5th Ocean Climate Summit Program

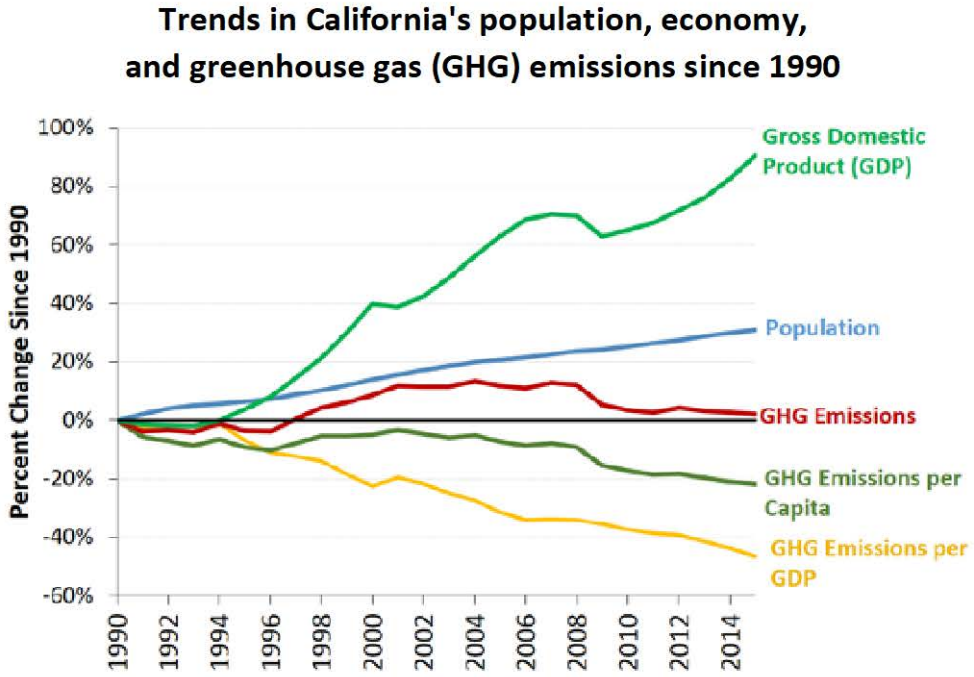
Learning from the Past, Looking to the Future

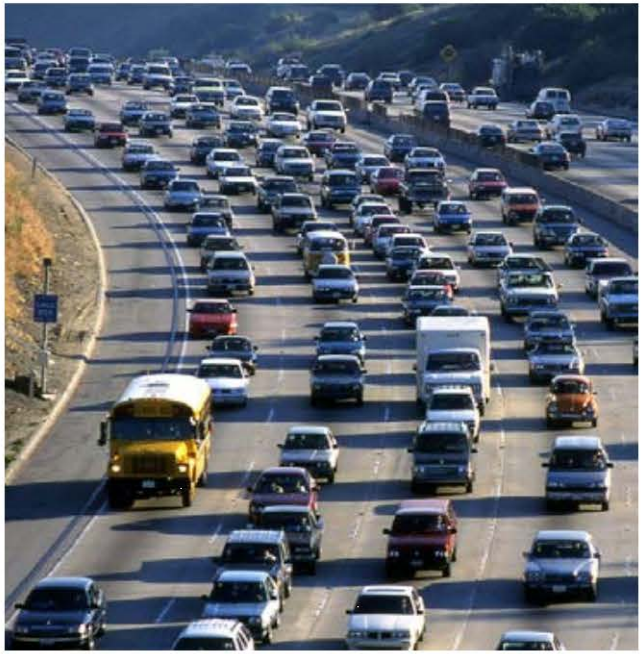
Monitoring the Pulse of the Ocean

John Largier,
Coastal & Marine Sciences Institute
UC Davis

Climate Change Drivers

2018 Indicators of Climate Change in California





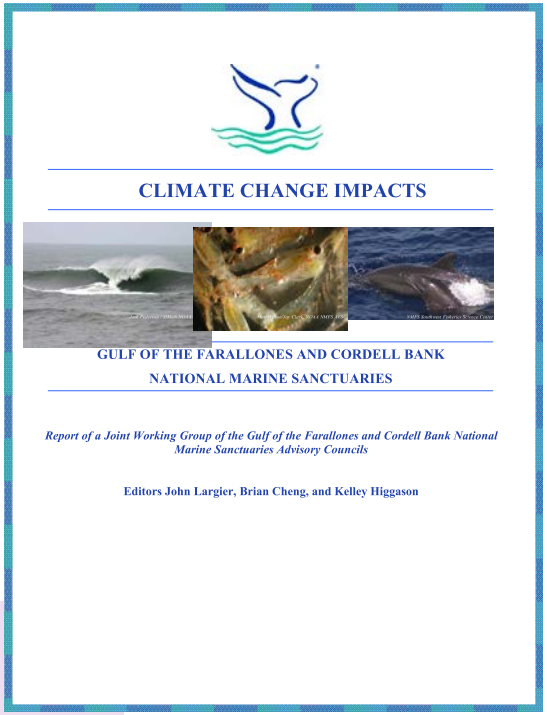
It’s looking pretty promising, huh?

Climate Change Commitment

Nope.

We're in this for the long haul!

