RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

Climate Change and Marine Ecosystem Research at NCAR

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and

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With Contributions from

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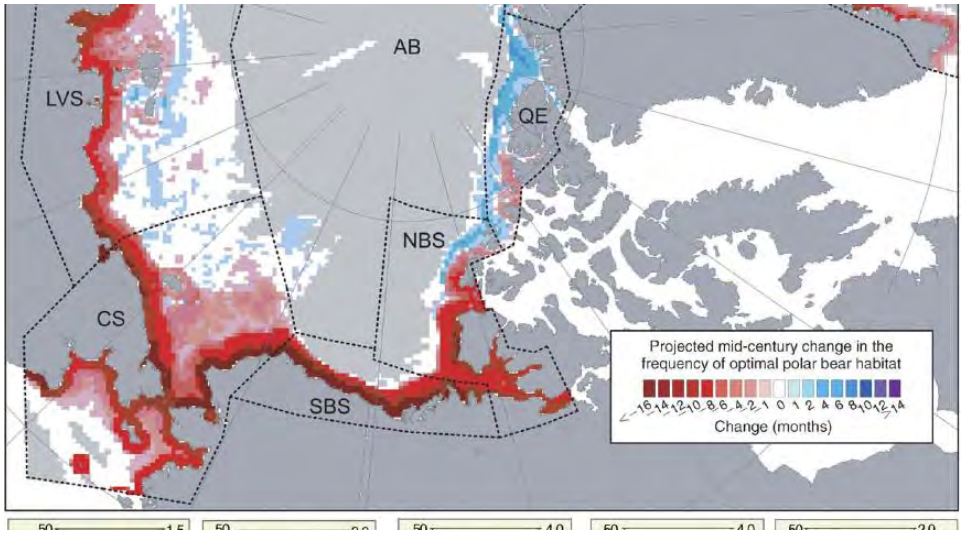
Relevant science topics:

- Climate change will cause marine ecosystems to shift geographically and change compositionally
- The ‘natural’ environmental conditions of many species and ecosystems will shrink or disappear
- It is no longer a question of conserving marine ecosystems in their natural state, but rather how to preserve ecosystem functioning
- How can we best apply oceanographic/climate modeling to understand/predict these changes and/or advise management strategies?

The responses of marine ecosystems to climate change

- Marine Biogeochemistry Modeling – climate change impacts on open ocean functional groups; carbon cycle
- Effects of sea ice and polar temperatures on species distributions
- Coral reef bleaching
- Effects of shifts in ocean circulation on fish/fisheries

