An ocean observatory for multidisciplinary studies at Station Papa

Meghan F. Cronin[1], Nathan D. Anderson[1,2], Patrick Berk[1,2], Robert Dziak[3], James Edson[5], Kee Onn Fong[1,2], Catherine Kohlman[4,2], Marie Robert[6], Tetjana Ross[6], Carlos Hernandez Santiago[1,2,7], Yolande Serra[1,2], Adrienne J. Sutton[1,2], Jim Thomson[8], Jie Yang[8], and Dongxiao Zhang[1,2]

Affiliations:

1. NOAA Pacific Marine Environmental Laboratory, Seattle WA USA. Email: Meghan.F.Cronin@noaa.gov
2. University of Washington Cooperative Institute for Climate, Ocean, and Ecosystem Studies, Seattle WA USA
3. NOAA Pacific Marine Environmental Laboratory, Newport OR USA
4. University of Washington, School of Oceanography, Seattle WA USA
5. Woods Hole Oceanographic Institution's Ocean Observatory Initiative, Woods Hole MA USA
6. Fisheries and Oceans Canada, Institute of Ocean Science, Sidney BC CANADA
7. Bowdoin College, Brunswick ME USA
8. University of Washington Applied Physics Laboratory, Seattle WA USA

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

PICES-2026 Annual Meeting | Nanaimo, BC Canada | 26 October 2026



OS Papa Mooring

Wave observations going back to 1950

Ocean Weather Ship Papa,
image from facebook post



Jim Thomson, *Scientist at Work,*
NYTimes blogpost

SCIENTIST AT WORK

FEB 15, 2013

Mooring Deployed, Now We Wait

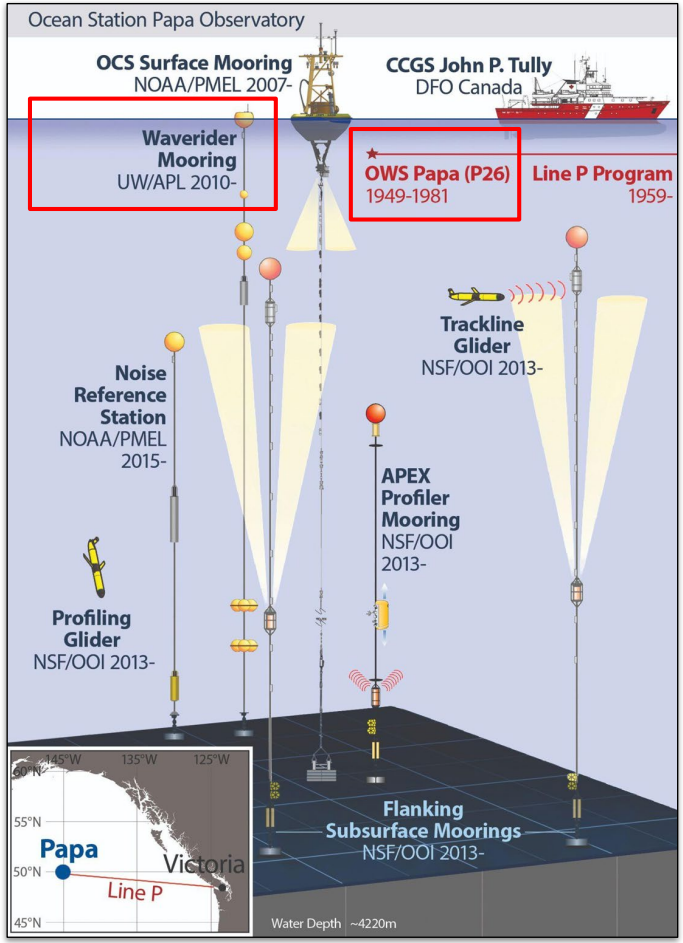
BY JIM THOMSON



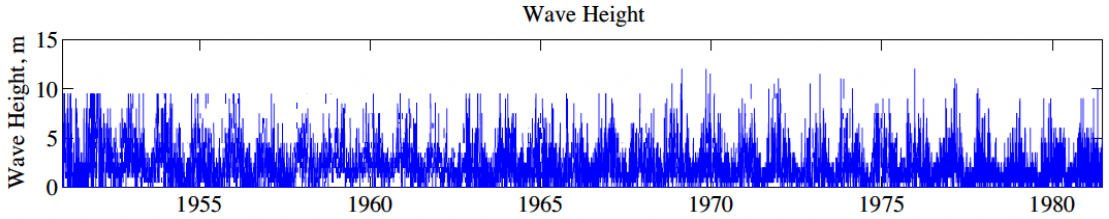
Deploying a mooring to measure turbulence in the Canal de Chacao. Nils Lindeen



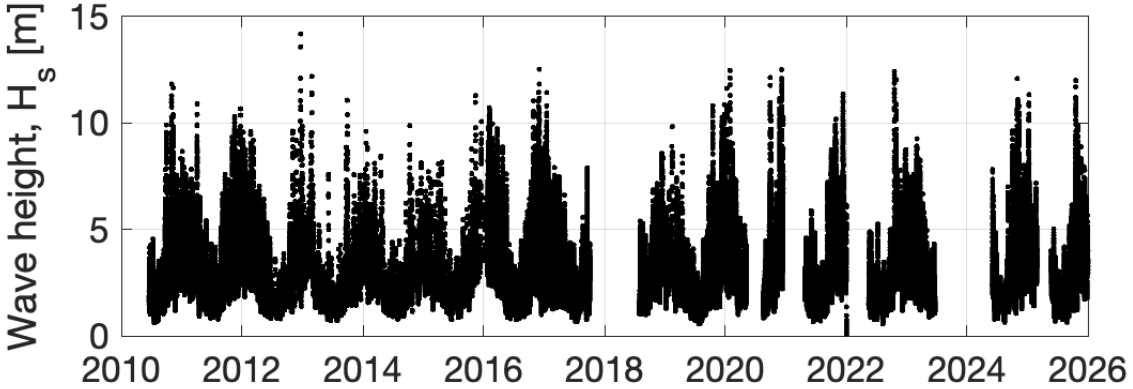
Jim Thomson is principal oceanographer at the Applied Physics Lab at the University of Washington. He studies ocean surface waves and coastal processes and wrote about his expedition to the North Pacific in the fall.

