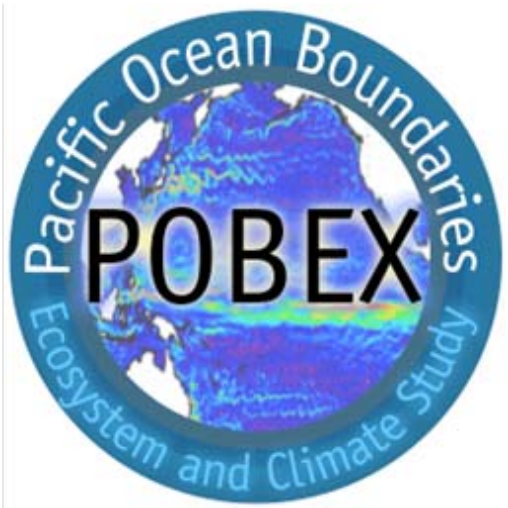
Pacific Ocean Boundary Ecosystems & Climate Study

This research is sponsored by the
National Science Foundation and US GLOBEC Program
through the Physical and Biological Oceanography programs



An international effort that shares data and methods

PIs: E. Di Lorenzo, A. Bracco, J. Keister, P.T. Strub, A. Thomas, P.J.S. Franks
NOAA Co-PIs: S. Bograd, W. Peterson, R. Mendelssohn, F. Schwing
Japanese Collaborators: S. Chiba, Y. Sasai, H. Sasaki, M. Nonaka, B. Taguchi, A. Ishida
South American Collaborators: O. Pizarro, R. Escribano, J. Rutllant, S. Hormazabal, V. Montecino
Canadian Collaborators: D. Mackas, M. Foreman, A. Pena, W. Crawford

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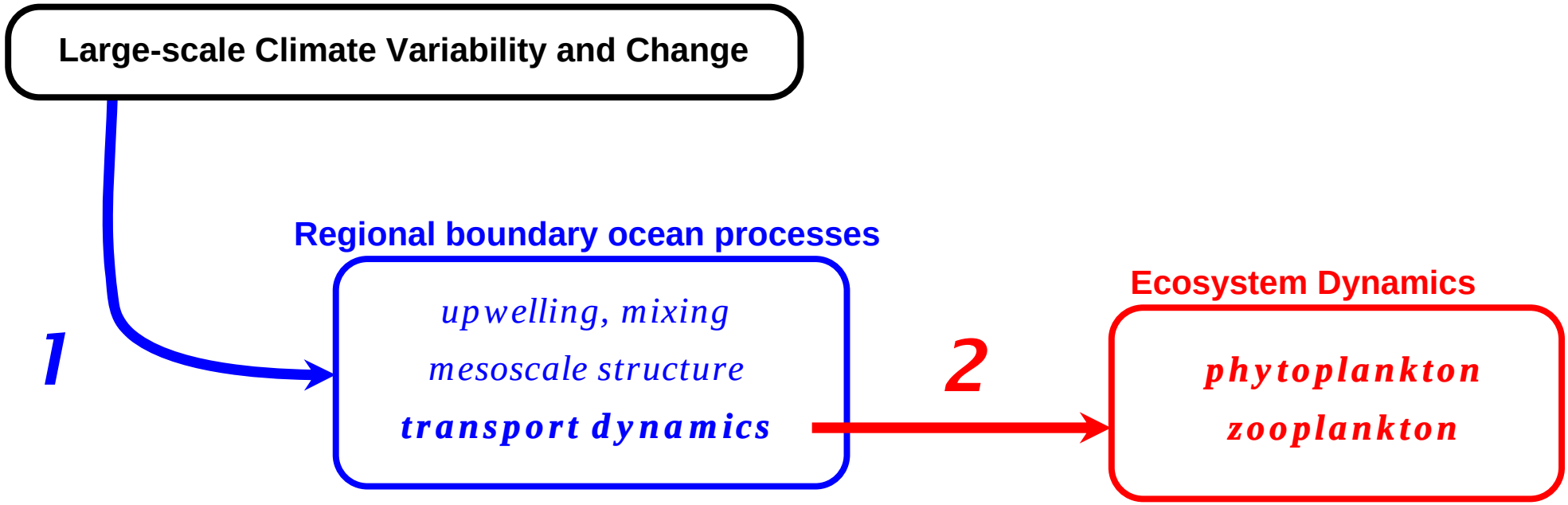
GOALS of POBEX

1) Understand, quantify and compare how large-scale climate variability has affected boundary ecosystems in the Pacific

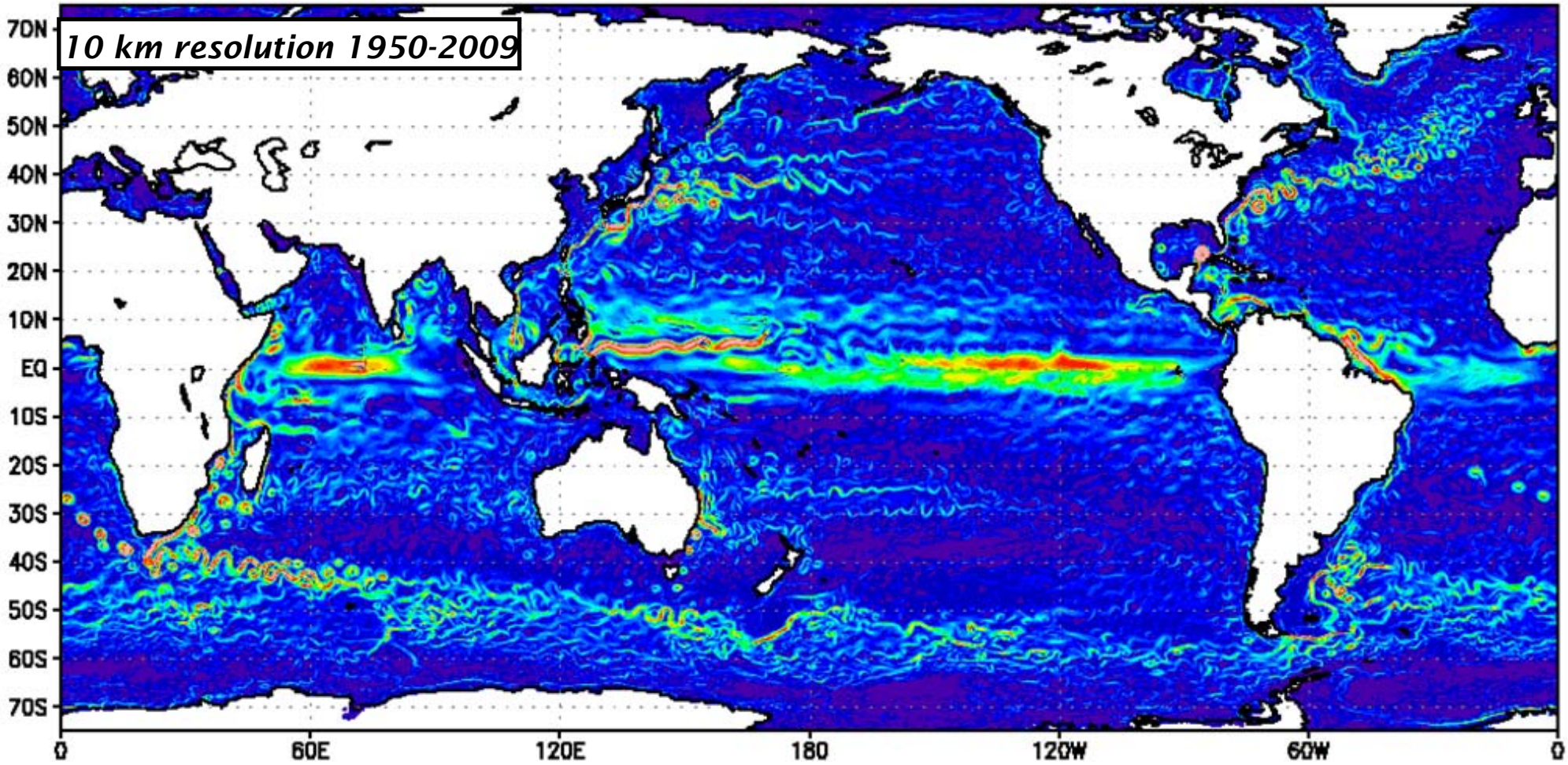
2) Explore the range of uncertainties in responses of these ecosystems to climate change