Recent Applications of NCAR Ocean Models to CCME-topics



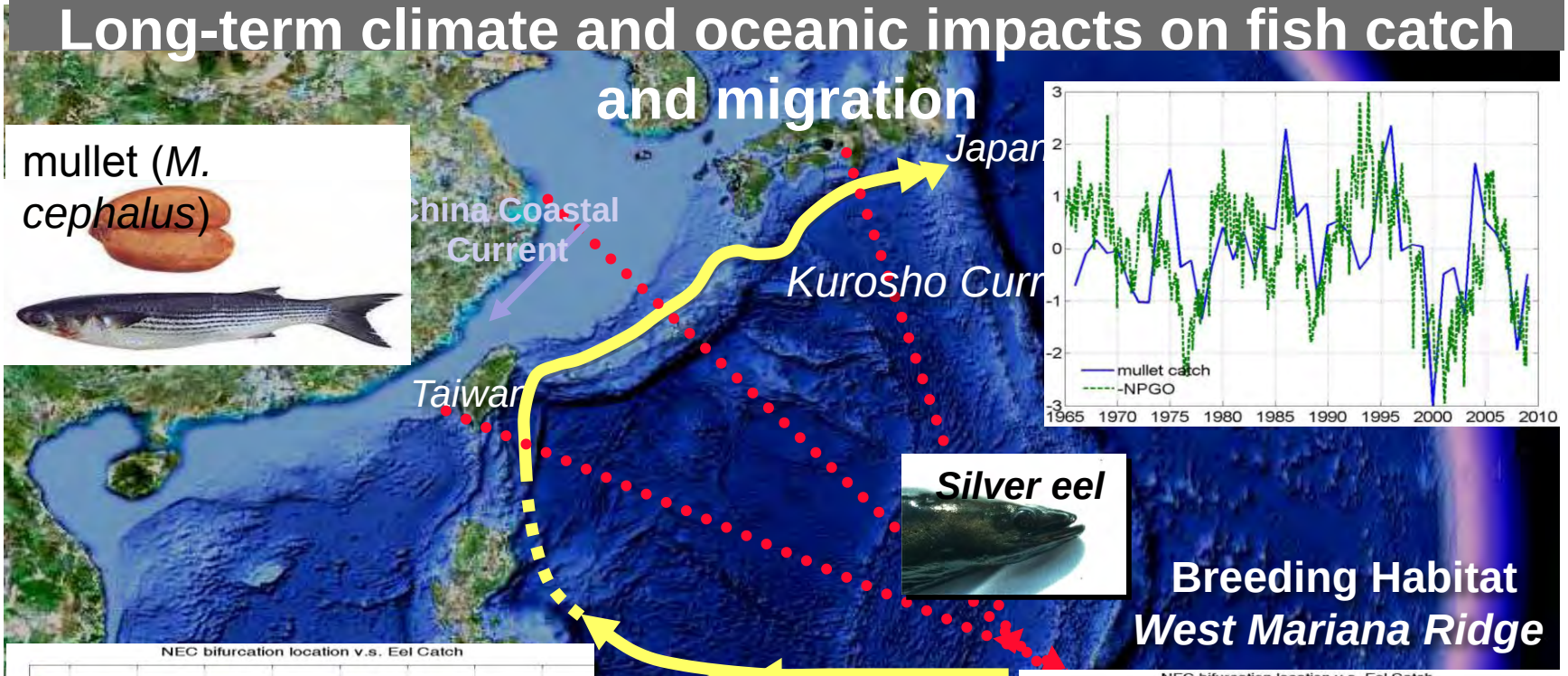
Application of the CESM sea ice model: Future changes in polar bear habitat

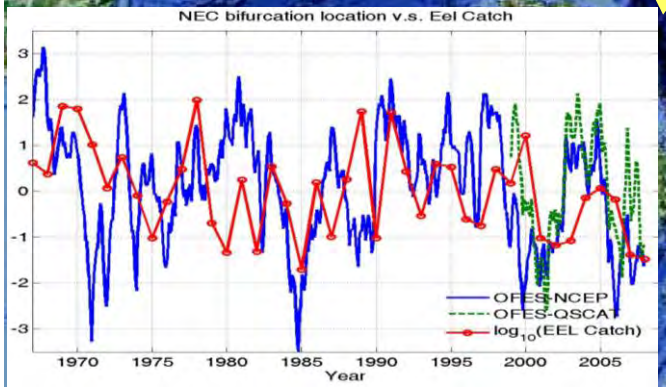
Durner et al. (2009) Predicting 21st-centruy polar bear habitat distribution from global climate models. *Ecological Monographs*

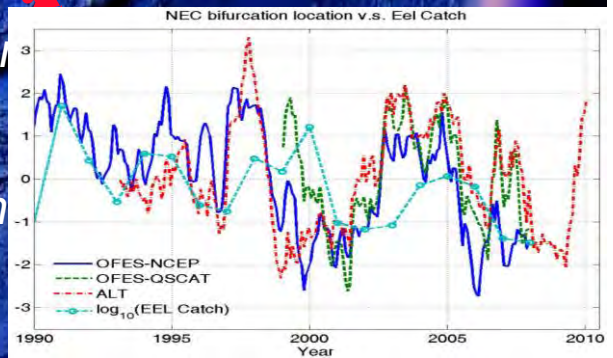
Recent Applications of NCAR Ocean Models to CCME-topics

Long-term climate and oceanic impacts on fish catch and migration

mullet (*M. cephalus*)