Doney et al 2012



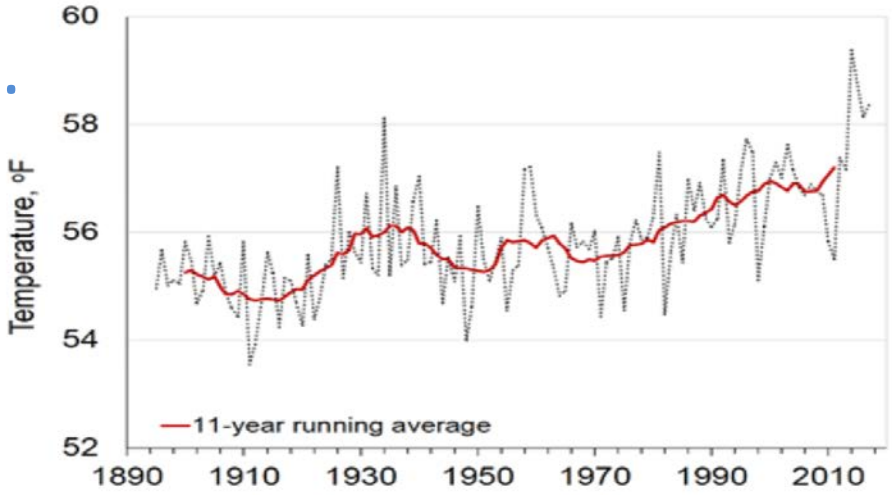
Climate Change and the Ocean

Changing climate affects our ocean …

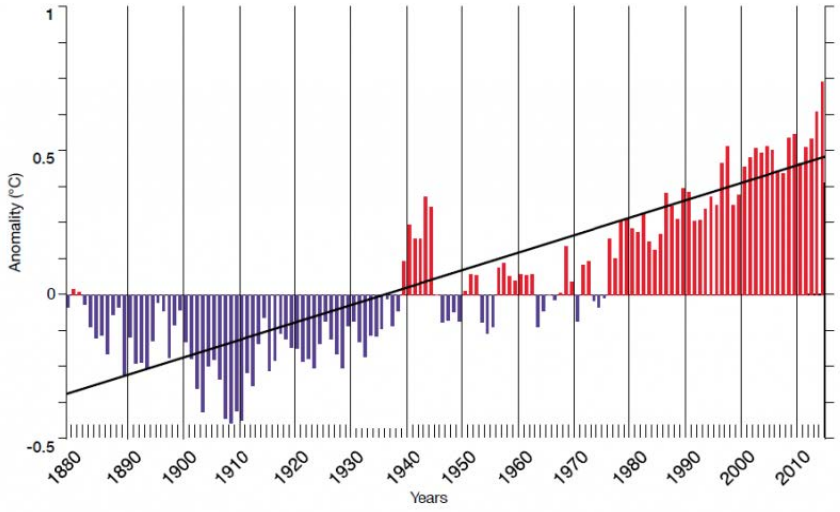
… and effects can be exacerbated by local drivers

① Ocean warming

Warming across California … statewide annual average temperature, 1895-2017 *(Indicators of Climate Change in California)*

