

NASEM Information-Gathering Meeting #3 for
NSF Ocean Sciences Decadal Survey
Challenges and Opportunities in Physical Oceanography

Portland, Oregon
October 24, 2023

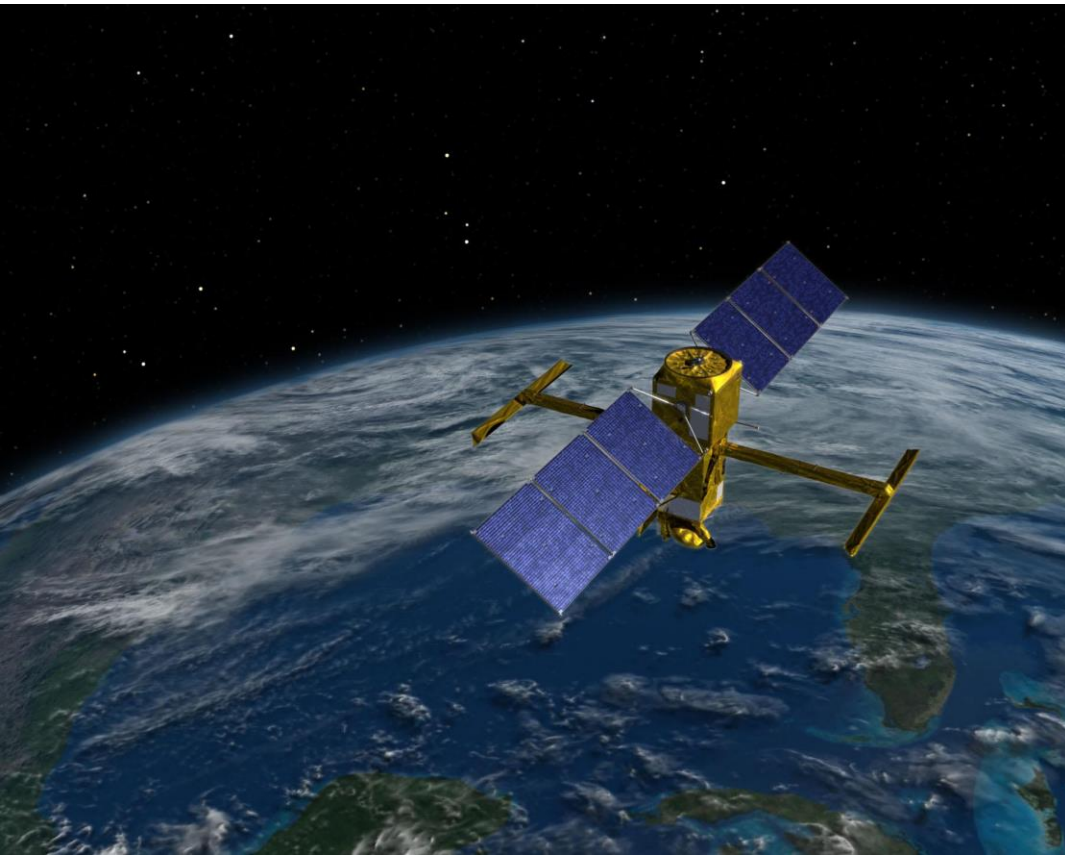
Dynamics, modeling and climate

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Sustained observations needed to detect change and to validate models