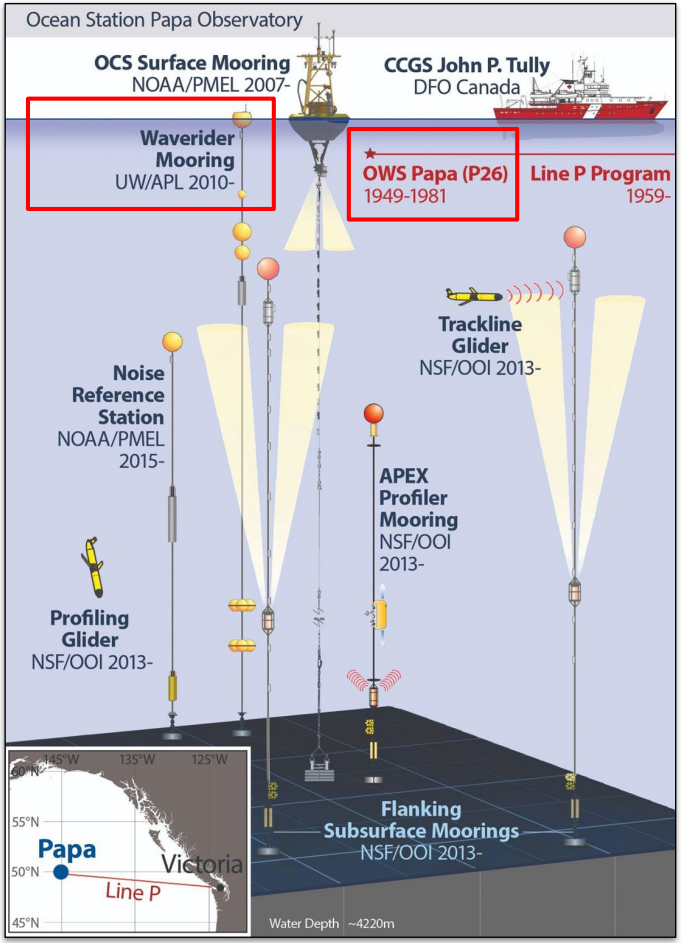


Wave observations going back to 1950



Belka et al. (2013)





www.apl.uw.edu/owsp and CDIP 166 / NDBC 46246

https://cdip.ucsd.edu/themes/cdip?zoom=auto&tz=UTC&ll_fmt=dm&numcolorbands=10&palette=cdip_classic&high=6.096&r=999&un=1&pb=1&u2=s:166:st:1&d2=p70

Changing Rain & Evaporation **Climatologies**

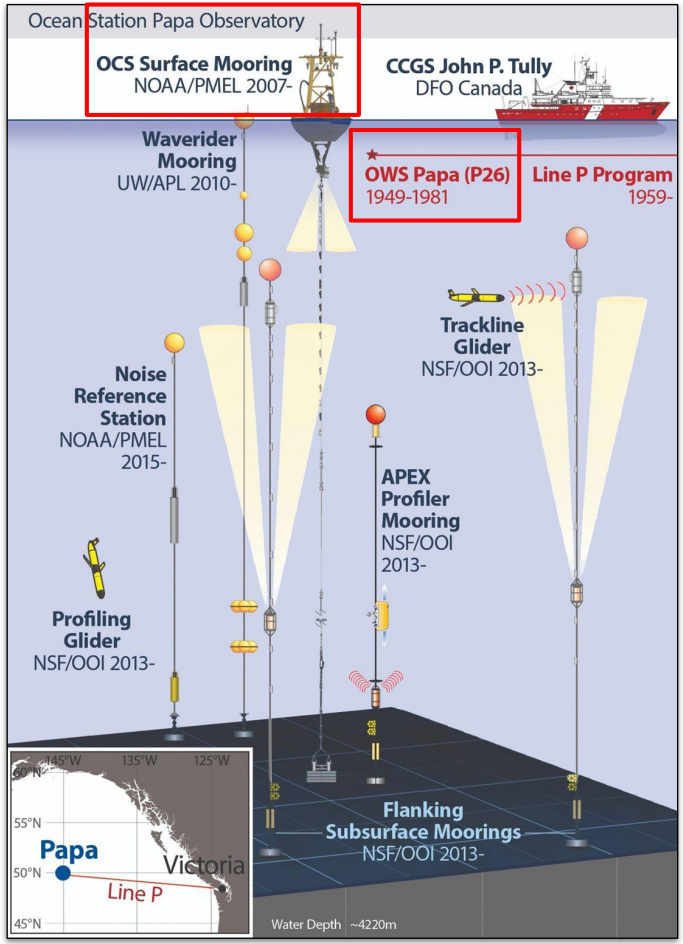
OWS Papa (1954-1970) vs. NOAA surface mooring (2007-2025)