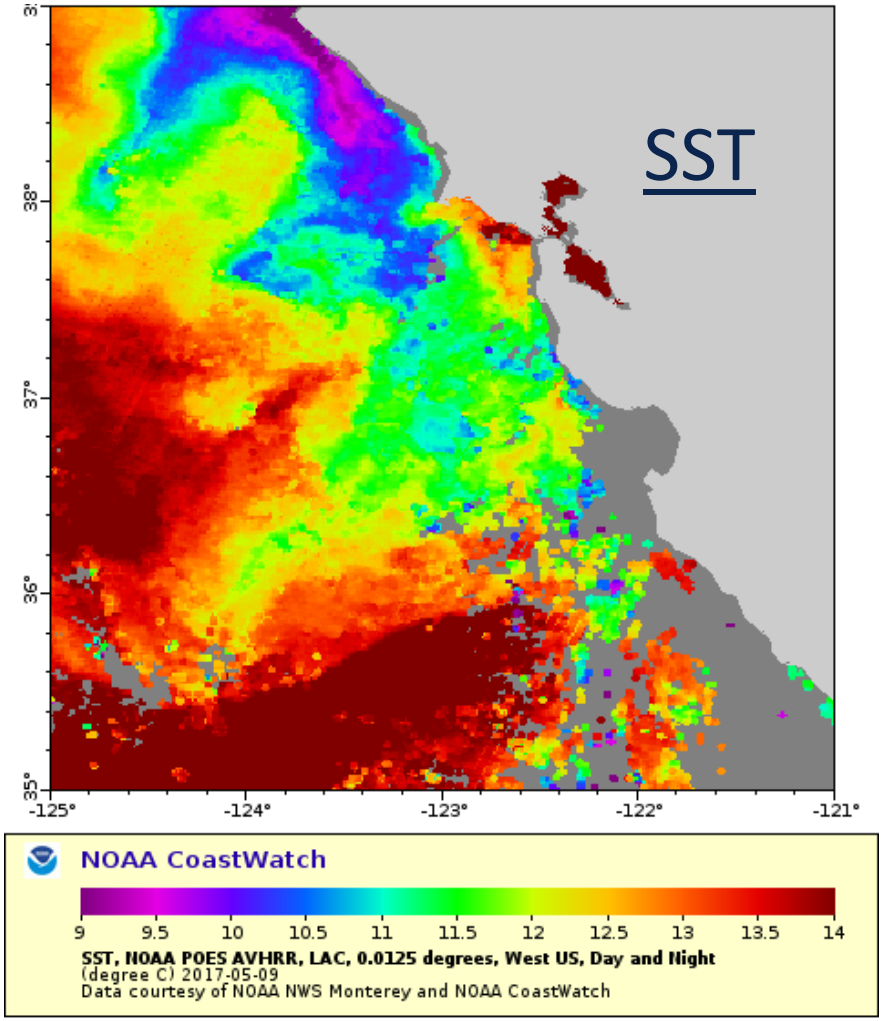


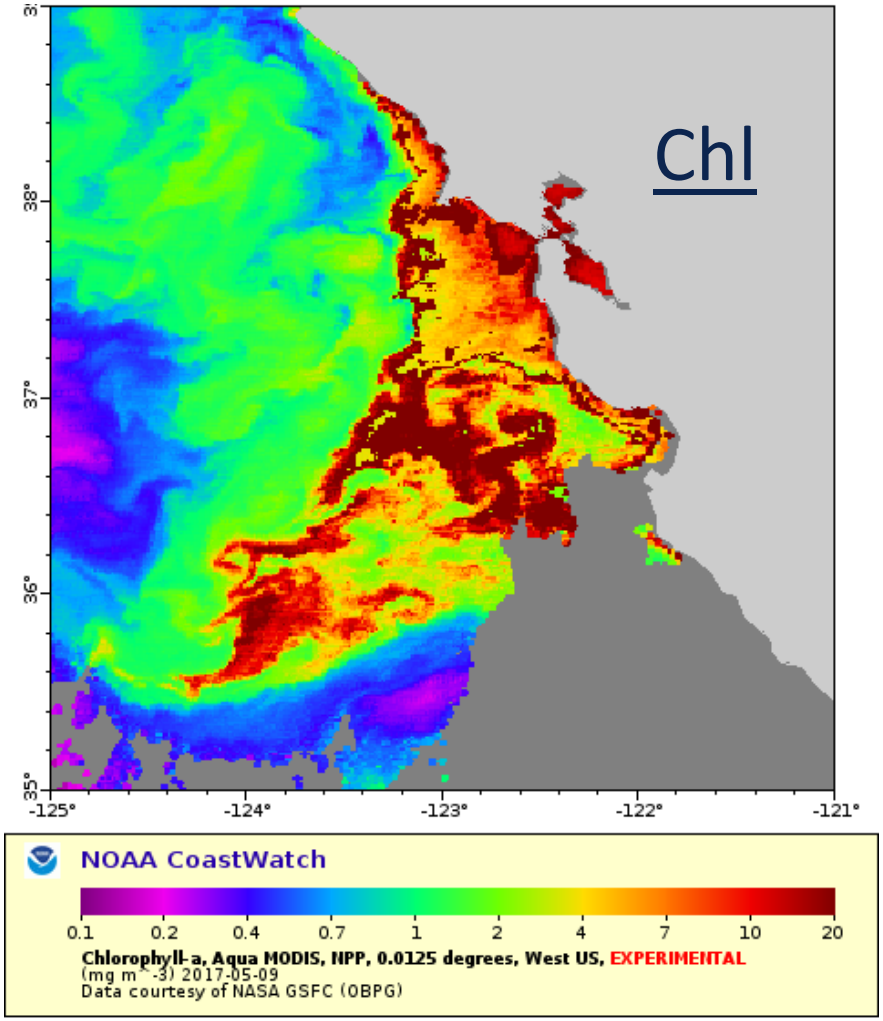
Warming across oceans … annual global sea surface temperature anomaly, 1880-2015 *(NCDC/NOAA)*



① Ocean warming

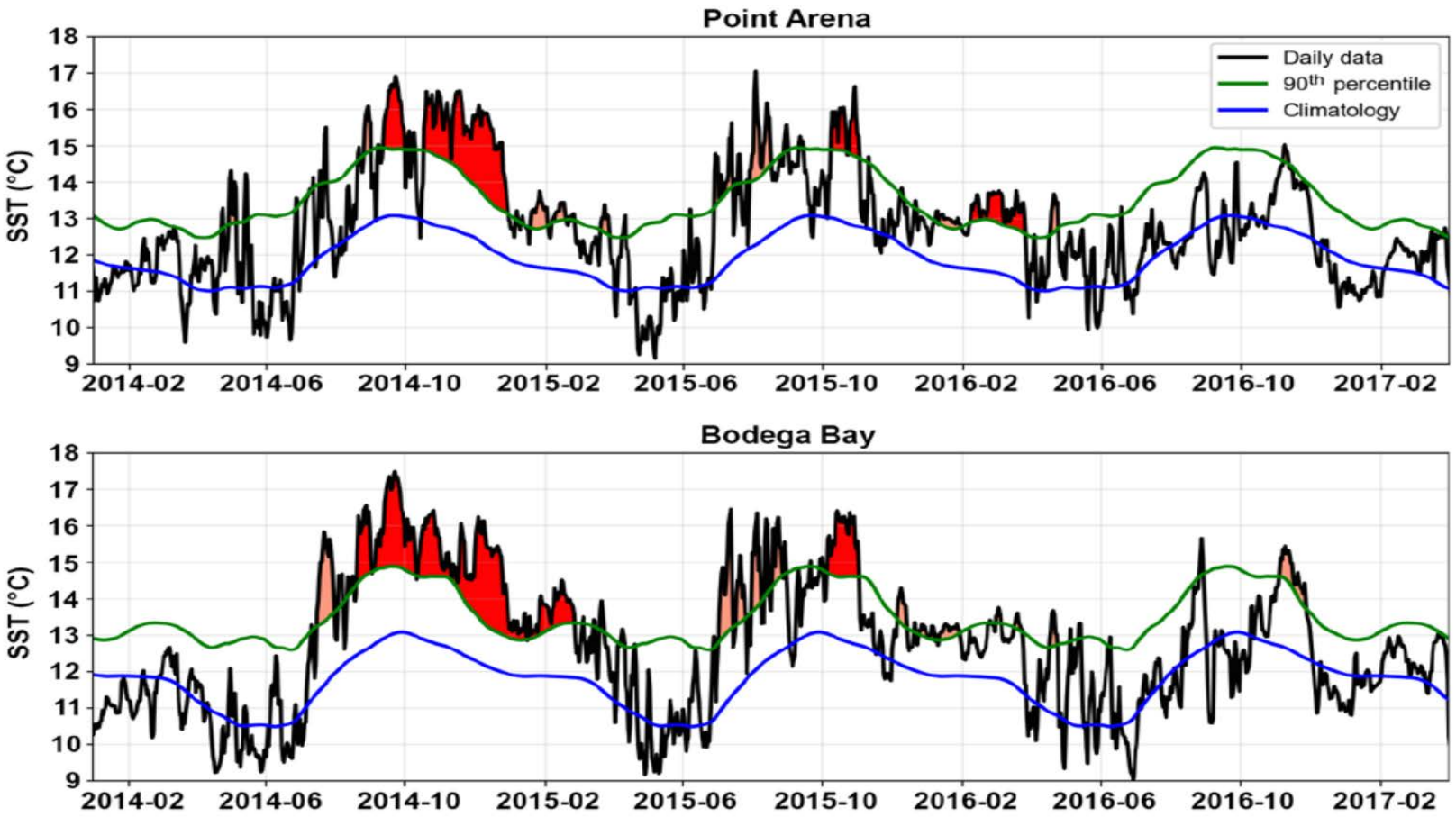
But … surface warming vs. increased upwelling.





① Ocean warming

Marine heat waves (MHW) in 2014 and 2015.