Main HYPOTHESIS



Modeling approach of POBEX

Japanese Earth Simulator Global Eddy-Resolving Model (OFES)



Surface Ocean Currents

0 10 20 30 40 50 60 70 80 90 100

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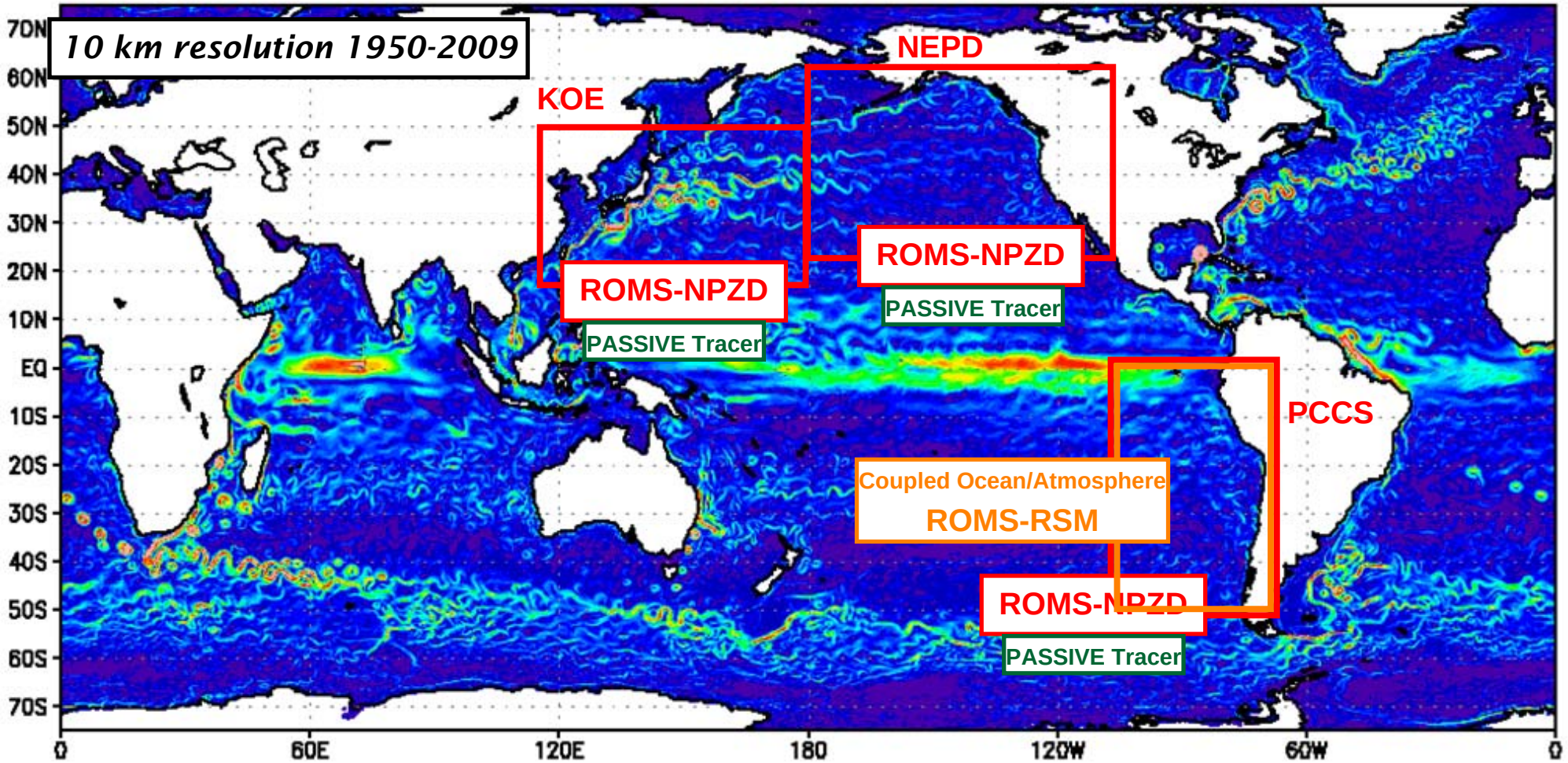