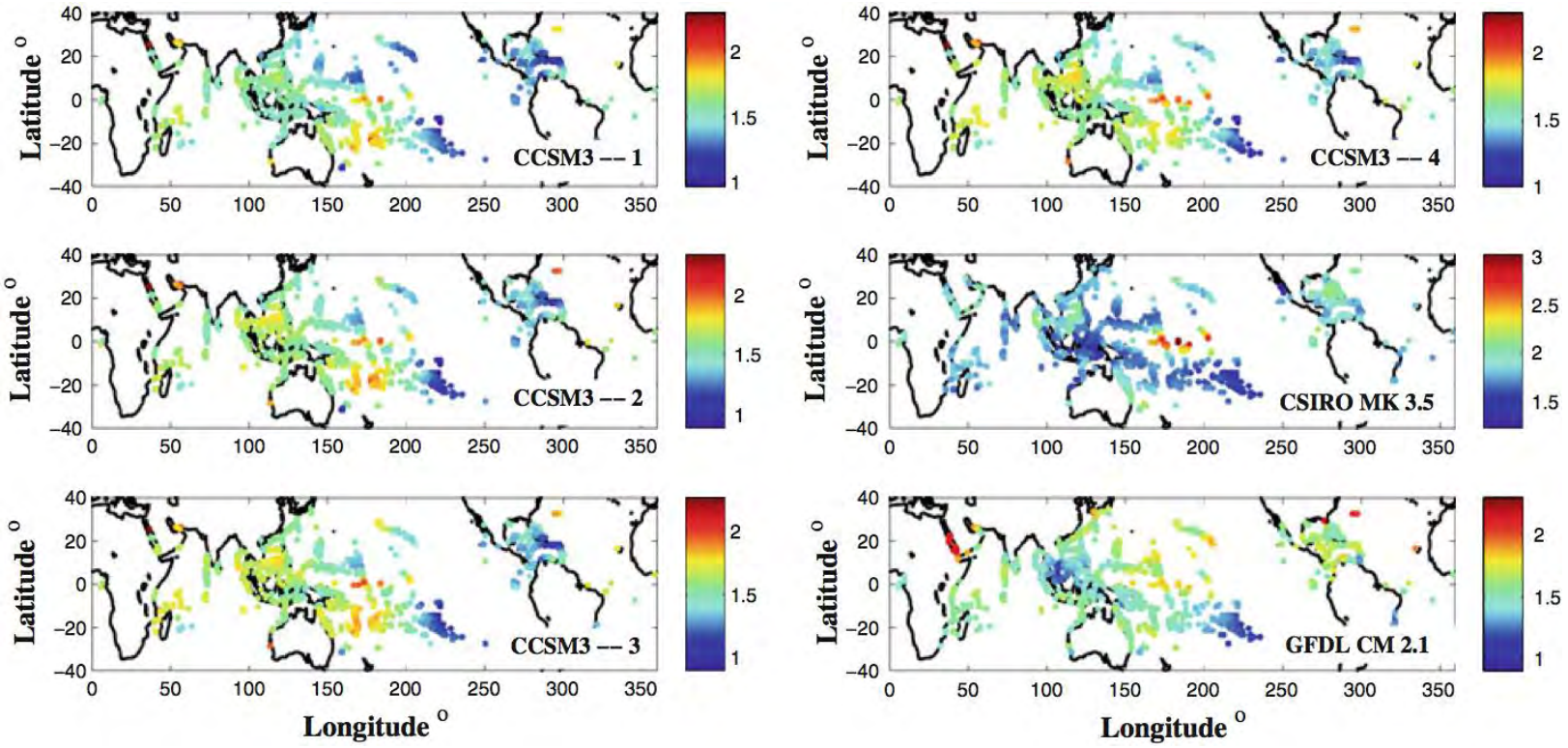






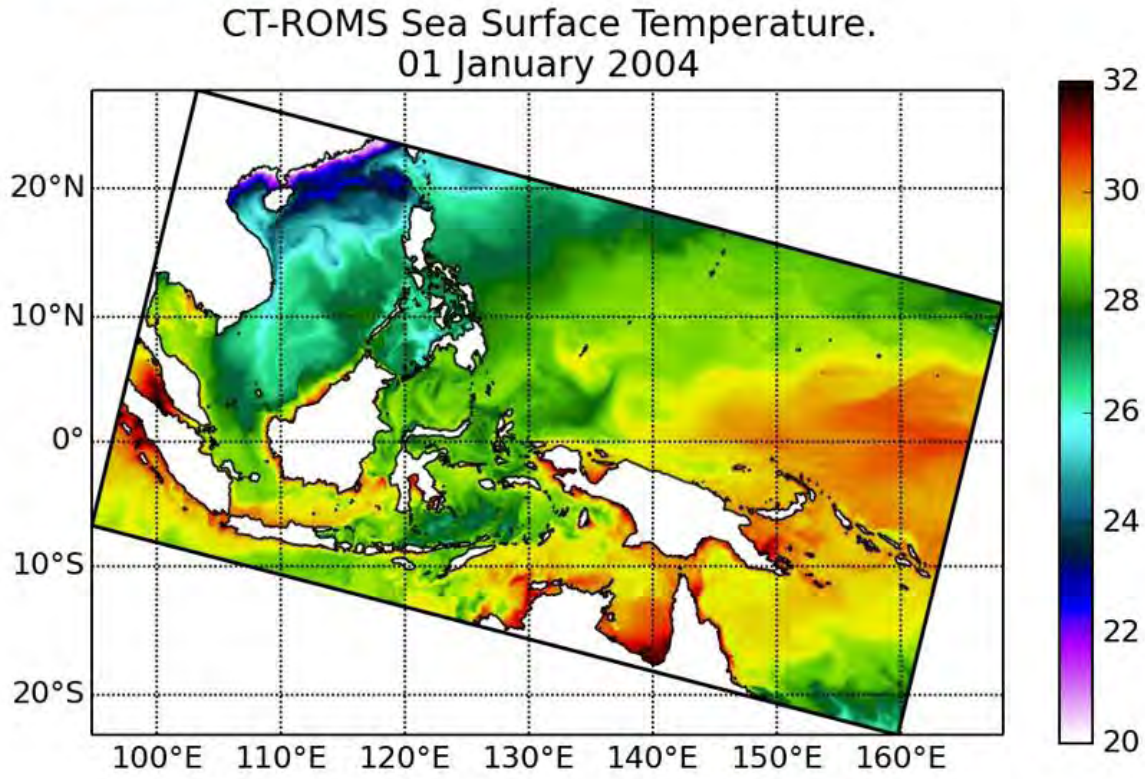
Recent Applications of NCAR Ocean Models to CCME-topics

Required adaptation, in °C, to avoid bleaching frequency of < 5 years