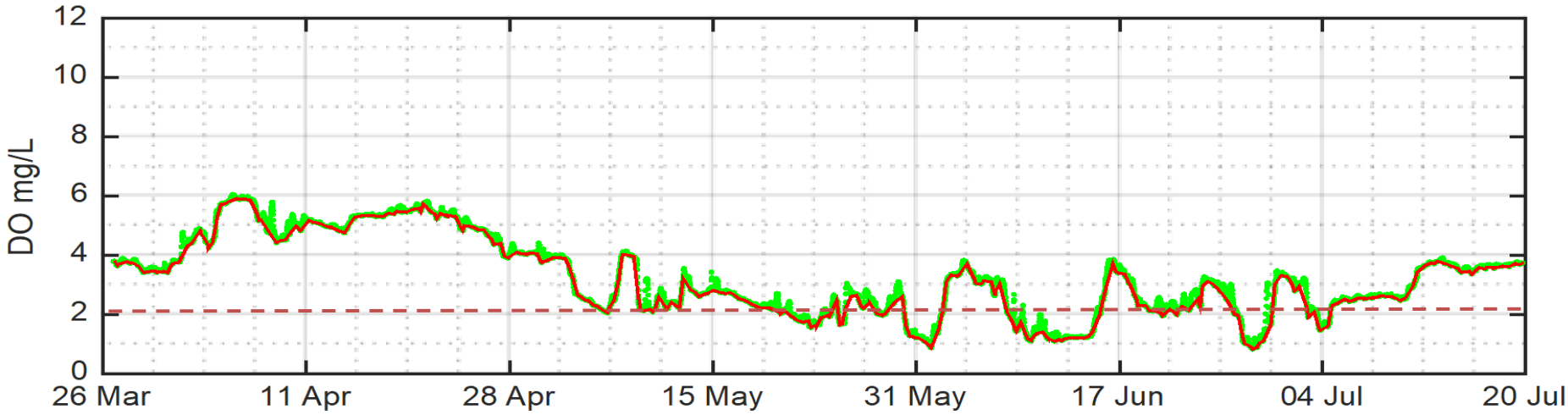
NDBC buoy data, 2014 to 2017 *(Sanford et al 2019)*

② Deoxygenation

Observed regional decrease in dissolved oxygen.

Near-bottom oxygen events in Gulf of Farallones 2015

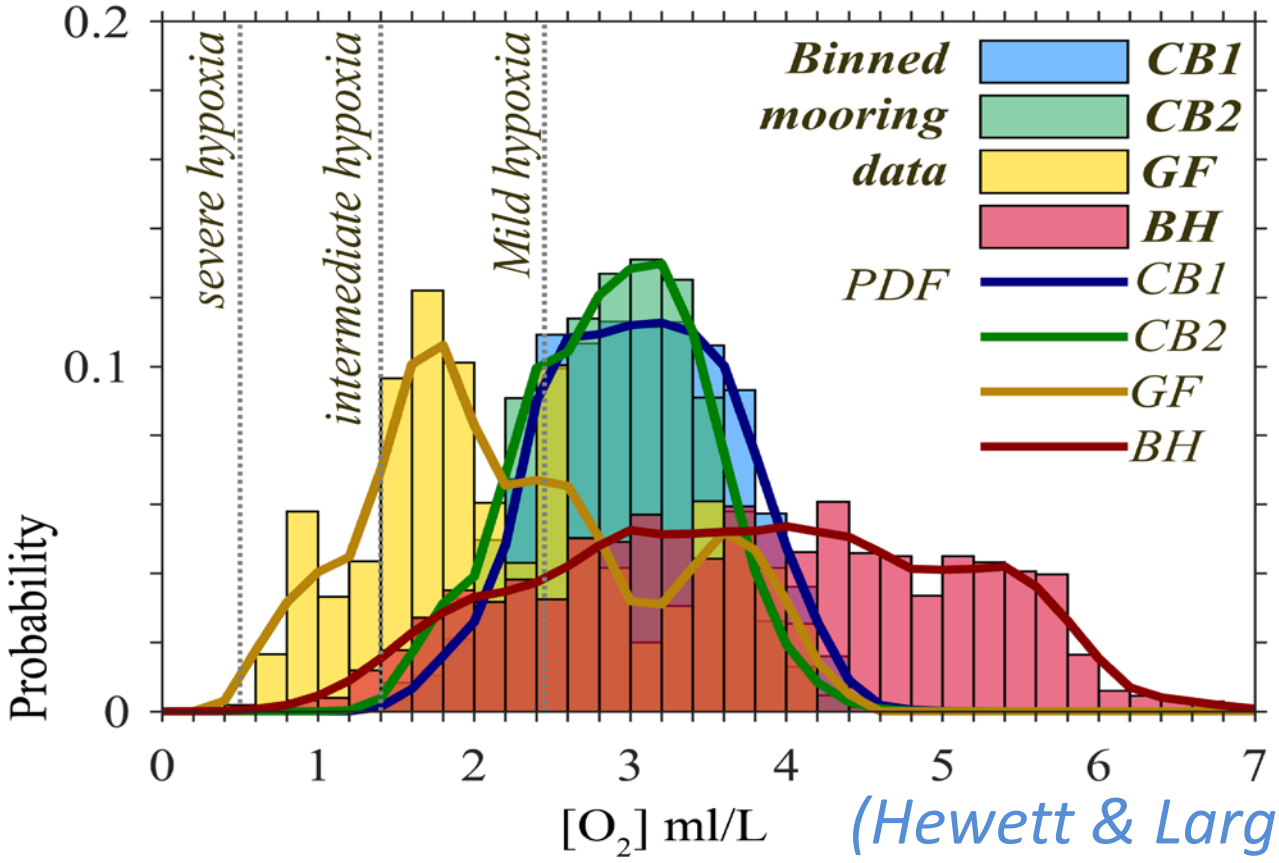
(Hewett & Largier, in prep.)



Local drivers in addition to global climate change?

② Deoxygenation

Spatial mosaic in addition to temporal variability – patterns & eco-regions.