Surface Ocean Currents

0 10 20 30 40 50 60 70 80 90 100

Modeling approach of POBEX

Regional Models with Passive Tracers

1 *No coherent long-term observations exist to date across boundary region*

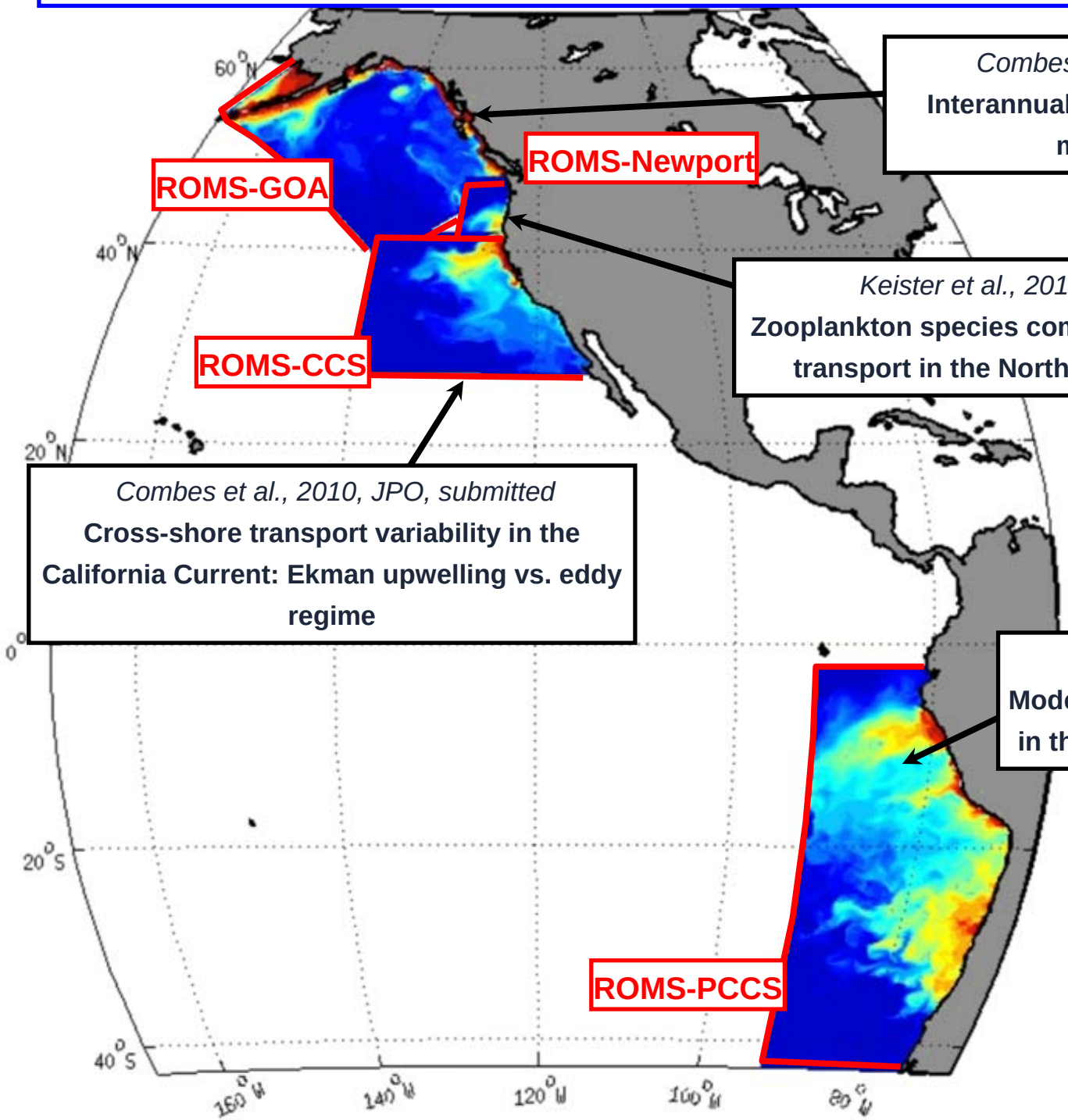
POBEX provides the first high-resolution modeling attempt

Indices of Transport and Upwelling Statistics

2 *Growing evidence lower-trophic levels are sensitive to changes in transport and connectivity*

Ecosystem Observed Timeseries (e.g. *zooplankton*)

Transport and Upwelling Statistics for Pacific Boundaries



Combes et al., 2009, JPO, 39(4), 1050-1059
Interannual and decadal variations in cross-shore mixing in the Gulf of Alaska.

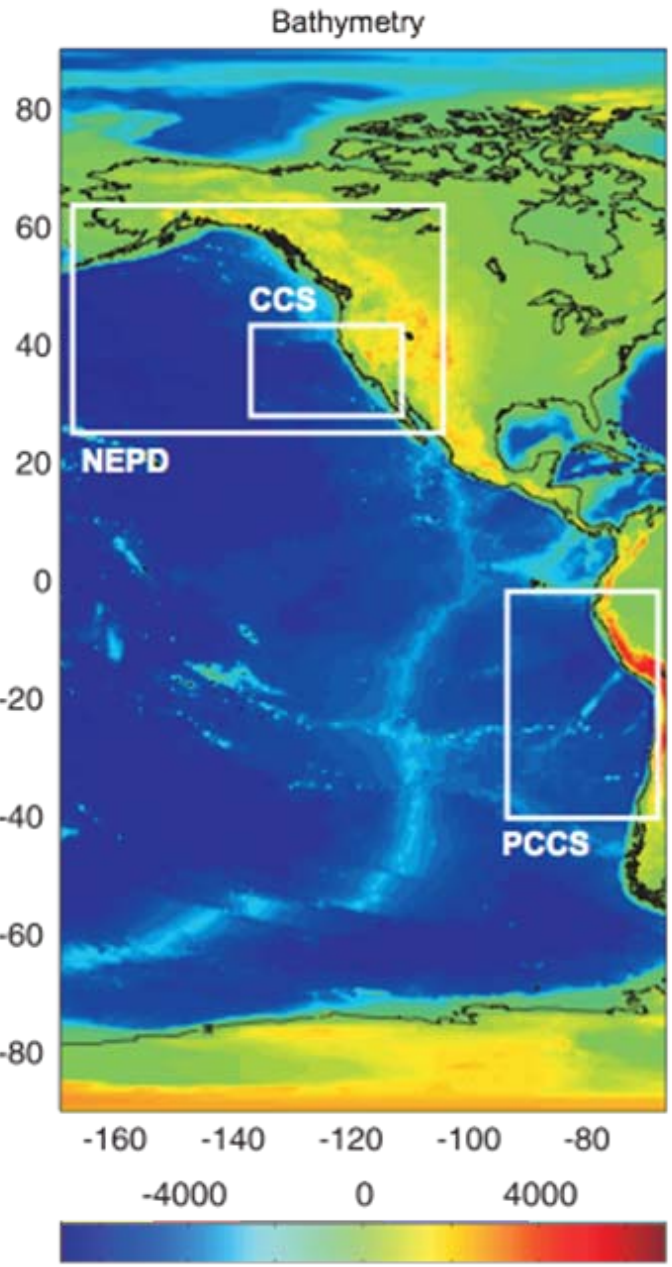
Keister et al., 2010, GCB, submitted
Zooplankton species composition linked to ocean transport in the Northern California Current

Combes et al., 2010, JPO, submitted
Cross-shore transport variability in the California Current: Ekman upwelling vs. eddy regime

