Ocean predictions at the applications interface

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How does temperature impact living marine resources?

Direct

Indirect

Coincidence

Temperature

Rate

→

or

~
Regional ocean models in a fisheries context

Socioeconomic pathways drive…

...global earth system models that...

...are dynamically downscaled by a regional ocean model.

Indices from the regional model drive...

...upper trophic level models.

Alaska Climate Integrated Modeling (see Hollowed et al., 2020)
Regional ocean models in a fisheries context
Regional ocean models in a fisheries context

Socioeconomic pathways drive... global earth system models that... are dynamically downscaled by a regional ocean model. Indices from the regional model drive... upper trophic level models.

Alaska Climate Integrated Modeling (ACLIM) (see Hollowed et al., 2020)
How do we select a biogeochemical model?

- Rigorously evaluate a variety of candidates at many spatiotemporal scales
- Use the one attached to your physical modeling framework
- Build a custom model from scratch
The experiment: Compare LMR metrics across a variety of models

Banas et al., 2009

BEST_NPZ

COBALT
Bering Sea shelf temperature variability

Mean SE shelf bottom temperature, Jul 1

Fraction SE shelf with water less than

-1°C  0°C  1°C  2°C

Warm

Cold

Neutral
Model uncertainty vs internal variability

- Phytoplankton biomass (mmol N m$^{-2}$)
- Microzooplankton biomass (mmol N m$^{-2}$)
- Net primary production (mmol N m$^{-2}$ d$^{-1}$)
- Net mesozooplankton production (mmol N m$^{-2}$ d$^{-1}$)

- Fraction P biomass large (fraction)
- Mesozooplankton biomass (mmol N m$^{-2}$)
- Net microzooplankton production (mmol N m$^{-2}$ d$^{-1}$)
How does NPP respond to temperature?
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How do zooplankton respond?

z-ratio = mesozoo prod/NPP
(Stock et al., 2014)
How do zooplankton respond?
What challenges do we face bringing environmental forecasts into the decision-making process?

1. Mismatch between model design priorities and current desired use (research focus vs use across spatiotemporal scales and with novel conditions)

2. Efforts like the CEFI are necessary to bring research-oriented models into an operational space