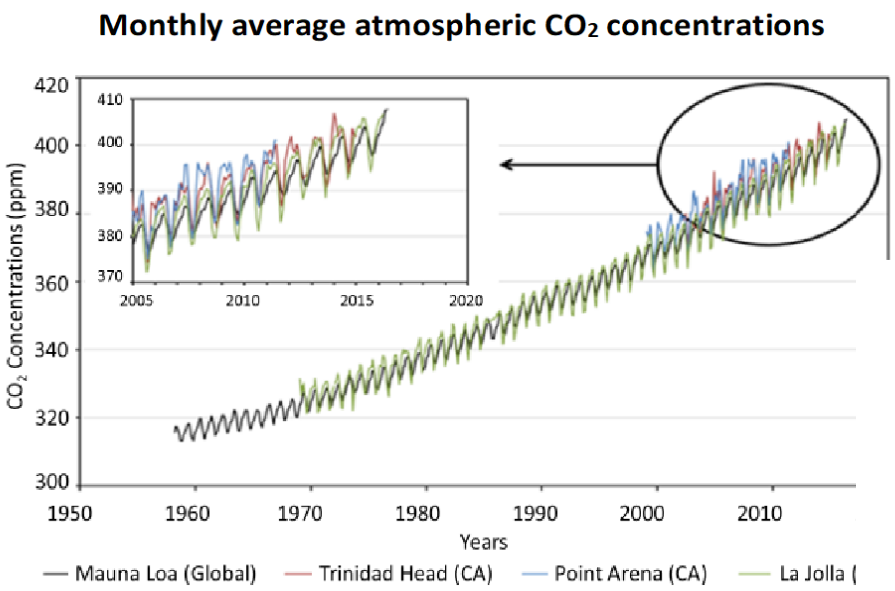


(Hewett & Largier, in prep.)

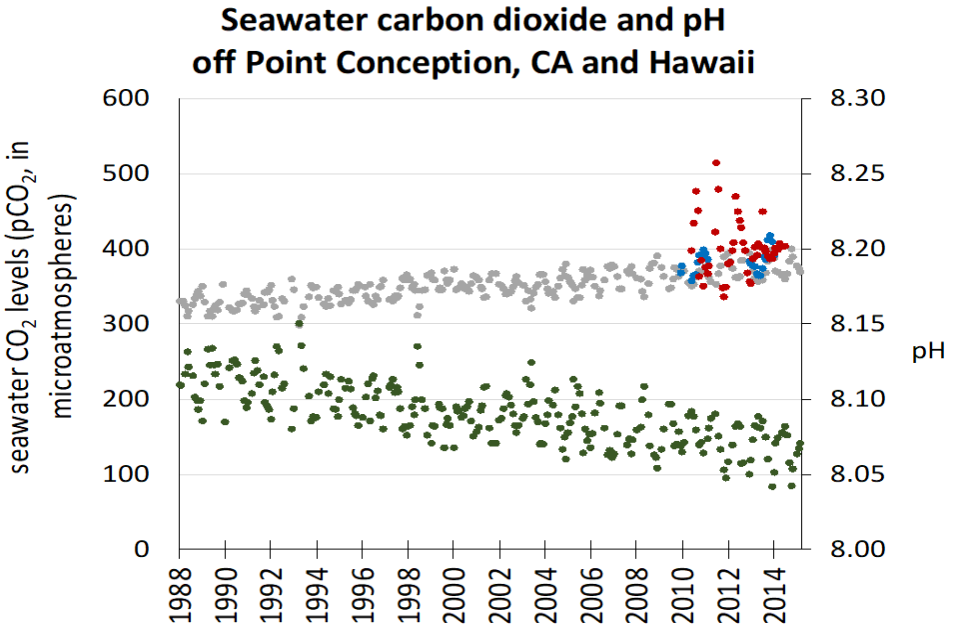
Exposure to hypoxia varies by location

③ Ocean Acidification

In parallel with deoxygenation …



… but enhanced by increased CO_2 in the atmosphere.