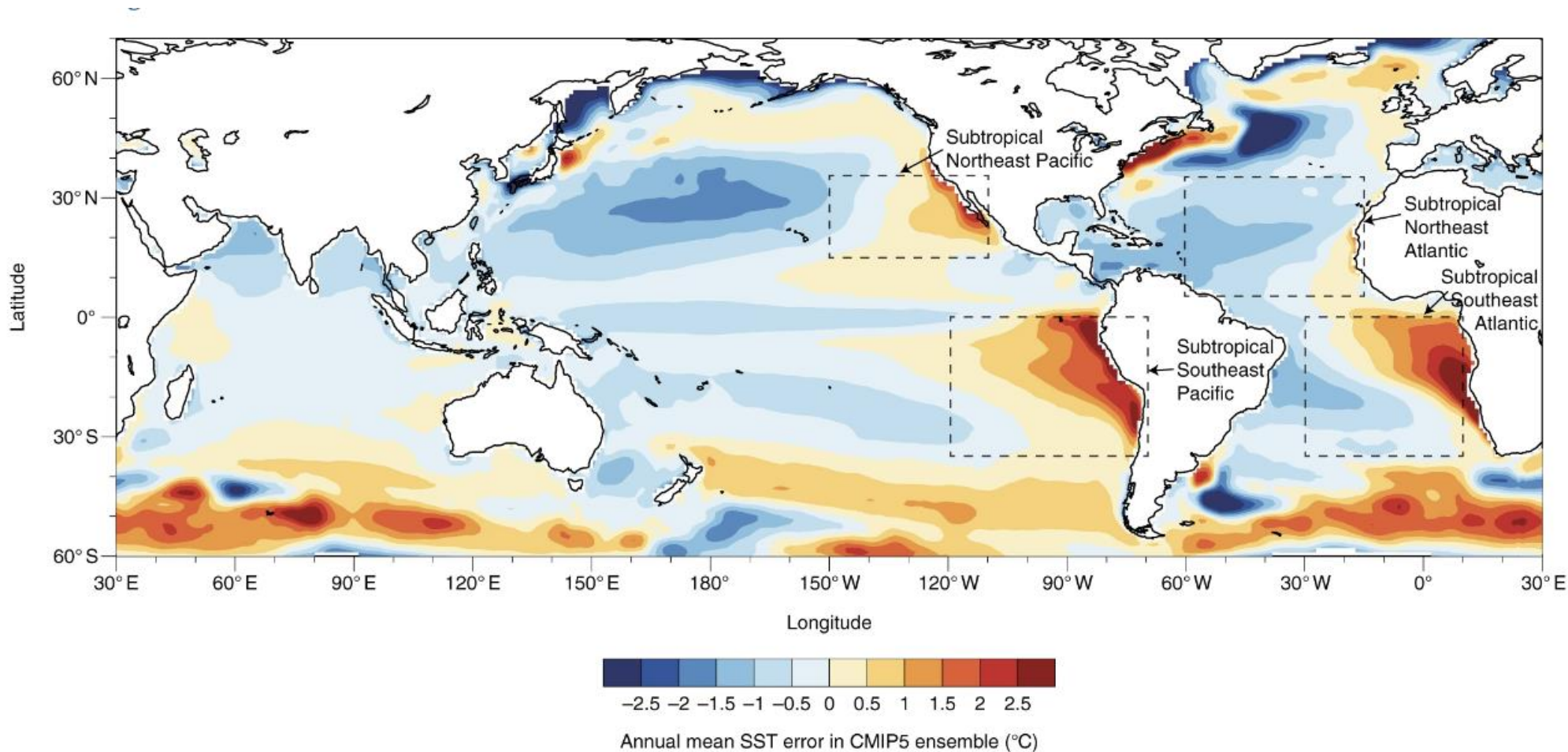
- Satellites: Sea surface height, sea surface temperature, sea surface salinity ...
- Argo: temperature and salinity profiles
- Repeat shipboard hydrographic sections and deep Argo



<https://podaac.jpl.nasa.gov/node/1280/datasetlist>
<https://www.whoi.edu/what-we-do/explore/instruments/instruments-floats-drifters/whoi-floats-drifters/>
<https://floats.pmel.noaa.gov/gallery/deep-argo>

CMIP models use for climate projections~100km grid

Large biases in SST in Eastern Boundary Upwelling Systems where up to 40% of global fish catch happens.



