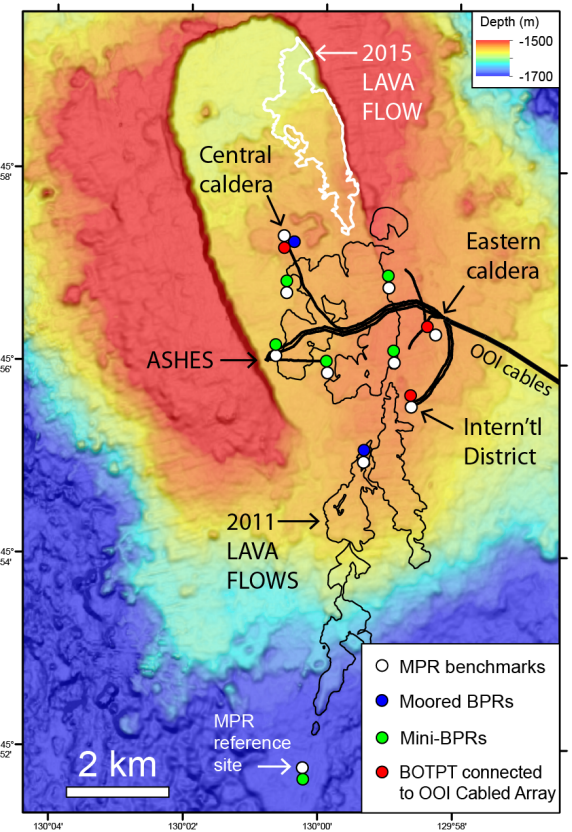
Earth-Oceans Interactions

- Axial Seamount Volcano inflation/deflation time-series started by NOAA PMEL in 1997 provides context for OOI Cabled Array data.

- Seafloor geodesy studies at Axial Seamount have been a joint NOAA-NSF project for many years (**PIs: Bill Chadwick, OSU & Scott Nooner, UNCW**)



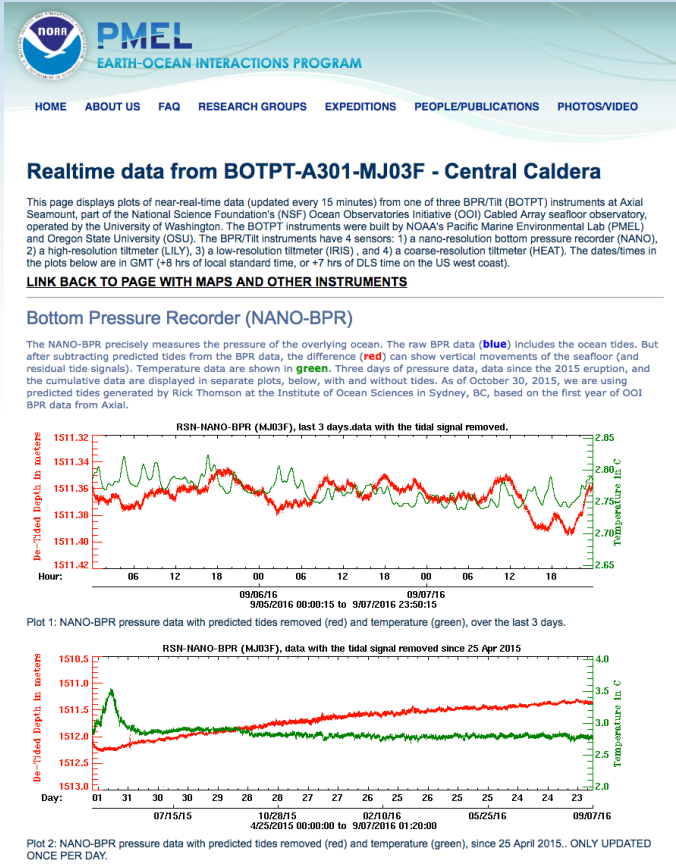
Earth-Oceans Interactions



- Six uncabled BPR stations augment the 3 OOI Cabled Array BPR stations. Non-cabled BPR data are available at Marine Geoscience Data System (MGDS)

- Plots of real-time OOI Cabled Array data from 3 BPR/Tilt instruments at Axial Seamount are available at: www.pmel.noaa.gov/eoi/rsn/

- **More info at Bill Chadwick's poster**


PMEL
EARTH-OCEAN INTERACTIONS PROGRAM

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Realtime data from BOTPT-A301-MJ03F - Central Caldera

This page displays plots of near-real-time data (updated every 15 minutes) from one of three BPR/Tilt (BOTPT) instruments at Axial Seamount, part of the National Science Foundation's (NSF) Ocean Observatories Initiative (OOI) Cabled Array seafloor observatory, operated by the University of Washington. The BOTPT instruments were built by NOAA's Pacific Marine Environmental Lab (PMEL) and Oregon State University (OSU). The BPR/Tilt instruments have 4 sensors: 1) a nano-resolution bottom pressure recorder (NANO), 2) a high-resolution tiltmeter (LILY), 3) a low-resolution tiltmeter (IRIS) , and 4) a coarse-resolution tiltmeter (HEAT). The dates/times in the plots below are in GMT (+8 hrs of local standard time, or +7 hrs of DLS time on the US west coast).