Ocean Weather Ship Papa,
image from facebook post



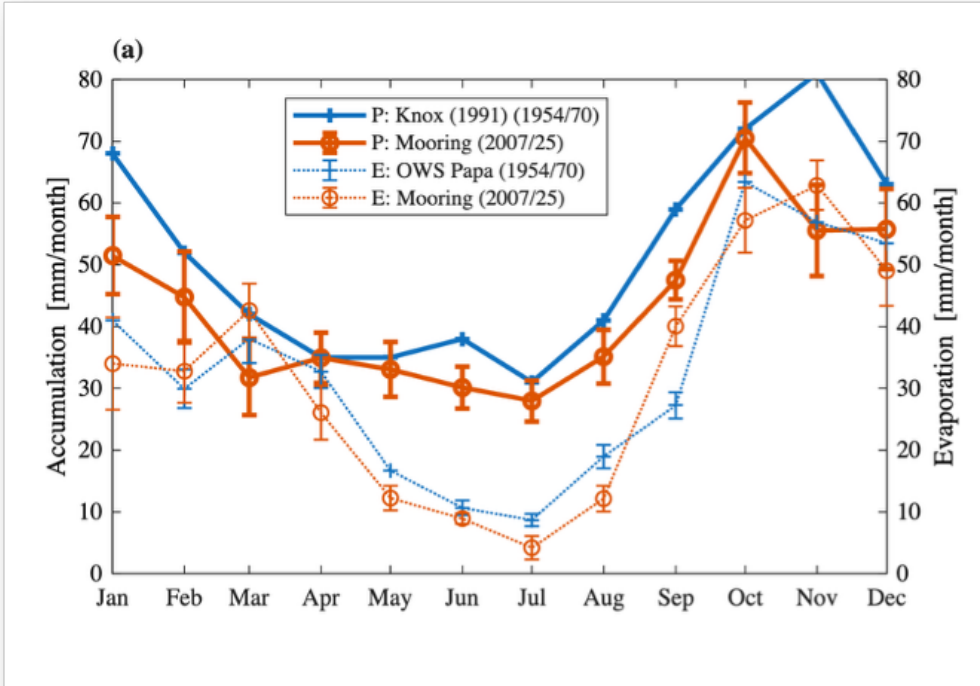
NOAA PMEL Ocean Climate Station team:
Dongxiao Zhang, Nathan Anderson, Meghan Cronin, Patrick Berk, Yolande Serra

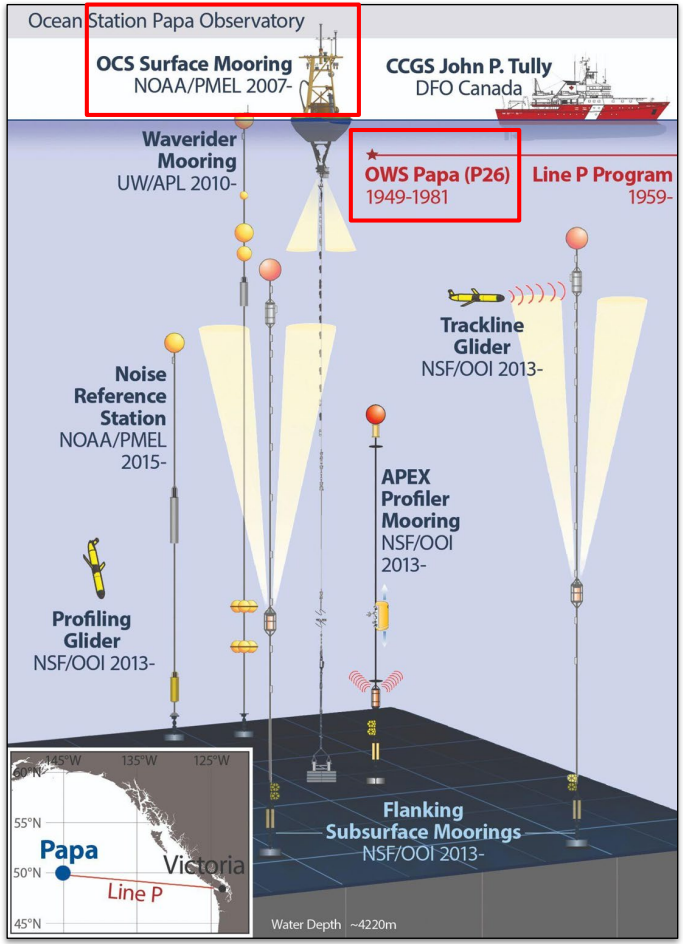




Changing Rain & Evaporation **Climatologies**

OWS Papa (1954-1970) vs. **NOAA surface mooring (2007-2025)**





Next talk (Yolande Serra): The “Fresher” got “Drier” over 7-decades at Ocean Station Papa in the northeast Pacific