<https://www.nature.com/articles/s41558-018-0355-y>

Ocean Modeling for climate and prediction

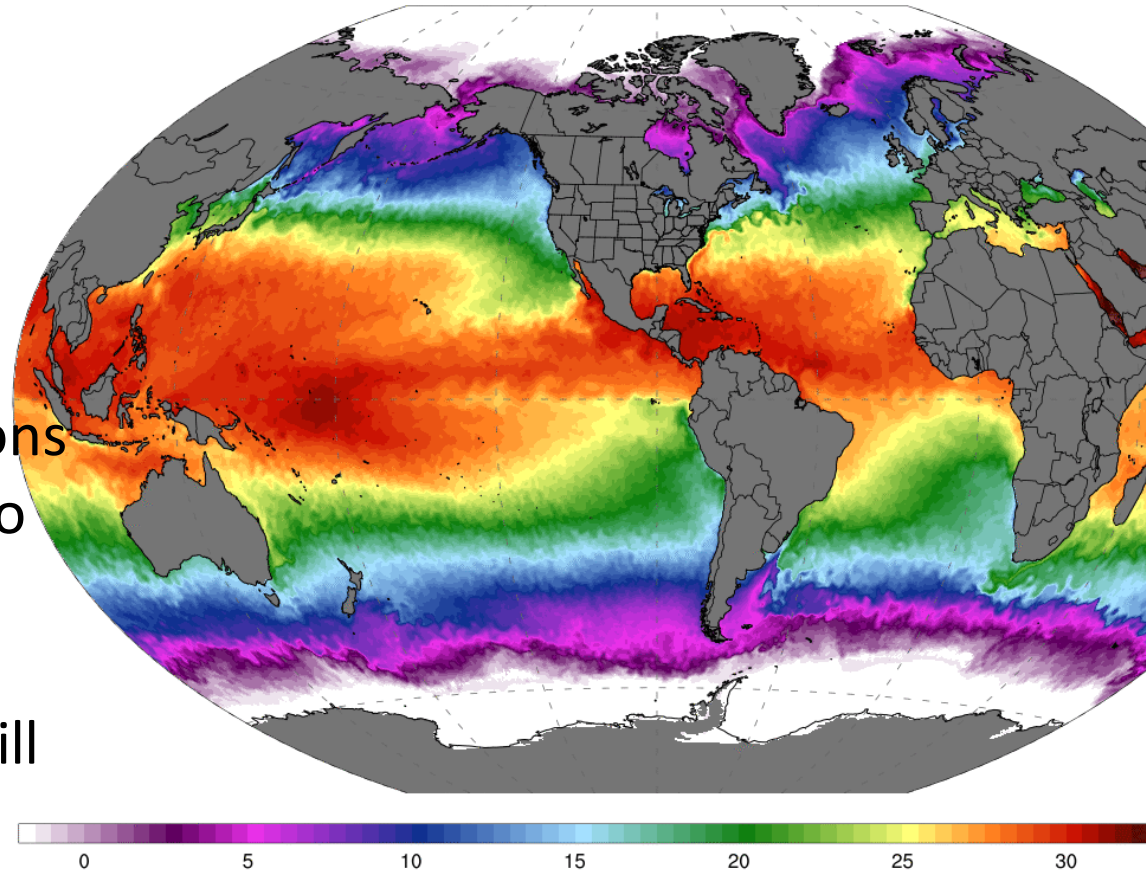
The Challenge: The ocean scales are small and motions are slow

Can we increase spatial resolution to eddy resolving from 100km to 10 km?

- 100X the amount of data
- 10X smaller time step.
- 1000X slower/model day
- The ocean takes centuries to spin-up
- Multiple simulations needed for climate predictions and projections
- This is BIG data: Analysis needs to happen where the data resides
- Regional downscaling for projections can be used, but it will inherit global model biases

NOAA OISST V2.1 Sea Surface Temperature (°C)
Thu, Oct 12, 2023 | preliminary

ClimateRea
Climate Change Instit



Work force Issues in ocean dynamics and modeling

Brain drain to industry

5 Scientists from the Ocean Section at the National Center for Atmospheric Research

1 Professor from Columbia University

Little Progress in gender parity in ocean modeling and dynamics

A few examples:

0 women on the tenure track-equivalent in the Ocean Section at the National Center for Atmospheric Research

2 women out of 12 in the Federal workforce the NOAA-GFDL Ocean and Cryosphere Division

25% of participants were women at an invitation only Sub-mesoscale Air-Sea Interaction workshop (September 2023)

Wild Cards

Rise in offshore wind and wave energy: what are the modeling/prediction/workforce needs?



Preparing for rapid sea level rise: Greenland and Antarctic ice-sheet melt caused by regional ocean warming

