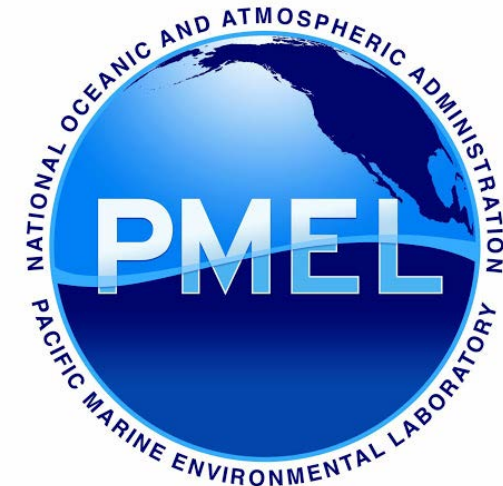


# Gulf of Alaska Climate - Integrated Modeling Project

Funding: NOAA Climate Program Office & North Pacific Research Board

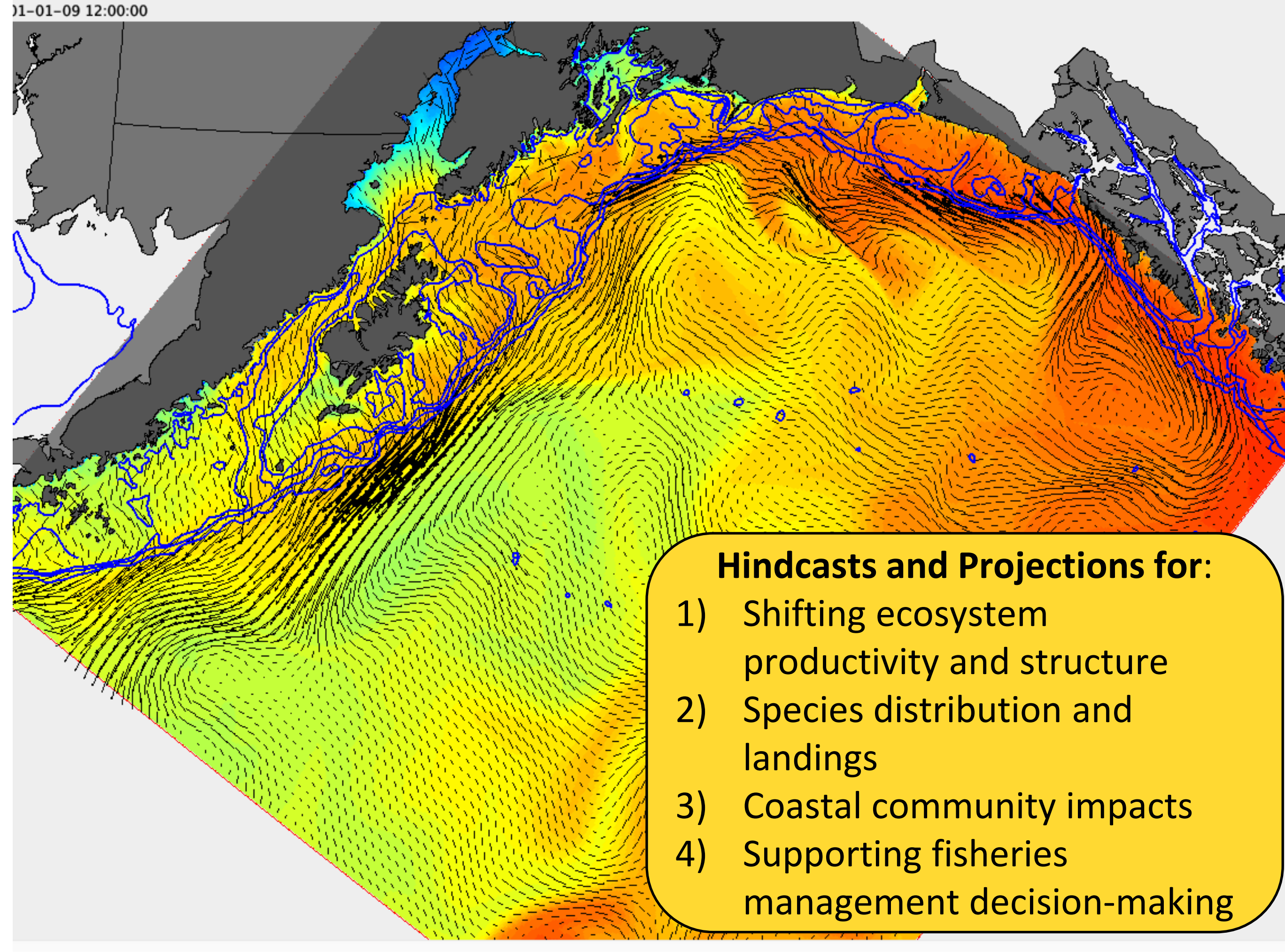
An operational suite of coupled socio-ecological models for climate fisheries hindcasts, forecasts, projections and Management Strategy Evaluation