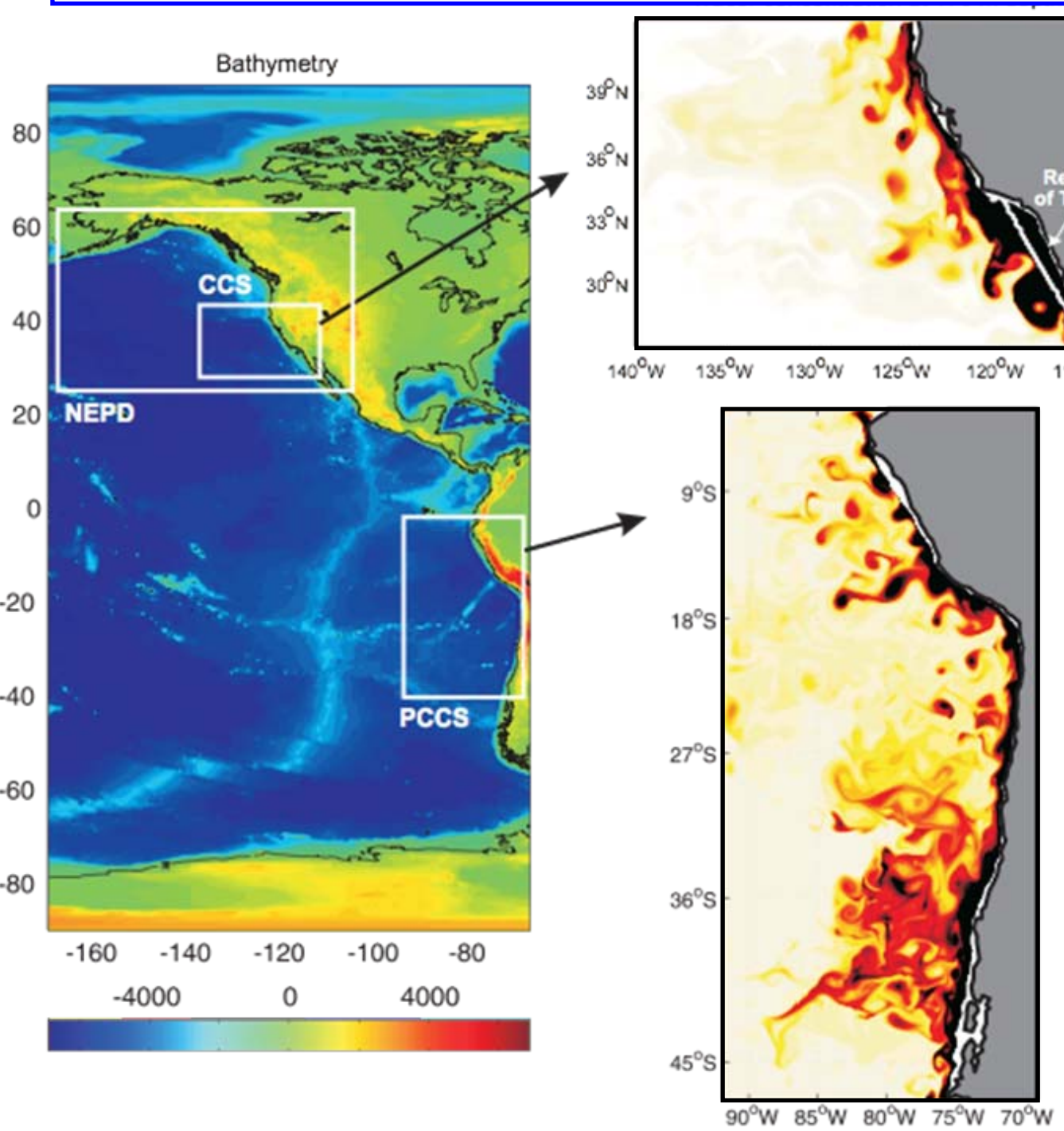
Combes et al., 2010, JPO, submitted
Modeling interannual and decadal variability in the Humboldt Current upwelling system.

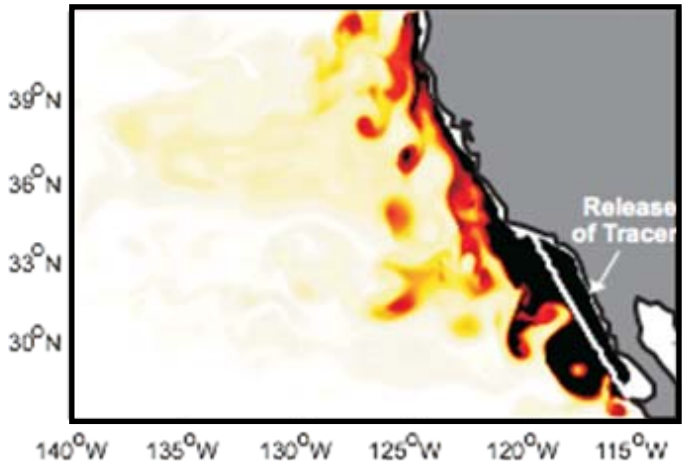
Pacific Ocean Boundaries
POBEX
Ecosystem and Climate Study