2018 Indicators of Climate Change in California

③ Ocean Acidification

Aragonite saturation state varies at BML, 2014

Aragonite proxy – *Davis et al (2018)*

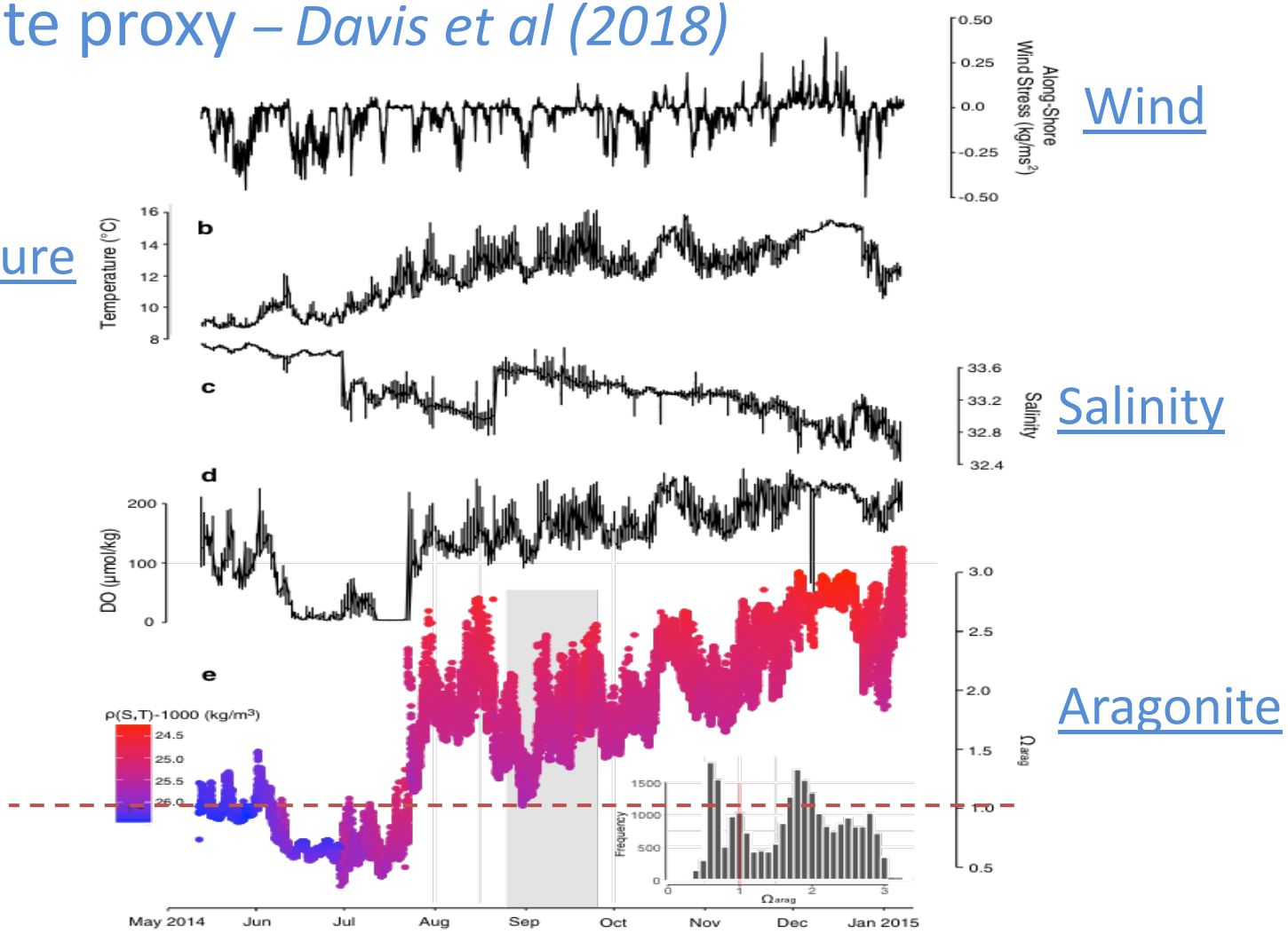
Wind

Temperature

Salinity

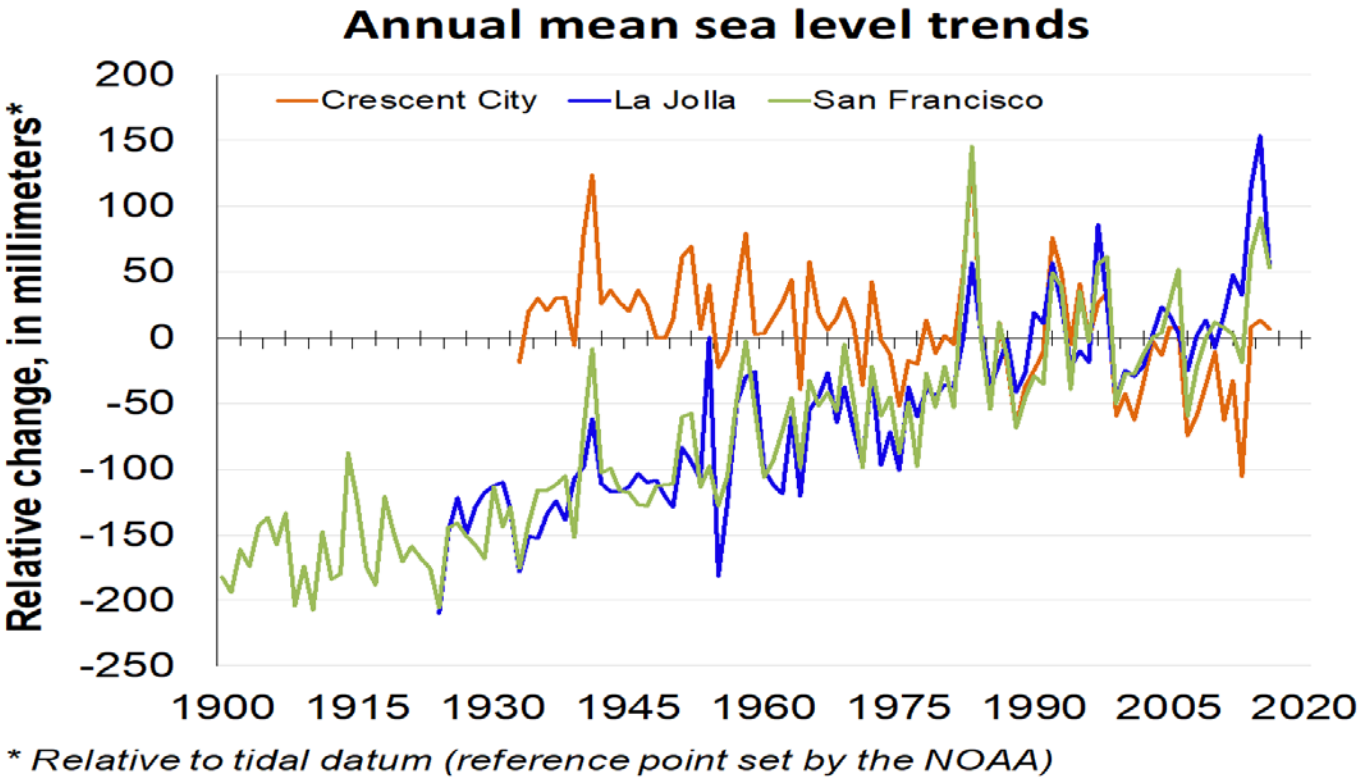
Oxygen

Aragonite



④ Sea Level Rise