UNIVERSITY of WASHINGTON



**NOAA**  
**FISHERIES**





# Gulf of Alaska Climate - Integrated Modeling Project

**From climate to communities in the Gulf of Alaska: using an integrated modeling approach to evaluate drivers of present and future system-level productivity and assess climate impacts on fishing-dependent communities**

**Lead PI:** Martin Dorn (Martin.Dorn@noaa.gov)

**PIs:** Beth Fulton, Alan Haynie, André Punt, Marysia Szymkowiak, Elizabeth McHuron

**Additional NPRB project PIs:** Isaac Kaplan, Kristin Marshall

**COCA project Co-PIs:** Kerim Aydin, Caihong Fu, Brian Fadely, Albert Hermann, Kirstin Holsman, Anne Hollowed, Stephen Kasperski, Jamal Moss, Olav Ormseth, Lauren Rogers, Chang Seung, James Thorson, Katie Sweeney

**Funding:** NPRB: \$472K over 3 years, NOAA COCA funding: \$1.5M over 3 years, plus in kind support from NOAA IEA program, and NOAA Fisheries core funding.

# Gulf of Alaska Climate - Integrated Modeling Project

## Institutional partners

**AFSC:** Marine Mammal Laboratory, REFM, Auke Bay Laboratories.

**CSIRO:** Technical support and advice on Atlantis model development, Contact Beth Fulton.

**DFO:** Advice on ecosystem modeling, Contact Caihong Fu.

**PMEL:** ROMS modeling, Contact Al Hermann.

**School of Aquatic and Fisheries Sciences/CICOES:** Post-doctoral scholars Matthieu Veron—climate-enhanced single species models, Alberto Rovellini—Atlantis modeling, Adam Hayes—fleet dynamics modeler. Research scientist Liz McHuron—Sea lion foraging and bioenergetics.