Transport and Upwelling Statistics for Pacific Boundaries



Transport and Upwelling Statistics for Pacific Boundaries





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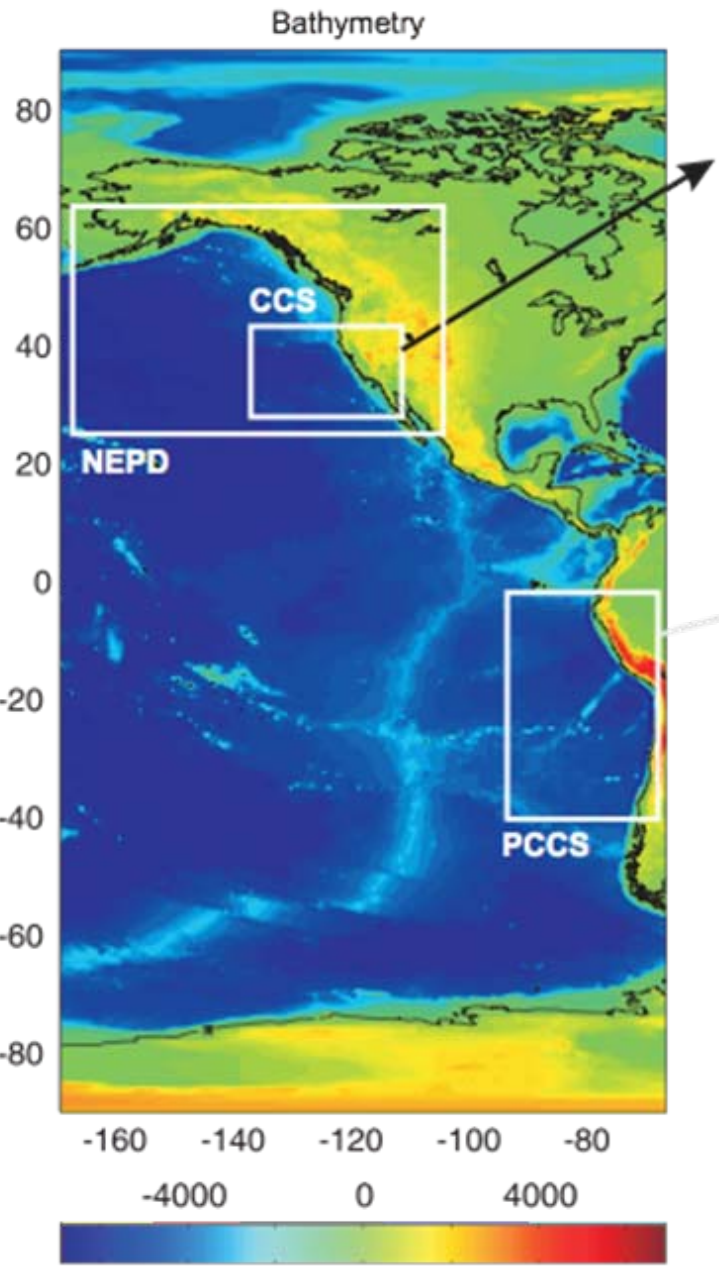
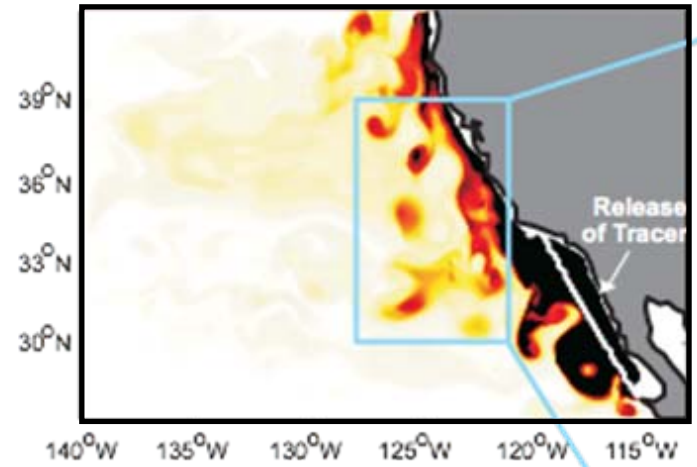
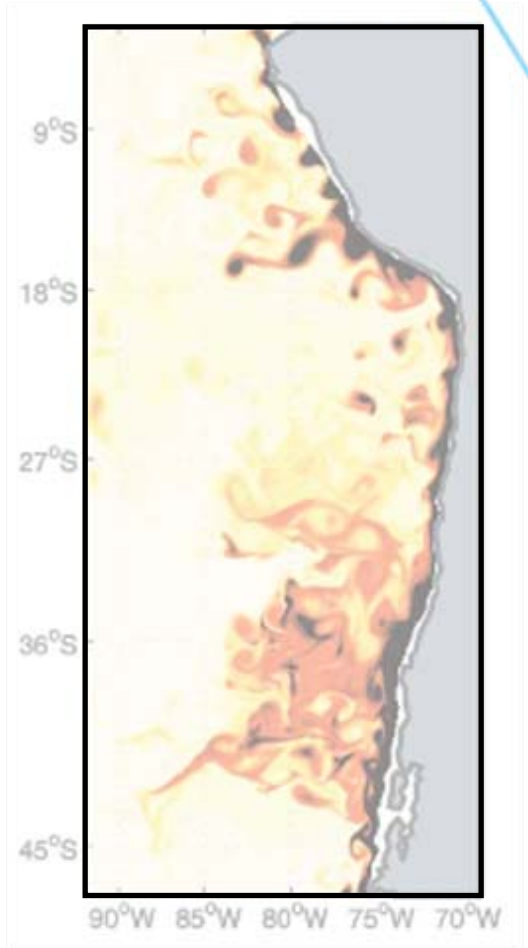
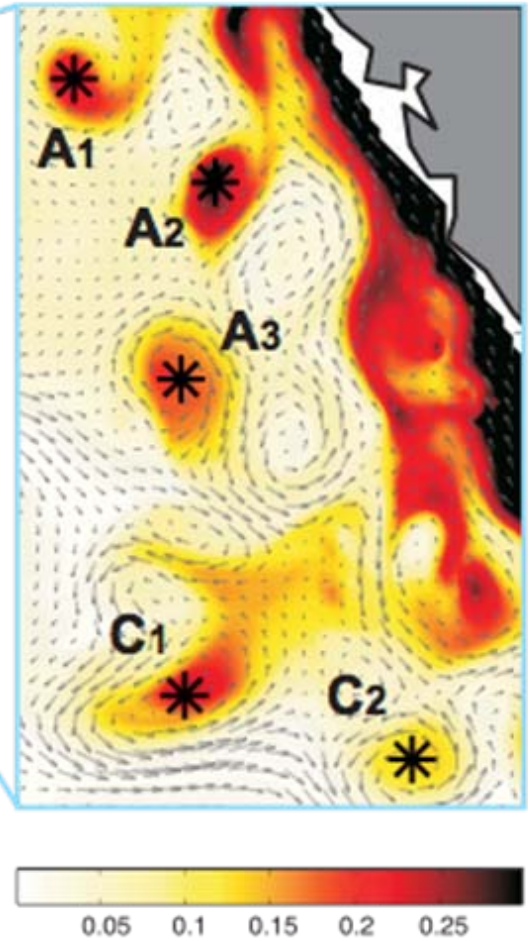