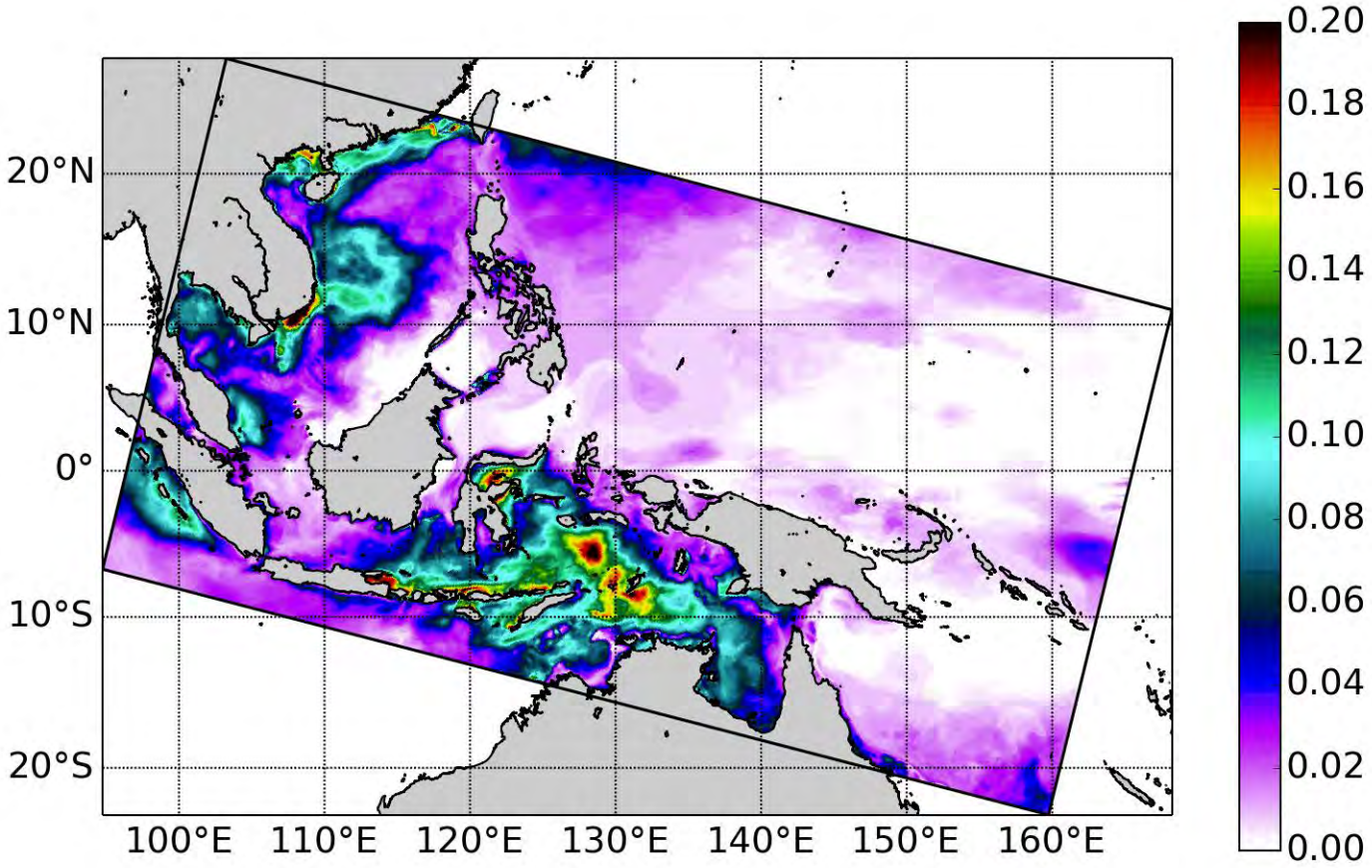
Teneva et al. (2011) Predicting coral bleaching hotspots: the role of regional variability in thermal stress and potential adaptation rates. *Coral Reefs*