Multiple Ocean Acoustic Observations



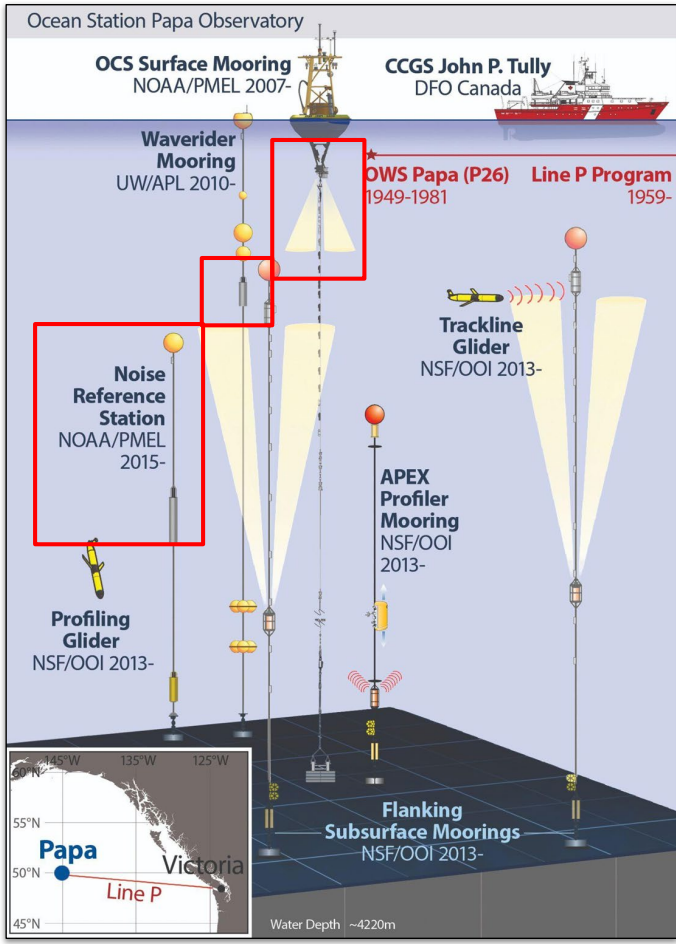
Bob Dziak (NOAA PMEL)
Noise Reference Station mooring (*passive acoustics*): Long-term ocean sound trends, bio-acoustics

Jie Yang (UW APL)
Passive Aquatic Listening (PAL) Device: Weather, environmental ambient sound





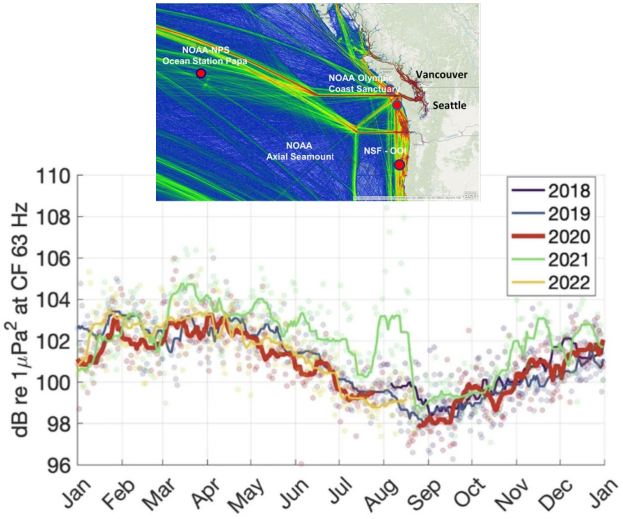
Kee Onn Fong (UW CICOES)
Nortek Signature-500 ADCP direct beam/echo sounder (*active acoustics*): Bubbles, zooplankton, fish reflectors



Ocean Noise is Monitored at Papa

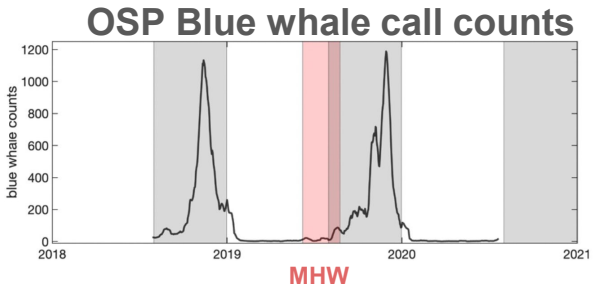
Pandemic related drop in container-ship traffic reduced ambient sound levels by 2 dB (30%) across the North Pacific.

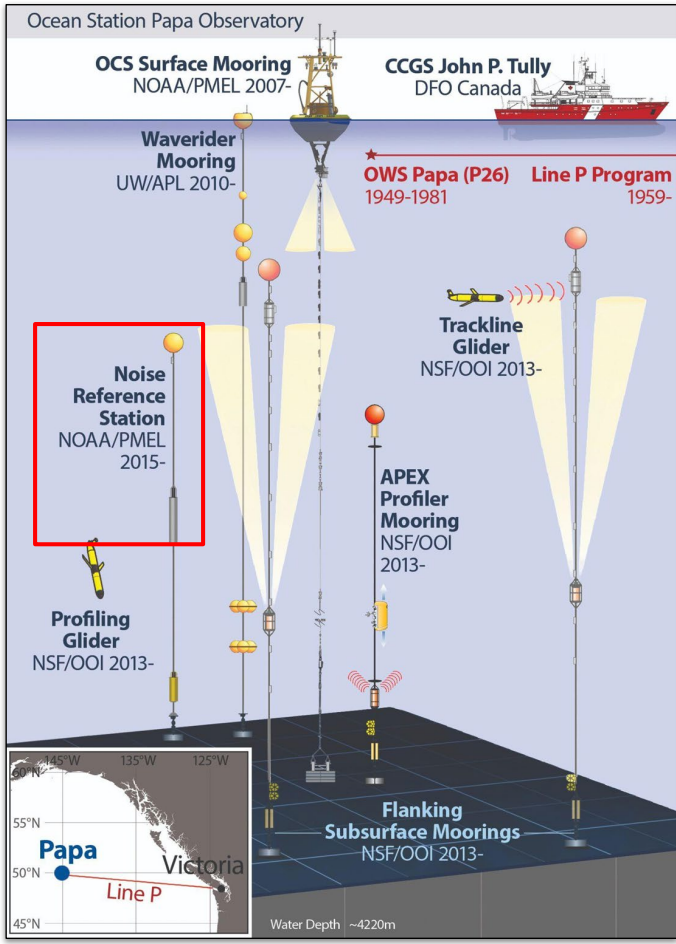
Dziak et al. (2025)