LINK BACK TO PAGE WITH MAPS AND OTHER INSTRUMENTS

Bottom Pressure Recorder (NANO-BPR)

The NANO-BPR precisely measures the pressure of the overlying ocean. The raw BPR data (**blue**) includes the ocean tides. But after subtracting predicted tides from the BPR data, the difference (**red**) can show vertical movements of the seafloor (and residual tide signals). Temperature data are shown in **green**. Three days of pressure data, data since the 2015 eruption, and the cumulative data are displayed in separate plots, below, with and without tides. As of October 30, 2015, we are using predicted tides generated by Rick Thomson at the Institute of Ocean Sciences in Sydney, BC, based on the first year of OOI BPR data from Axial.

Plot 1: NANO-BPR pressure data with predicted tides removed (red) and temperature (green), over the last 3 days.

Plot 2: NANO-BPR pressure data with predicted tides removed (red) and temperature (green), since 25 April 2015.. ONLY UPDATED ONCE PER DAY.

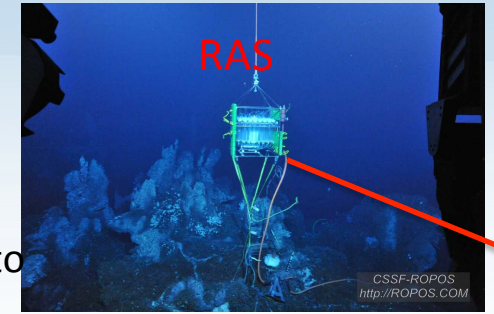
Time-Series Chemistry/Microbiology Sampling

PI: David Butterfield (NOAA PMEL)

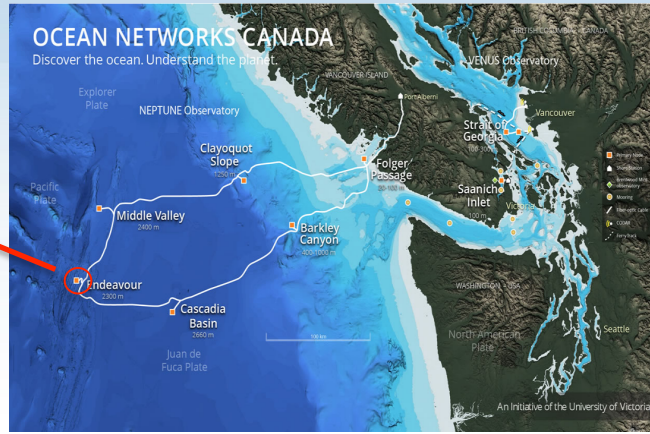
PPS (DNA)

OOI and ONC are using time-series samplers controlled from shore to track chemistry and microbiology in hydrothermal vents. How to make chemistry data available is under discussion.

Remote Access Sampler (chemistry)