CT-ROMS: Downscaling the climate model



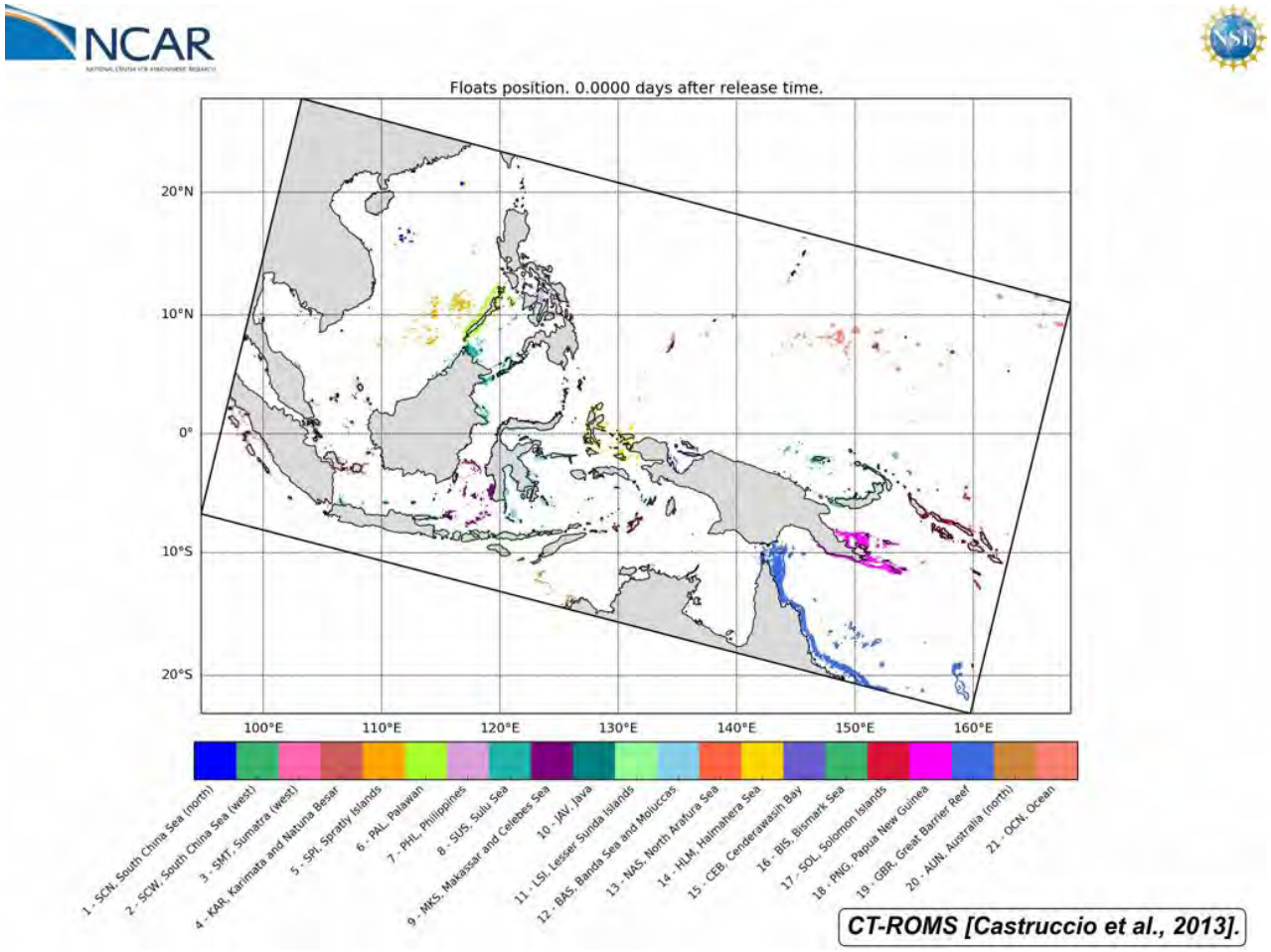
CT-ROMS [Castruccio et al., 2013].