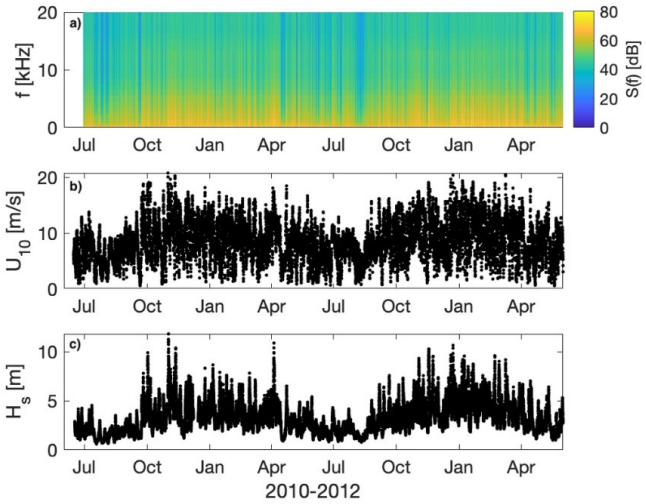
Blue whales are heard often at OSP in fall and early winter. During 2019 Blob-2 Marine Heat Wave (MWH), more blue whales were heard, potentially due to the increased productivity in the upper ocean there.

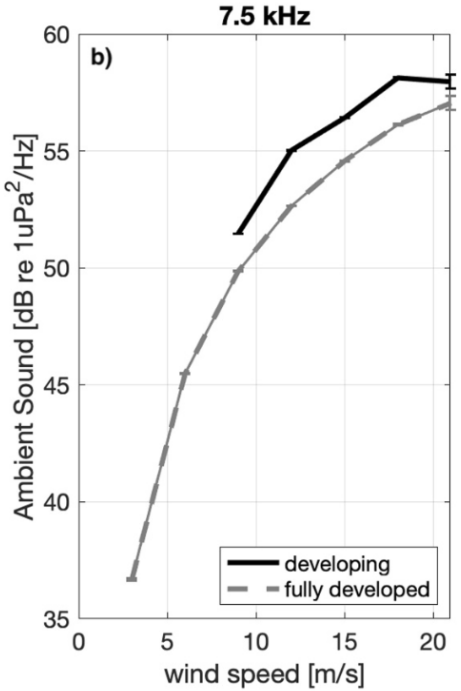
Kohlman et al. (2023)





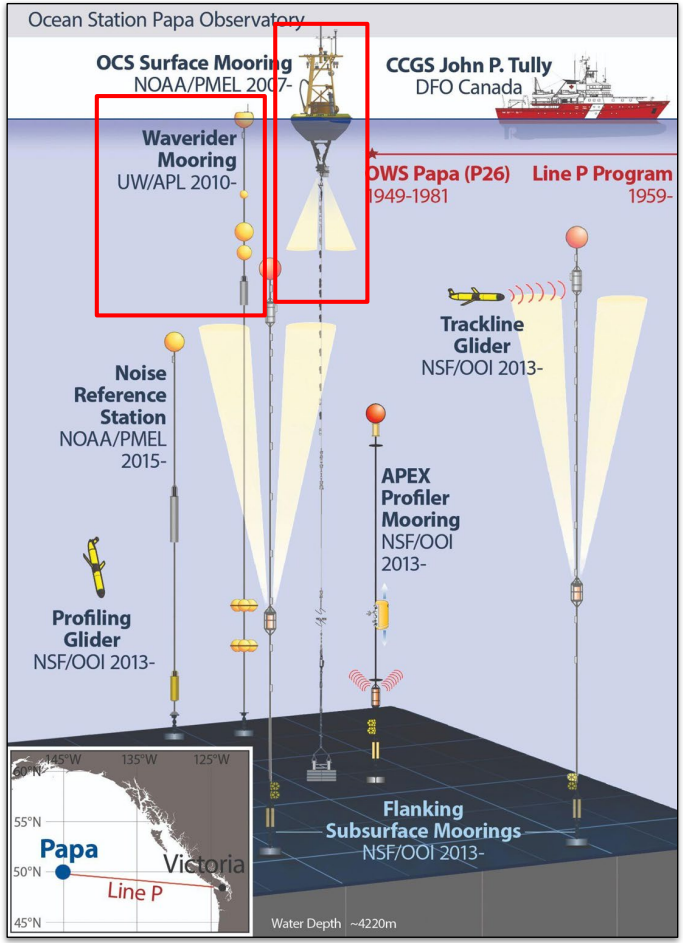
Ambient Sound is monitored at Papa





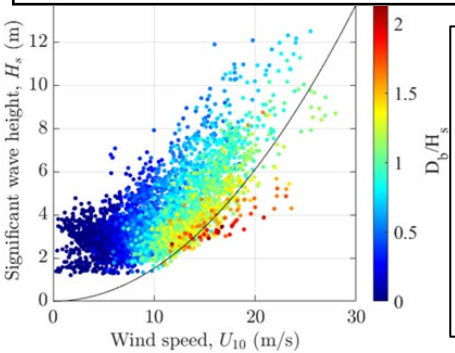
Ambient sound is louder in developing seas than in a fully developed seas.