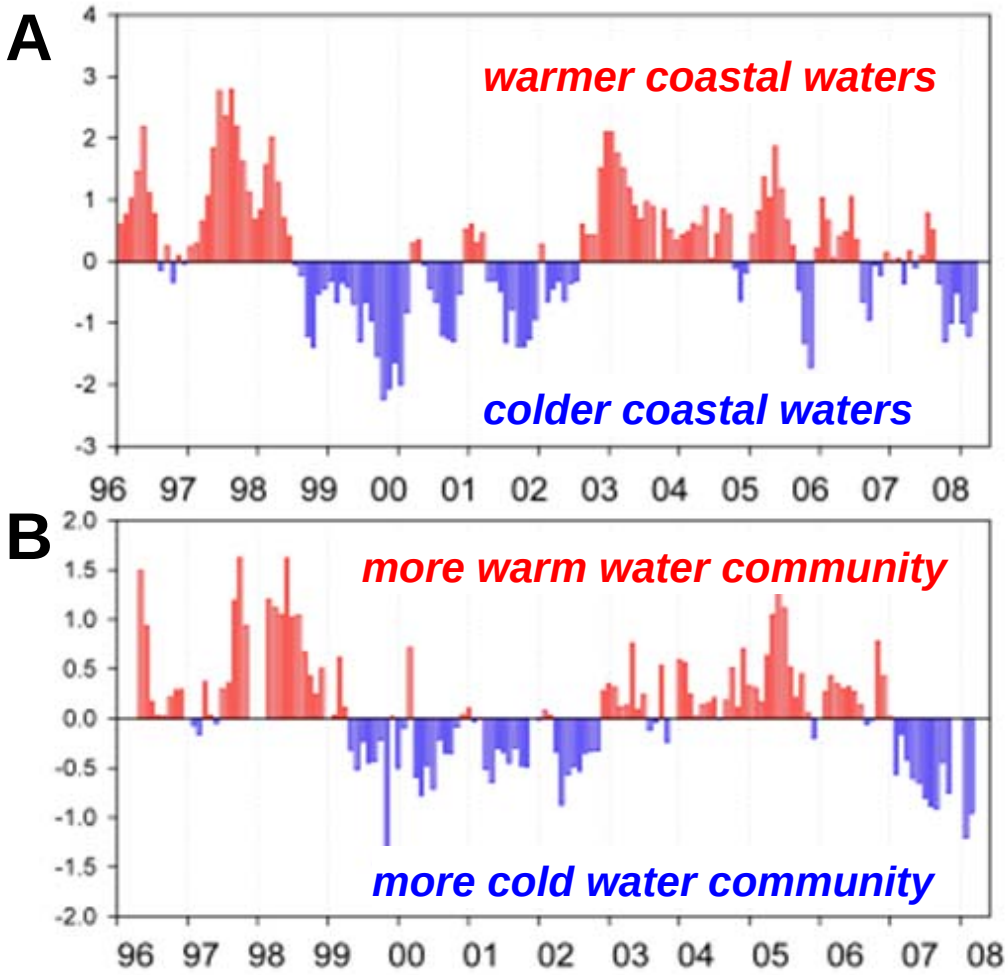


Combes et al, submitted

EXAMPLE of testing *Hypotheses* on the link between changes in transport and ecosystems:

The HYPOTHESIS

the Pacific Decadal Oscillation modulates the intrusion of warm/cold copepod species in the Northern California Current



PDO Index

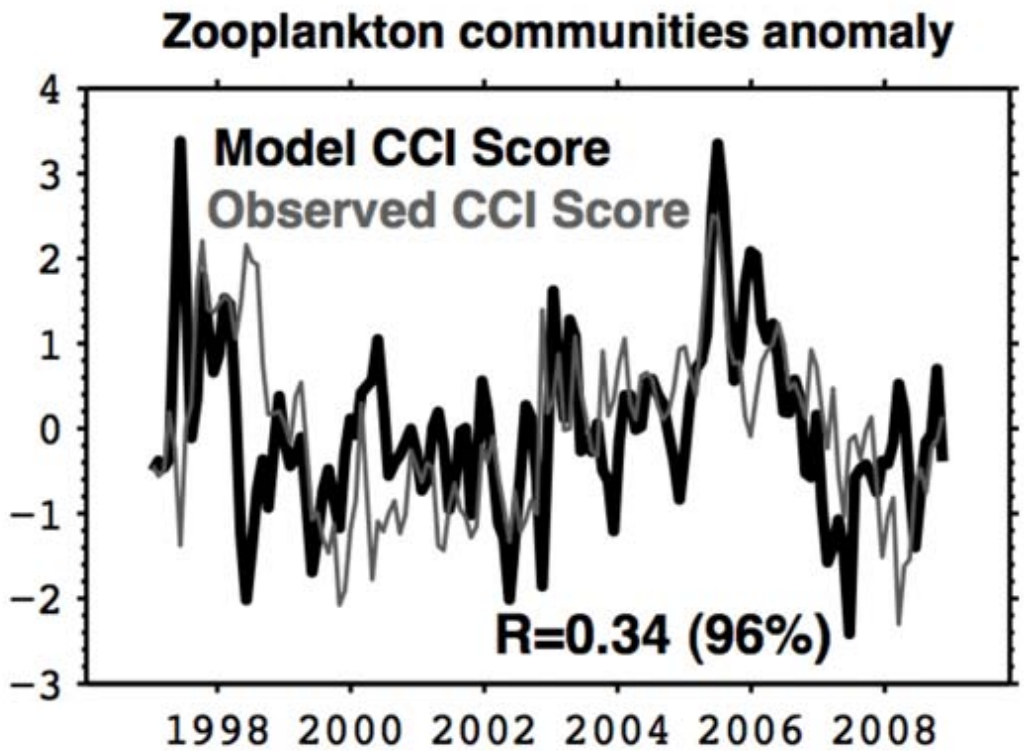
"CCI"

Copepod Community Index anomaly

EXAMPLE of testing *Hypotheses* on the link between changes in transport and ecosystems

The TEST

use model passive tracers
to track the warm/cold copepod
species intrusions



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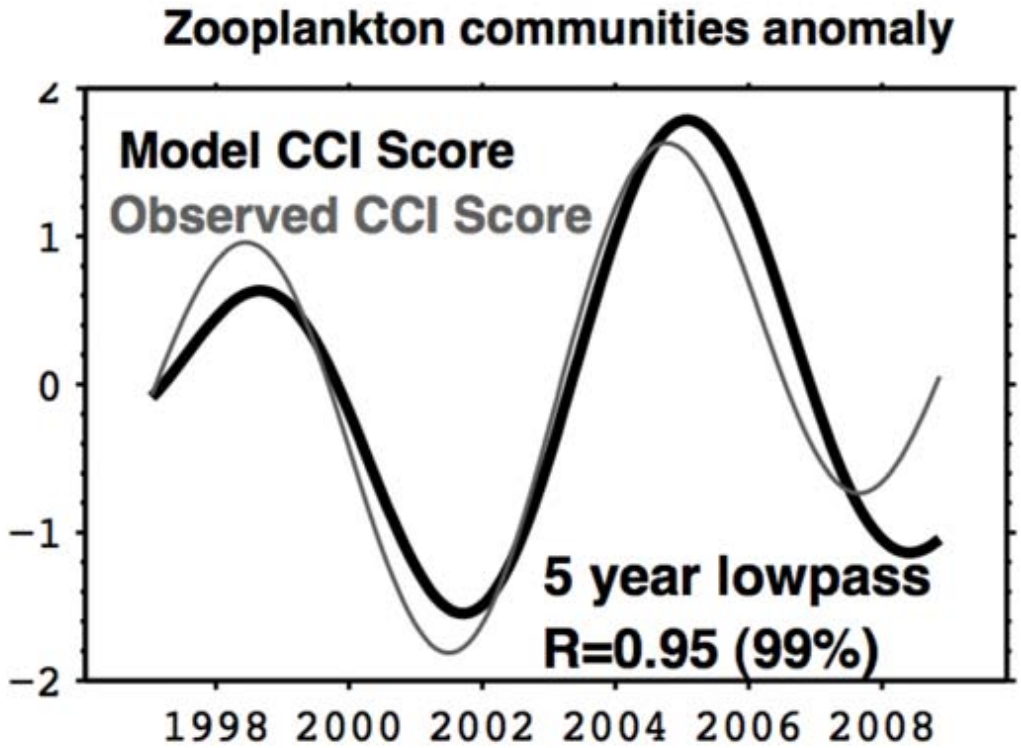