CT-ROMS: Degree-Heating-Weeks (DHW)



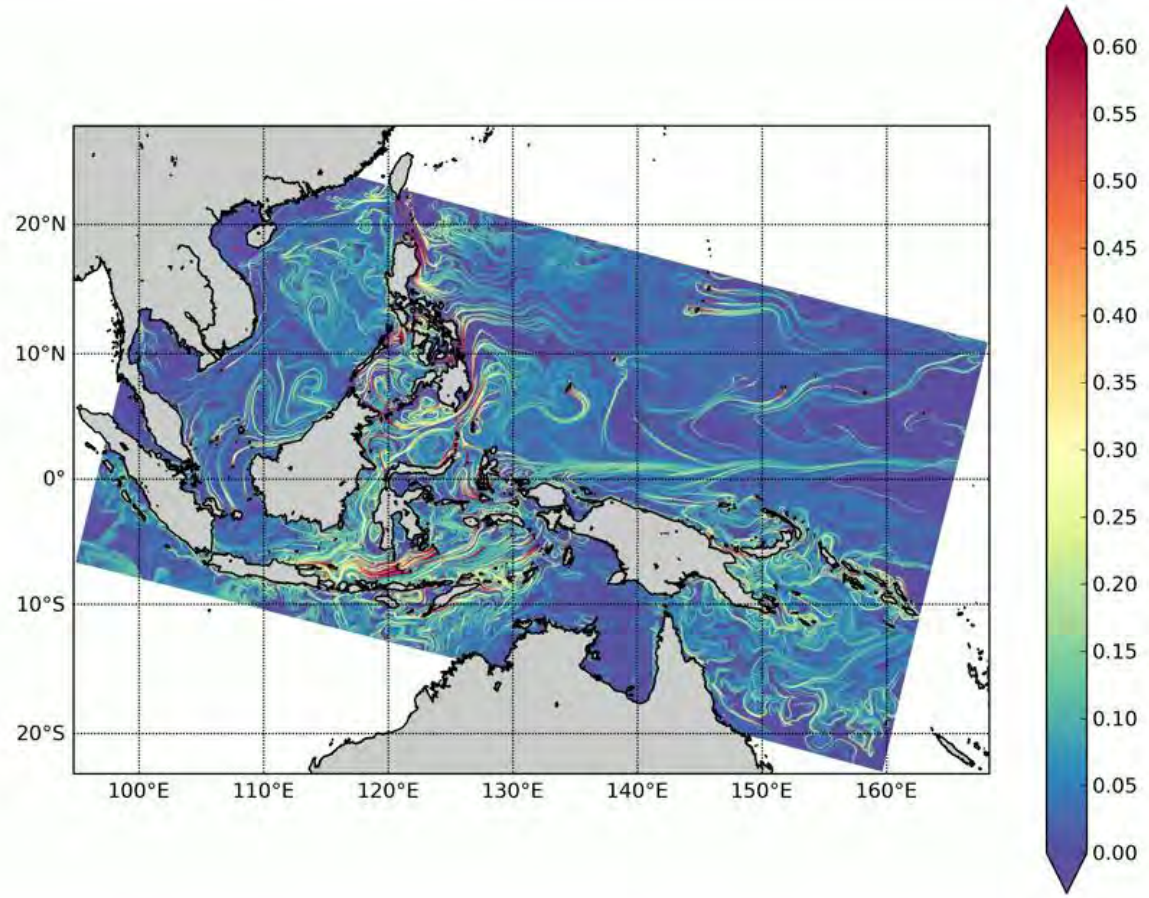
frequency of thermal stress events reaching a stress thresholds of DHW > 4