Thomson et al. (2024)



Bubble depths (ADCP echosounder)

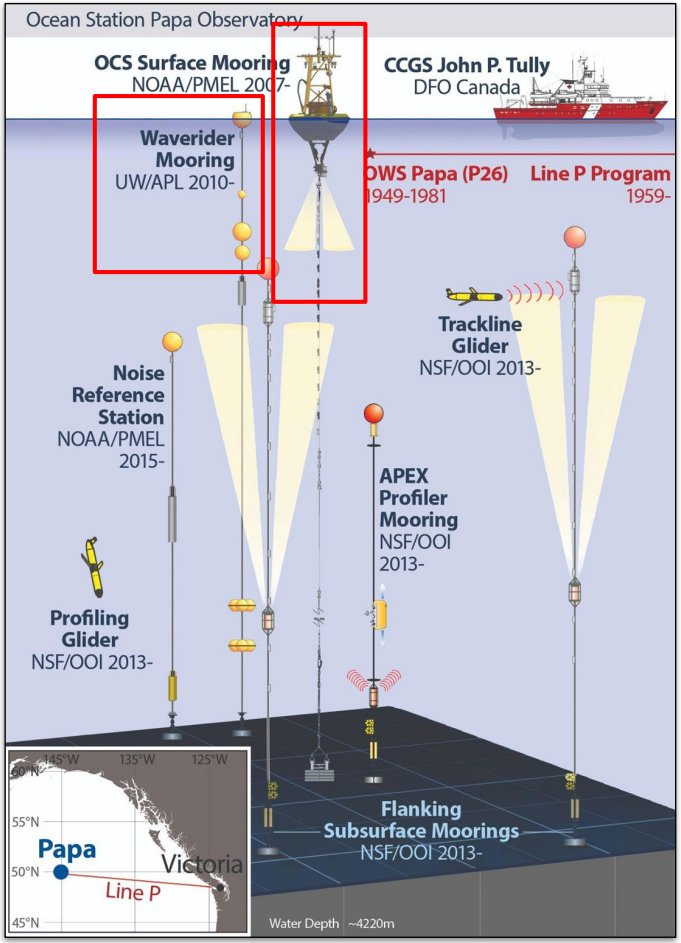
Link to wind speeds (mooring met tower) and wave heights (WaveRider)



Bubble plumes exceeding the sig. wave height (Db/Hs>1) occur in young seas where the winds are blowing strongly over developing waves

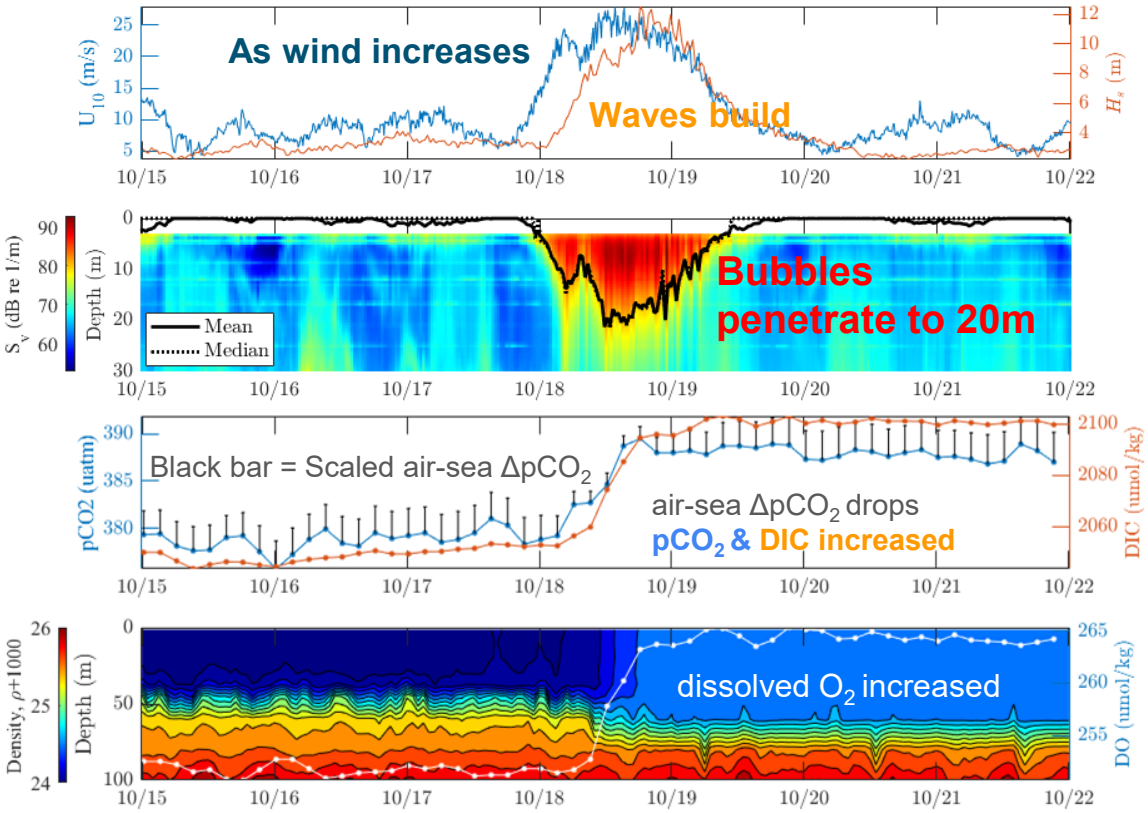
Points under the black line are developing seas (winds driving wave development)