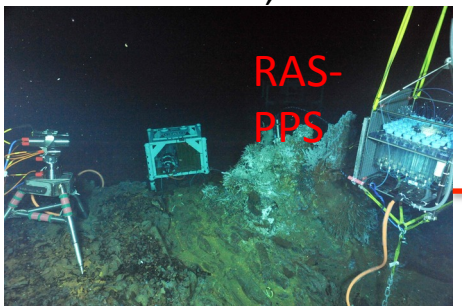


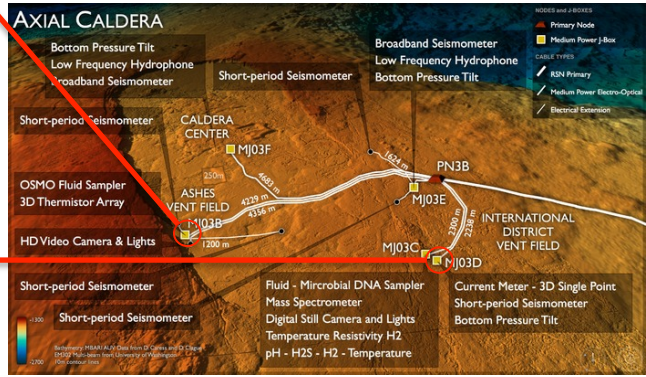
Grotto Vent, MEF RAS



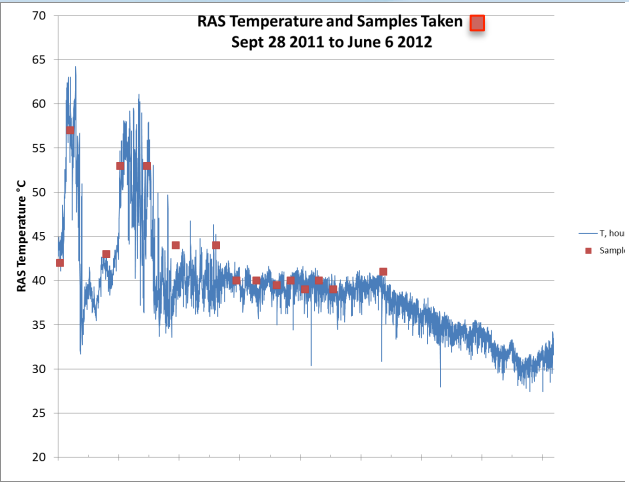
Continuous Osmosampler

El Gordo Vent, Axial

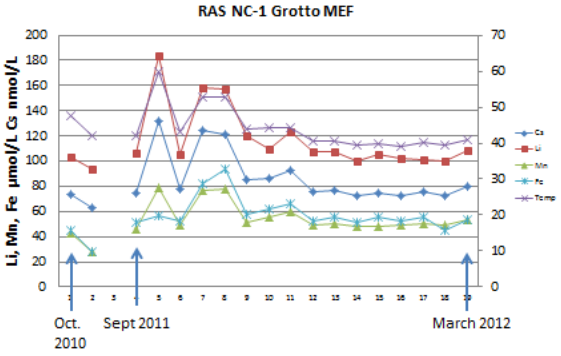




Chemistry Results from RAS



2010-2012, Alkalies, Mn, Fe



Endeavour-Grotto: many large T fluctuations over 2 yrs. Corresponding variations in hydro-thermal component. Results shared with ONC, plan to publish a dataset for public access.

The first OOI-cabled RAS/PPS deployed 2014 and recovered 2015 from Axial has been processed and chemistry results delivered to OOI. The second OOI-RAS/PPS recovered in 2016 is still being processed and results are not in. **For details, see poster by Butterfield.**

Explore NOAA PMEL's data at:
http://www.pmel.noaa.gov/public/pmel/globe/

PMEL Metadata by Project

- ☑ Acoustic Monitoring Program
- ☑ Arctic Climate Dynamics
- ☑ Argo
- ☑ Atmospheric Chemistry

Carbon Program:

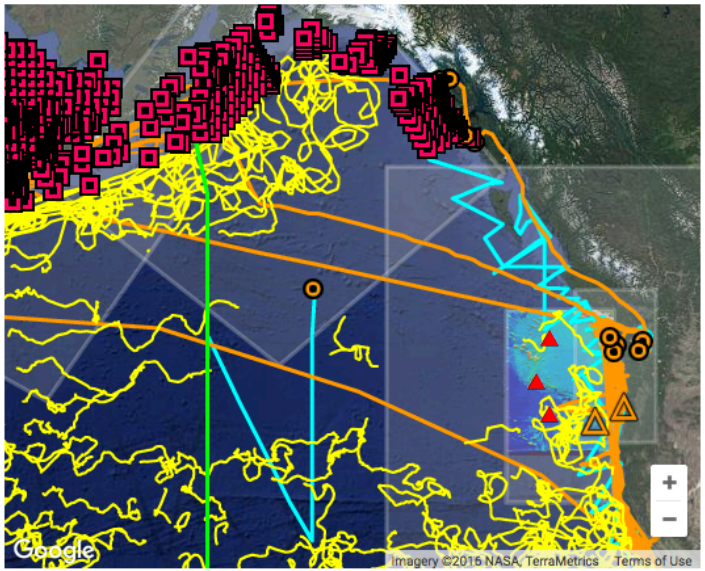
- ☑ Coastal and Regional
- ☑ Moorings
- ☑ Repeat Hydro
- ☑ VOS

- ☑ EcoFOCI

EOI:

- ☑ MAPR
- ☑ Colville Ridge
- ☑ Chile Rise
- ☑ Geotraces Research
- ☑ Lau Basin
- ☑ Mariana Arc
- ☑ NE Pacific
- ☑ Pacific Antarctic Ridge

- ☑ GTMBA
- ☑ NCTR
- ☑ Ocean Climate Stations
- ☑ Ocean Tracer
- ☑ Solomon Sea Glider



Data may take a few seconds to load, depending on your bandwidth.

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Geophysical Research Letters
AN AGU JOURNAL

Special Collections:

Midlatitude Marine Heatwaves: Forcing and Impacts

Persistent, midlatitude marine heatwaves (MHWs), such as the 2013-2014 extreme warming of the Northeastern Pacific (aka “the Blob”), can have dramatic and widespread impacts on ecosystems, fisheries and weather. MHWs have been observed in both hemispheres (e.g., the Ningaloo Niño in Western Australia), including in semi-enclosed basins such as the Mediterranean Sea. MHWs can be caused by a combination of atmospheric and oceanographic processes. It is also expected that they will become more frequent and intense under anthropogenic climate change. This Special Collection welcomes papers investigating the causes, evolution, and impacts of persistent midlatitude MHWs.

Joint with: JGR-Oceans, GRL, JGR-Atmosphere, JGR-Biogeosciences