CT-ROMS: Connectivity in the Coral Triangle

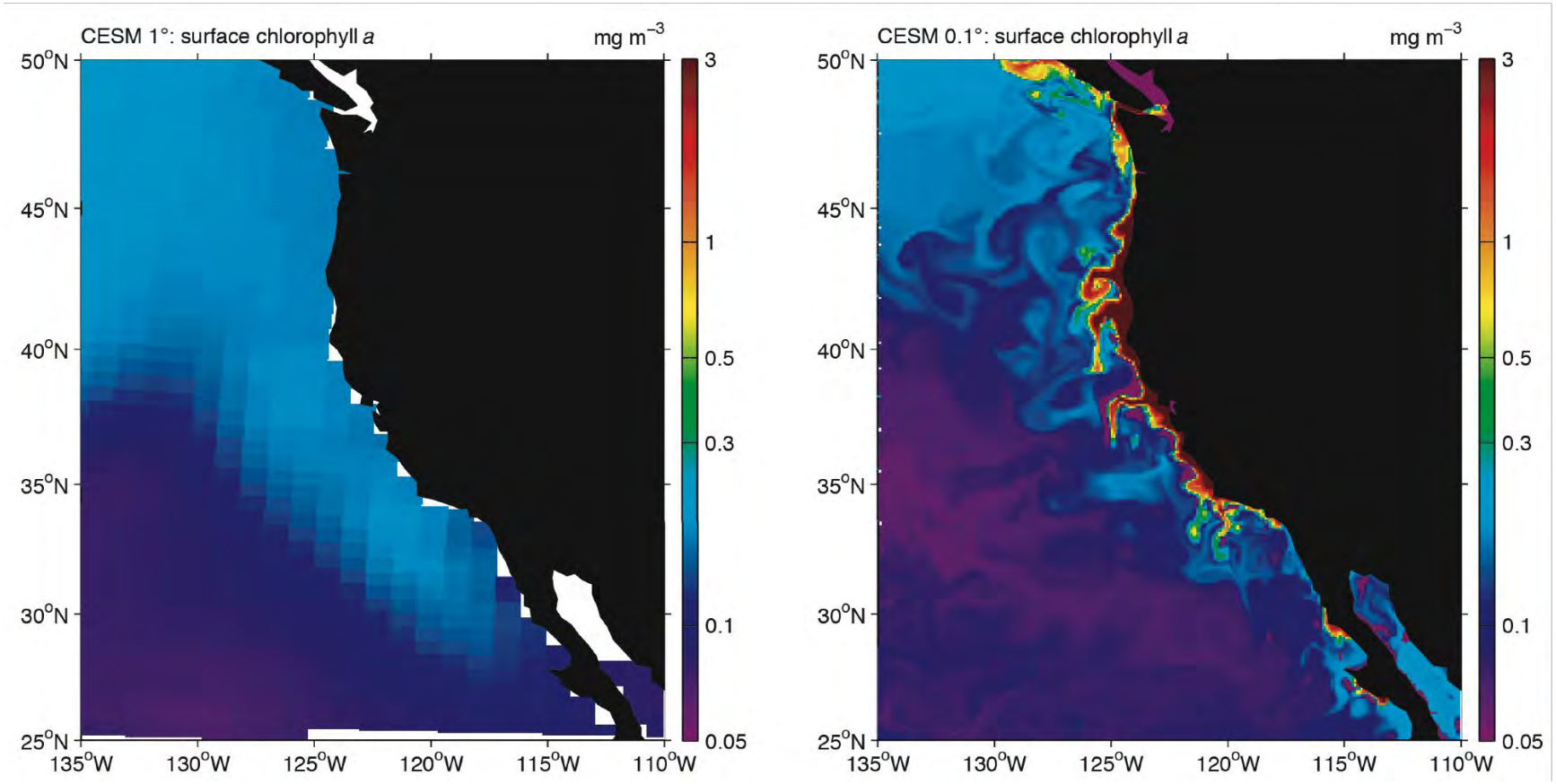


CT-ROMS [Castruccio et al., 2013].