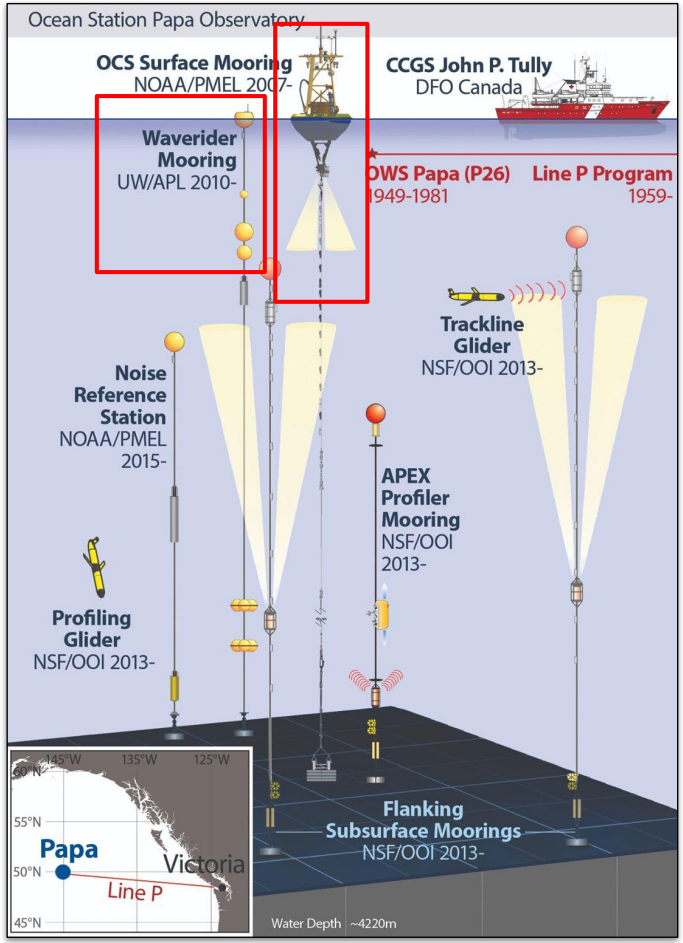
Fong et al. (in prep)



Link to gas exchange

Link with other OCS sensors and moorings at Papa





Fong et al. (in prep)

More Air-Sea Flux Measurements



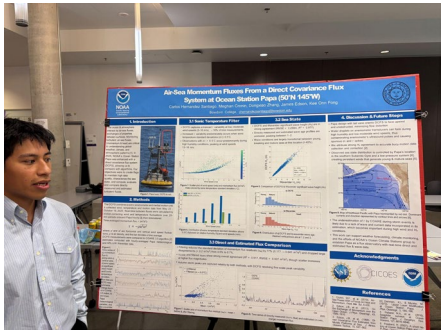
Adrienne Sutton
(NOAA PMEL)
Carbon PI /
MAPCO2 system



Jim Edson
(WHOI)
OOI PI / Direct Covariance Flux System

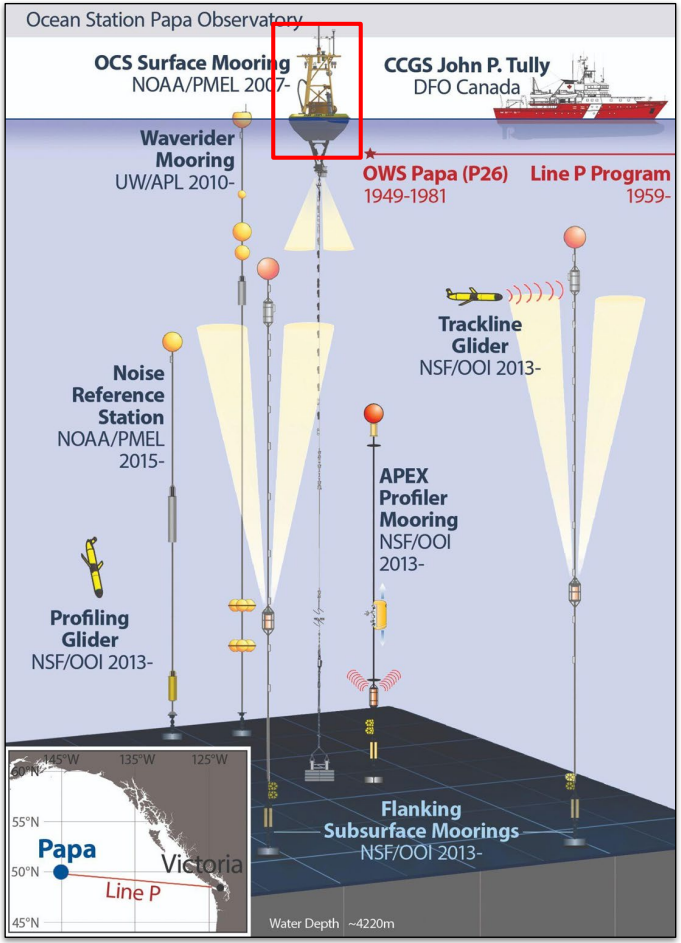
Students:

Carlos Hernandez Santiago
(UW/CICOES REU Intern)



Katie Kohlman (former Hollings Scholar, now UW grad student)