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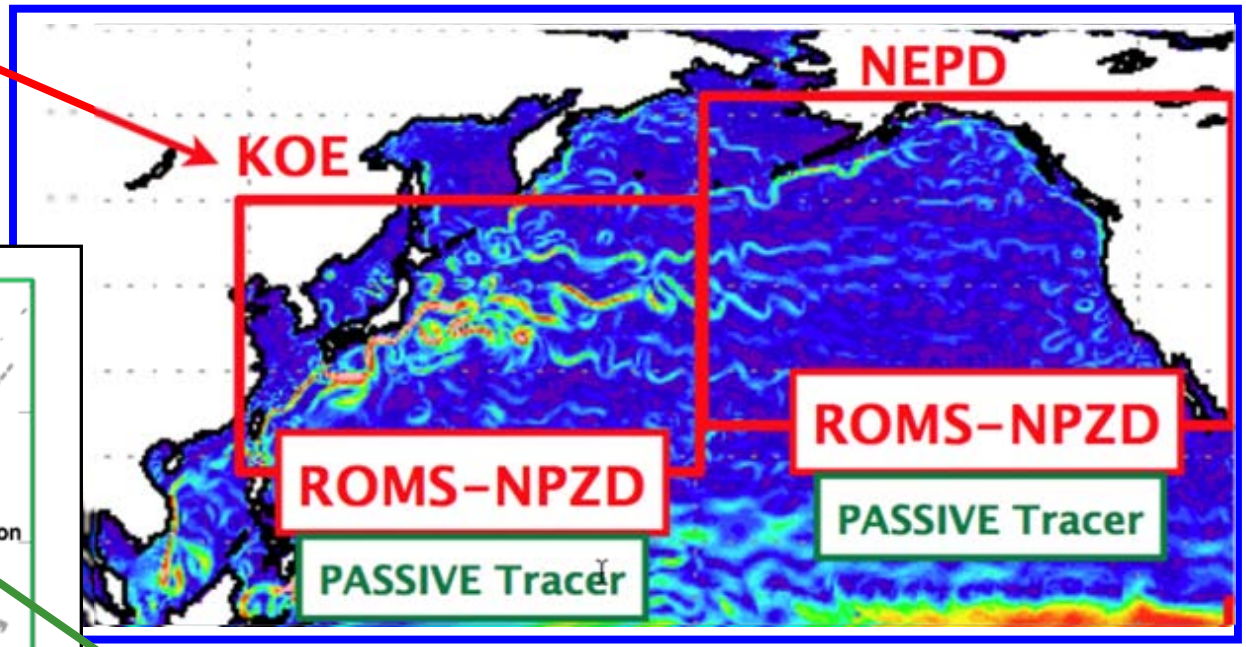
Low-Frequency Zooplankton and Transport Dynamics in the KOE

*S. **Chiba** (JAMSTEC, Japan), J. **Keister** (UW, USA)*
*H. **Song** (UCSD), B. **Taguchi** (JAMSTEC), V. Combes and E. Di Lorenzo(GaTech, USA)*

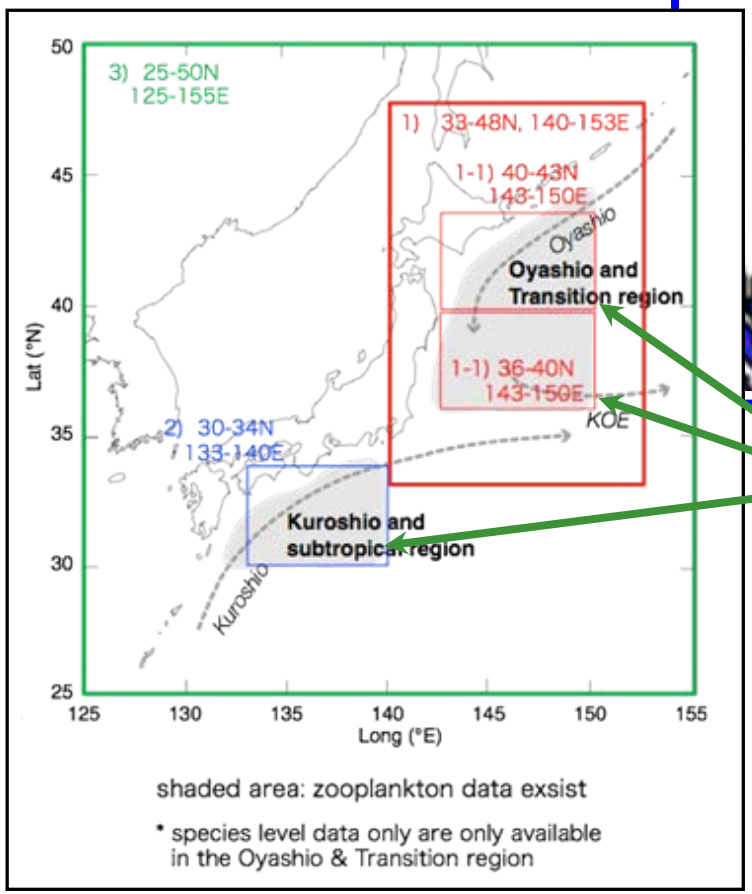
1 **Generate Forward ROMS-KOE integration 1950-2009**

OFES Model

10 km resolution 1950-2009



Passive Tracer Study Area



2 **Perform Adjoint integration to assess where water masses are coming from in regions 1 and 2**