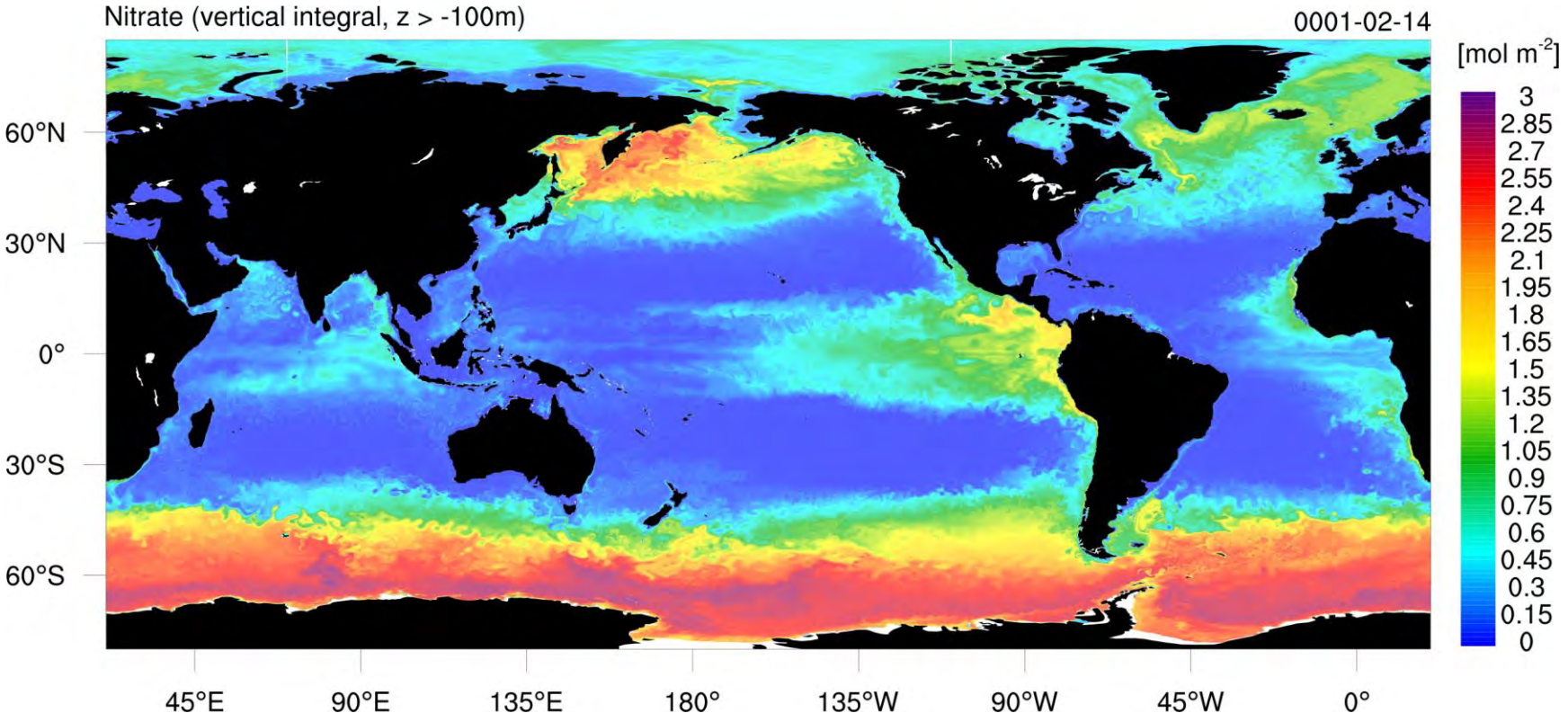
CT-ROMS: Lagrangian Coherent Structures



Emerging directions: High-resolution global coupled models



Emerging directions: High-resolution global coupled models



Emerging directions: High-resolution global coupled models