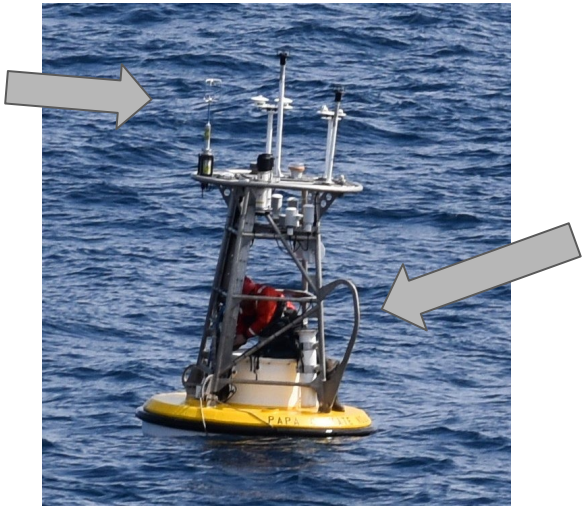




More Air-Sea Flux Measurements

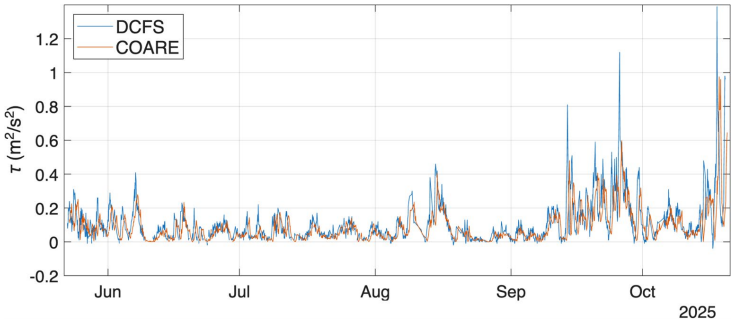
WHOI Direct Covariance Flux System

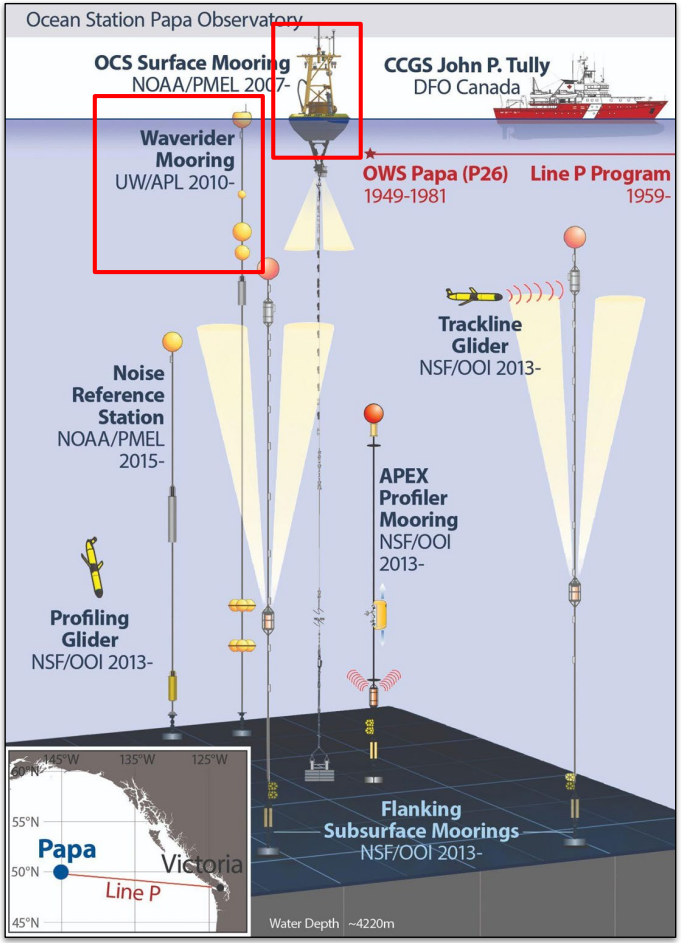
Points into wind almost always!



Buoy Handle acts as a wind vane

High quality direct covariance wind stress measurements at Papa!

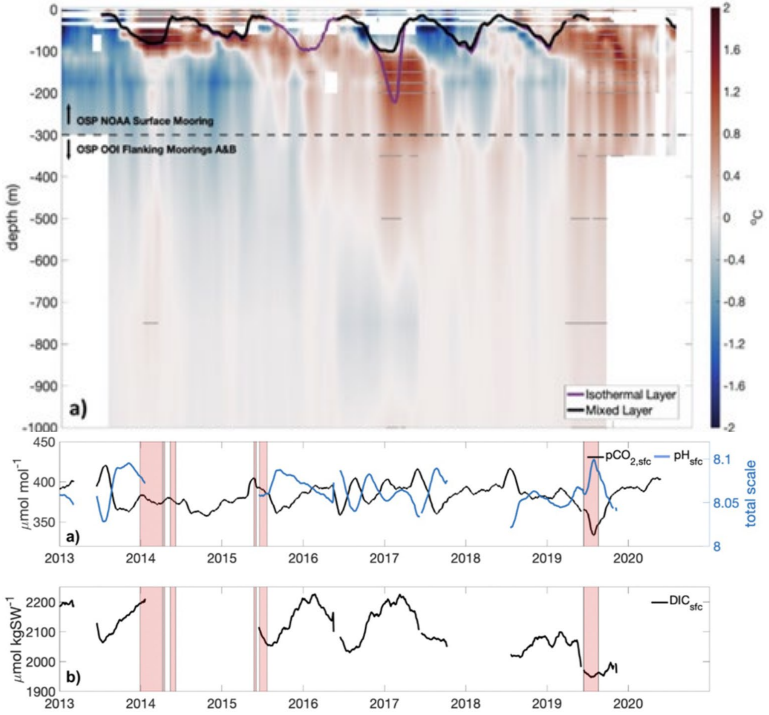




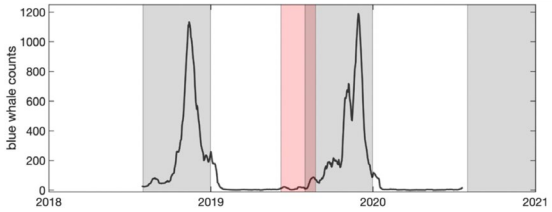
Papa allows a holistic approach to understanding marine heatwaves & impacts

Calm conditions and a shallow, strongly stratified surface layer set the stage for extreme warming, alongside changes in ocean chemistry and biology.

Kohlman et al. (2024)



pCO2, pH, DIC



Even whale counts!