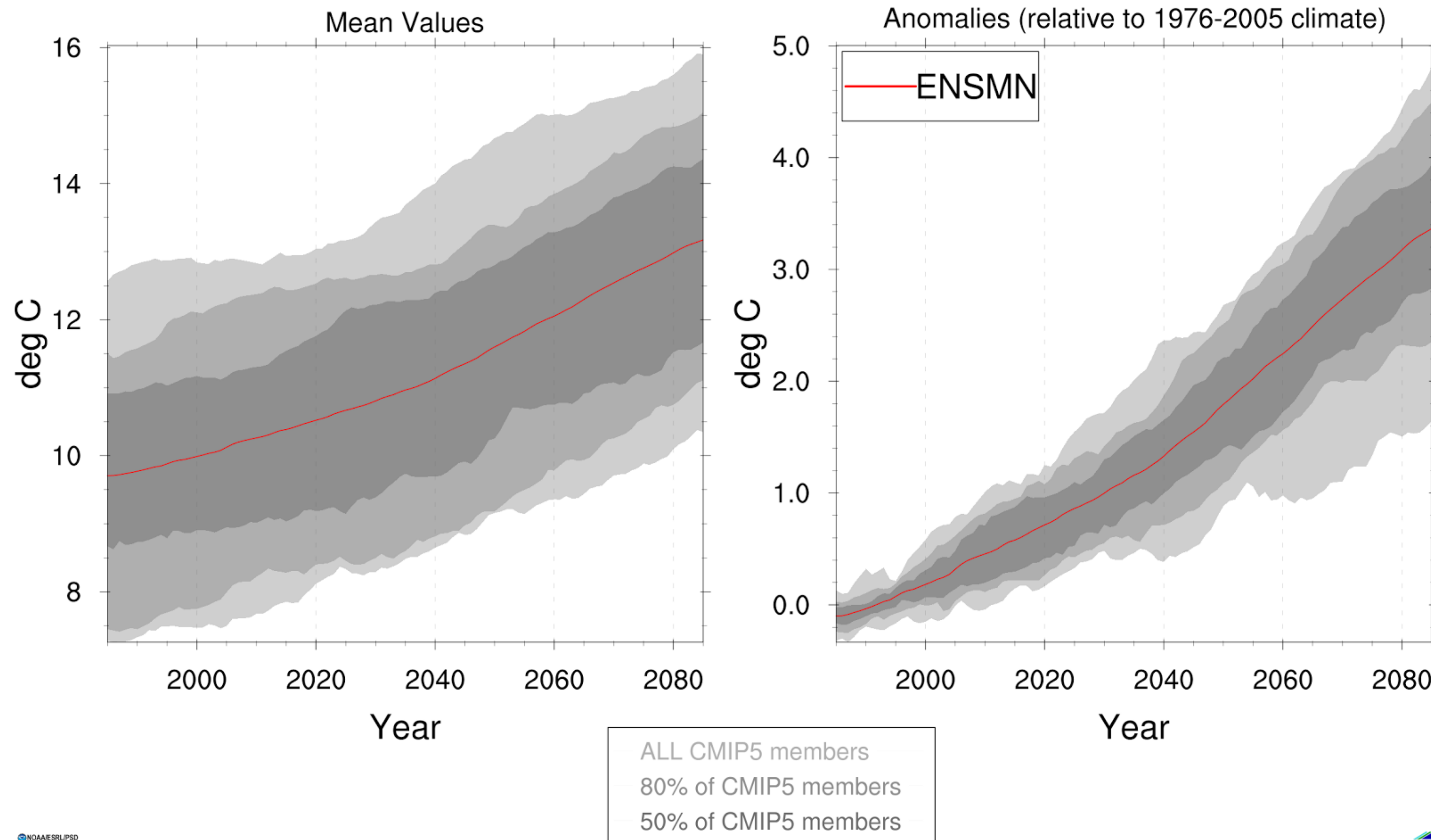
**Pacific States Marine Fisheries Commission:** Andrew Steinkruger—sociology post-doctoral scholar.

# Gulf of Alaska Climate - Integrated Modeling Project

Projected climate changes:

- Ocean warming
- Ocean acidification
- Oxygen limitation
- Changes in ocean circulation and stratification

ANN tos for Gulf of Alaska with 20 year running mean (20thC + rcp85)



Projected increases in sea surface temperature for the Gulf of Alaska (left) and future temperatures relative to historic means (right).

## **GOA-CLIM is an integrated research program that:**

- 1) leverages ongoing research at the Alaska Fisheries Science Center,
- 2) is closely aligned with the successful eastern Bering Sea ALCIM project, and
- 3) represents a substantial step towards meeting the objectives of GOA Climate Science Regional Action Plan (Dorn et al. 2018) and the NMFS climate science strategy (Link et al. 2015).

Overarching research questions concern the drivers of system-level productivity under climate change, the ways that fisheries management can promote resilient fisheries in a changing climate, and development of a coupled modeling approach that extends from climate to communities to evaluate economic and social impacts of climate change on resource-dependent communities in the GOA.



# Gulf of Alaska Climate - Integrated Modeling Project

## Three research pathways:

- Research pathway 1: Development and application of the Atlantis model as an element of a multi-model ensemble to evaluate fisheries management strategies in a changing climate.
- Research pathway 2: Evaluate and predict the impacts of major environmental anomalies to the endangered Western DPS population of Steller sea lions
- Research pathway 3: From Climate to Communities. Building the tools and knowledge-base to couple the ecosystem models to regional economic models to evaluate the impacts of climate change on resource-dependent communities.

# Gulf of Alaska Climate - Integrated Modeling Project

## GOA-CLIM models under development:

- Atlantis ecosystem model.
- Multispecies statistical model of pollock, arrowtooth flounder, Pacific cod and Pacific halibut
- ECOPATH model of the eastern Gulf of Alaska
- Updated ECOPATH model(s) of central and western GOA
- Climate-enhanced single-species projection models for sablefish and Pacific cod.