3 **Diagnose relationship between changes in Zooplankton and source waters**

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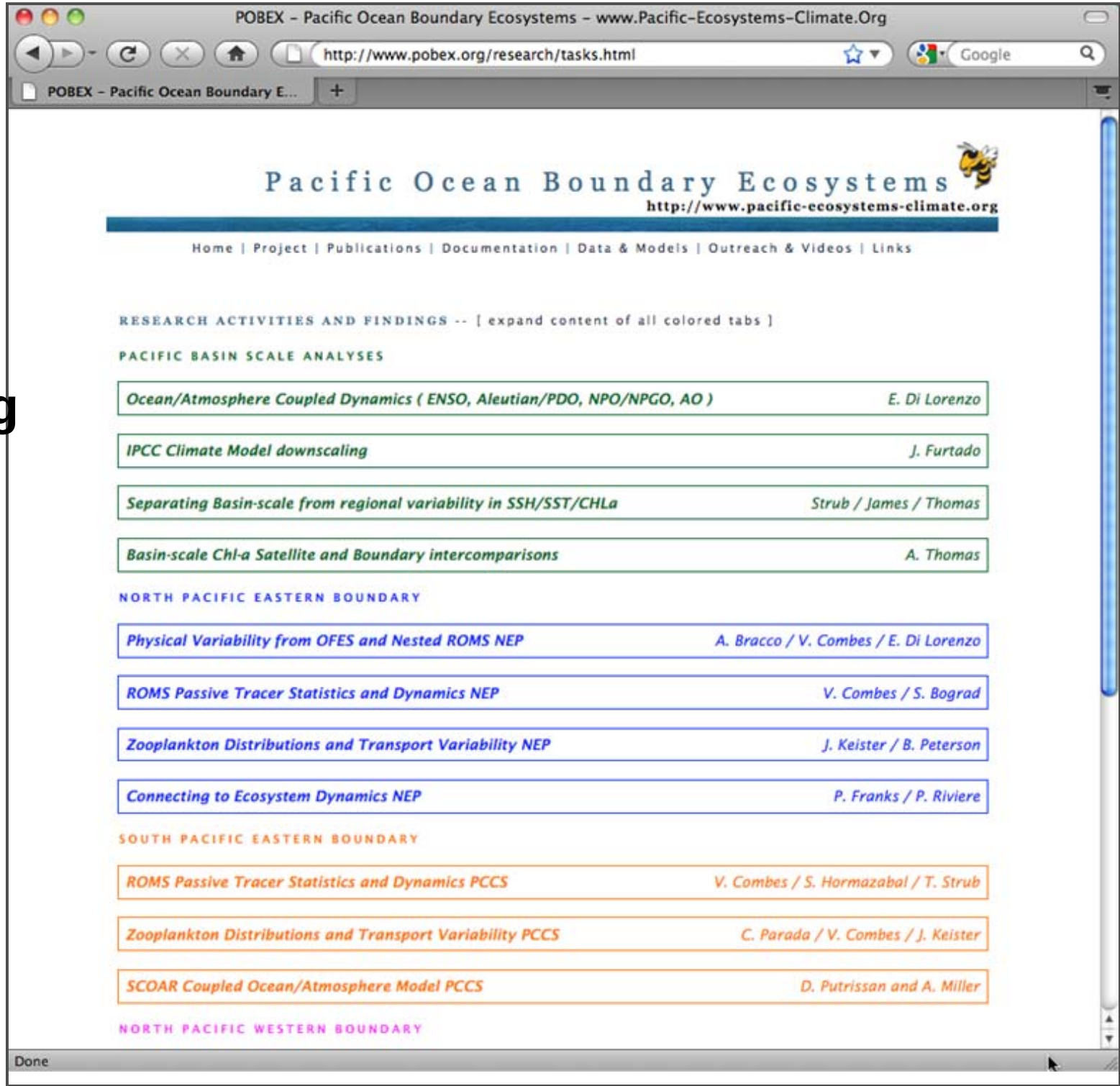
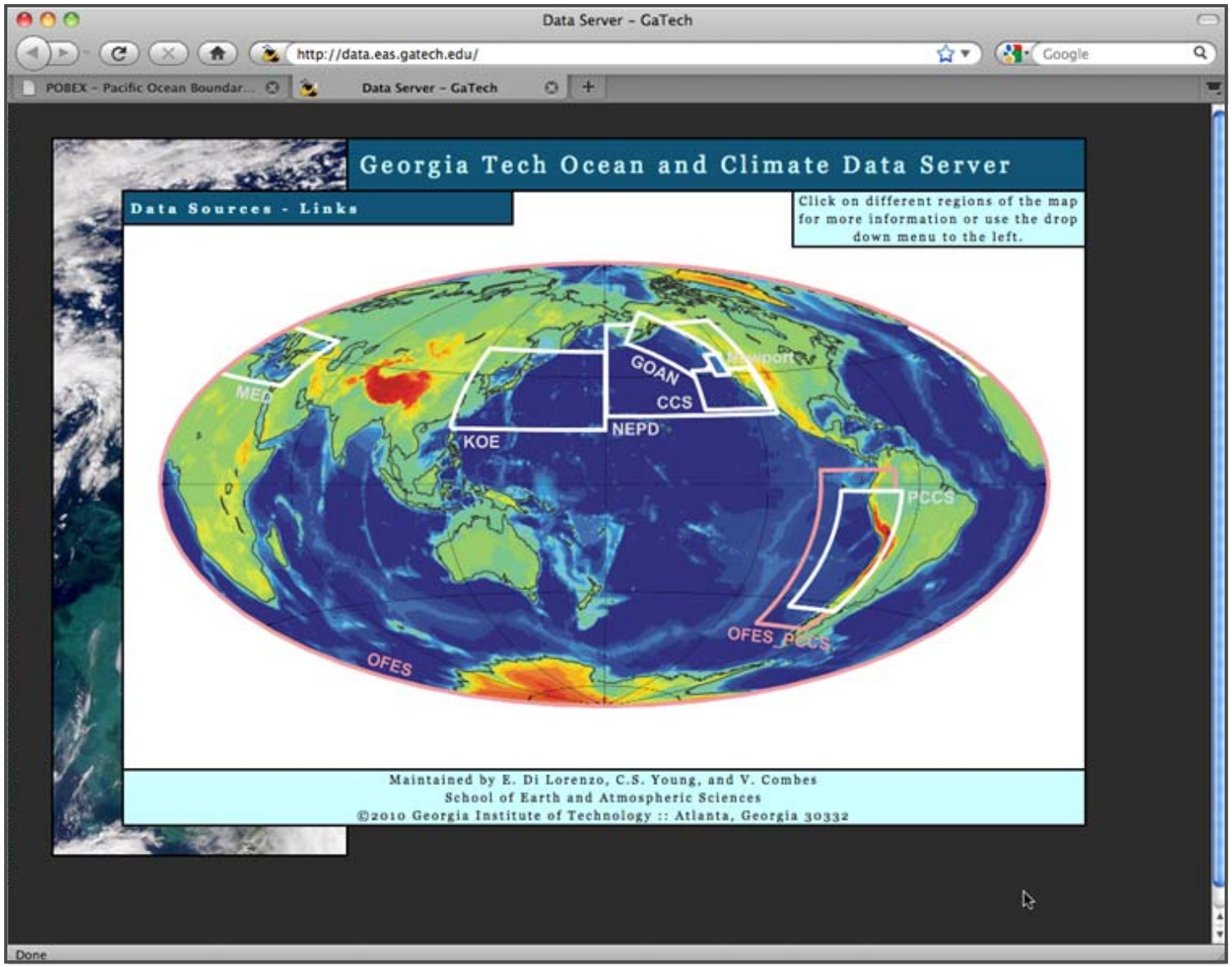
Research updates and findings:



Model Data Archive available on Georgia Tech OpenDAP Server

www.pobex.org



http://data.eas.gatech.edu

Challenges of basin-scale synthesis research

Problems

1)The need for data from multiple collaborators from many nations.

2)The ability (inability) of international colleagues to focus on projects together.

Solutions

1)Open collaboration and data-sharing

2)(a wish…) Increased availability of funding that can cross country-boarders.

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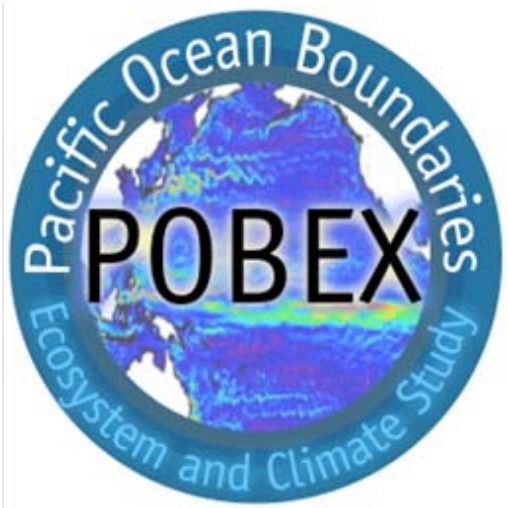

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