2018 Indicators of Climate Change in California

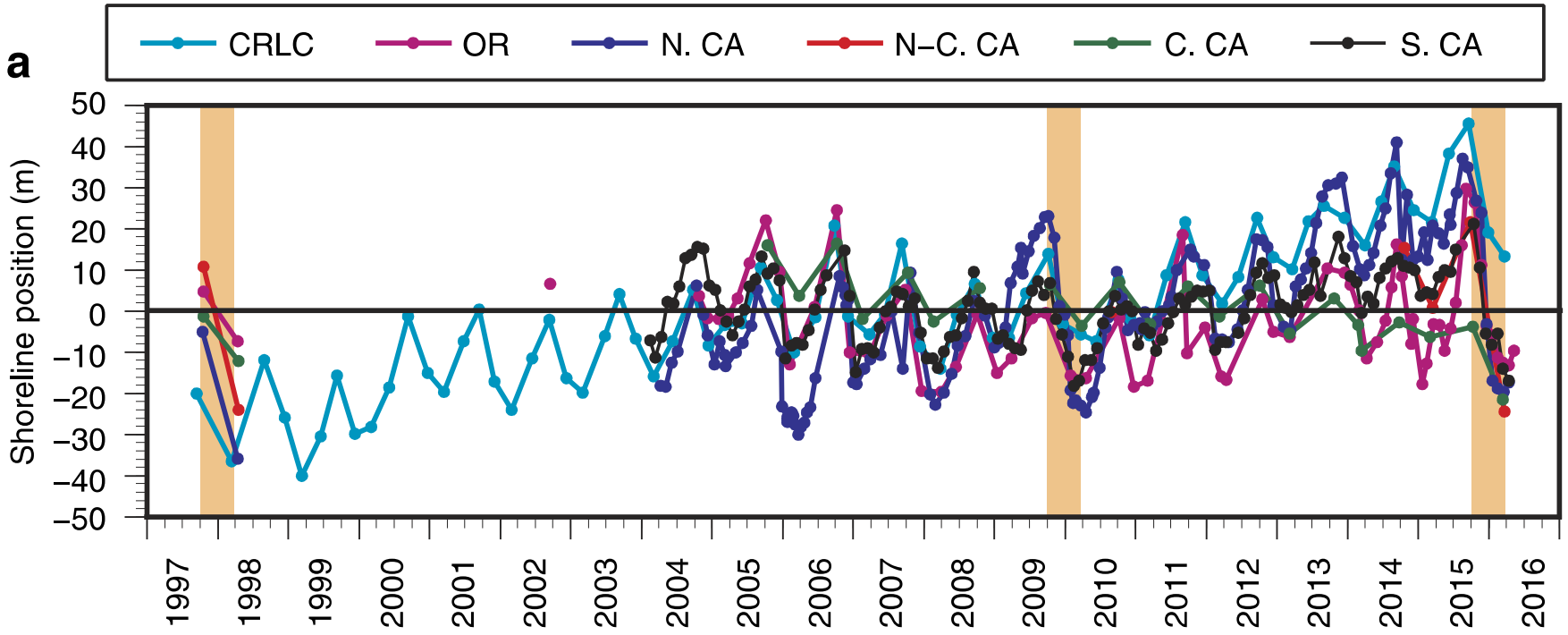


Lowland flooding, marsh feedbacks, shoreline erosion, .

④ Sea Level Rise

West coast beach response – seasonal & El Niño events

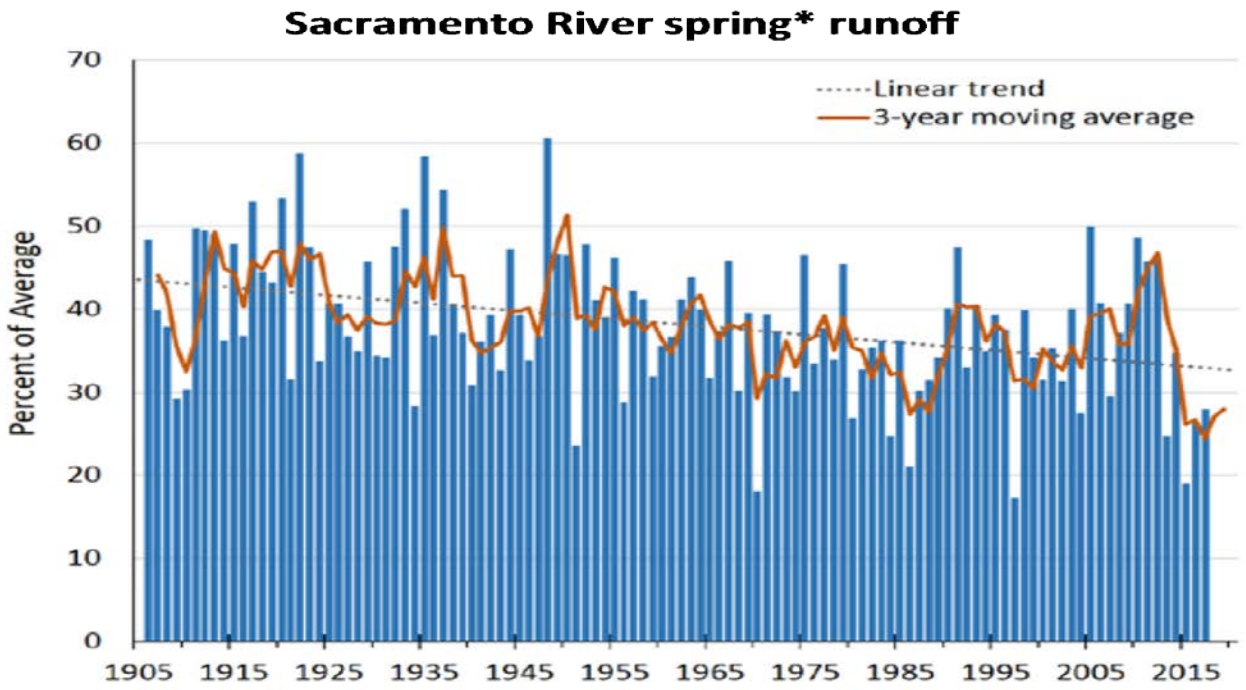
Barnard et al (2017)



Climate trend, climate fluctuation, seasonal change, and events.

⑤ Land Runoff

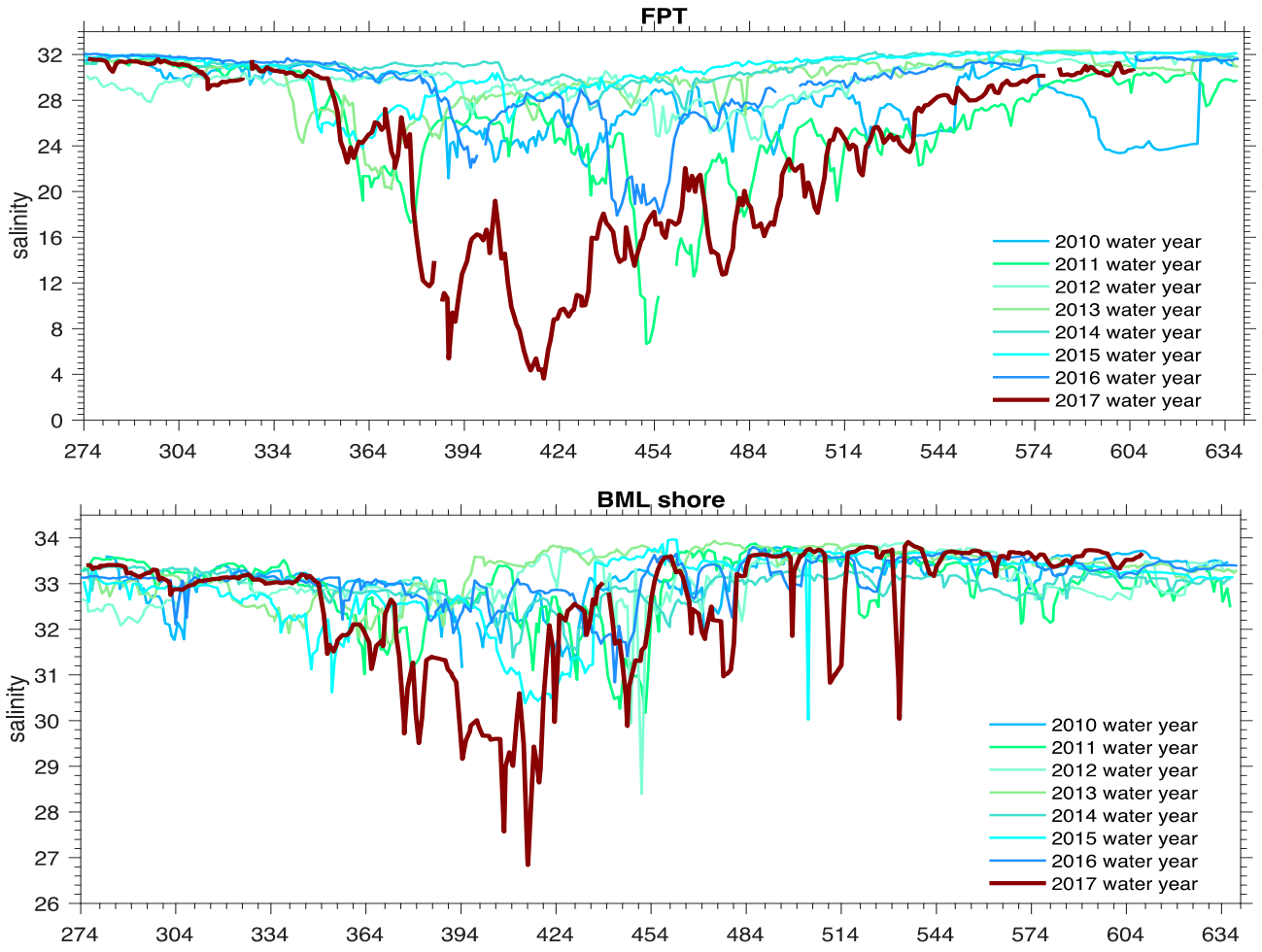
2018 Indicators of Climate Change in California



Changing precipitation in watersheds impact ocean.

⑤ Land Runoff

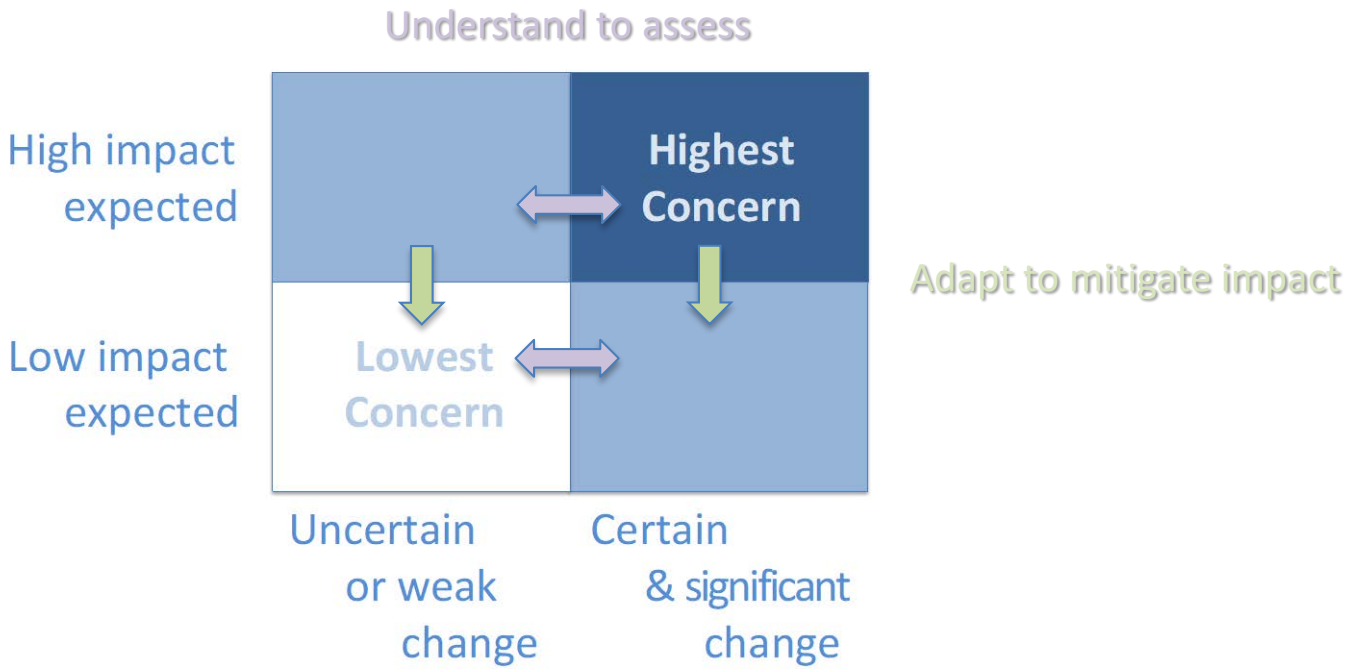
Salinity records at Fort Point and BML *(CeNCOOS)*



Key Questions

Change is happening – and a lot more will happen.

- With so many changes, which ones take ***priority***?



Key Questions

Change is happening – and a lot more will happen.

- With so many changes, which ones take ***priority***?
- What is the ***mechanism*** for environmental impact on an organism – and so what is an index?

  … slow cumulative change vs acute events.

Key Questions

Change is happening – and a lot more will happen.

- With so many changes, which ones take ***priority***?
- What is the ***mechanism*** for environmental impact on an organism – and so what is an index?

  … slow cumulative change vs acute events.

- How does one combine trend, fluctuation, season, and event into probability of ***extremes***?

Ongoing Action

As climate change continues to unfold ...

- ***Reduce*** GHG emissions and other drivers.
- ***Track*** changes and continually re-assess.
- ***Adapt*** to most severe impacts (pro-actively).

5th Ocean Climate Summit Program

Learning from the Past, Looking to the Future

Monitoring the Pulse of the Ocean

Andy O'Neill, USGS – shoreline & nearshore

Dani Lipski, CBNMS – offshore ecosystems

Carrie Pomery, CSG & UCSC – humans & fisheries

Panel Discussion: Priority actions for next decade

Further sessions on habitats, OA, living shorelines, multiple stressors …