

Winners And Losers During ENSO Conditions In The CCS From a ROMS-NEMURO Perspective

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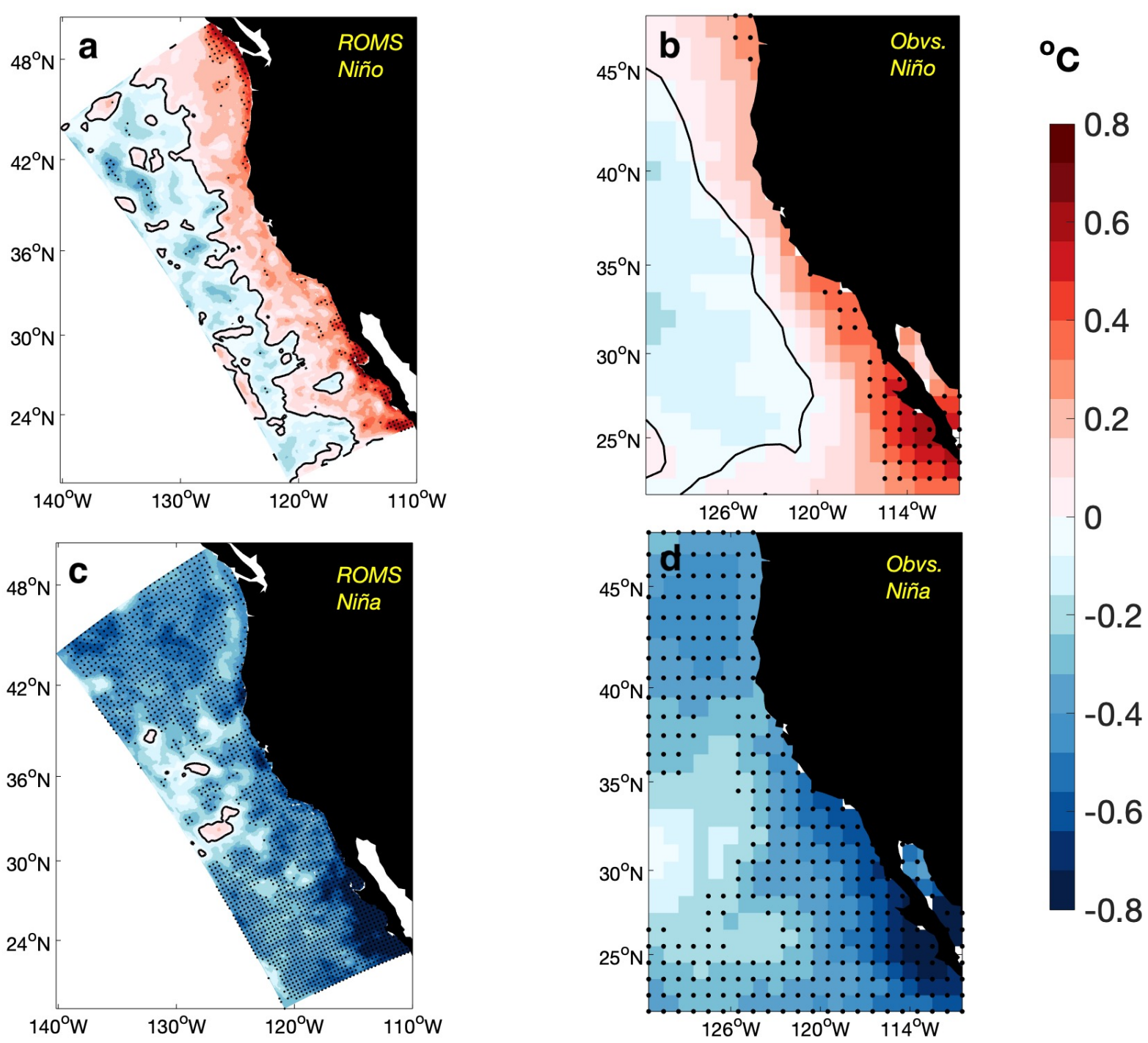
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Introduction

The physical variability of the California Current System (CCS) drives changes in the biogeochemistry of the ecosystem, and this coupled bio-physical interactions result in a consistent response of the CCS to El Niño and La Niña events, that can be exploited as a potential predictor of the ecosystem.

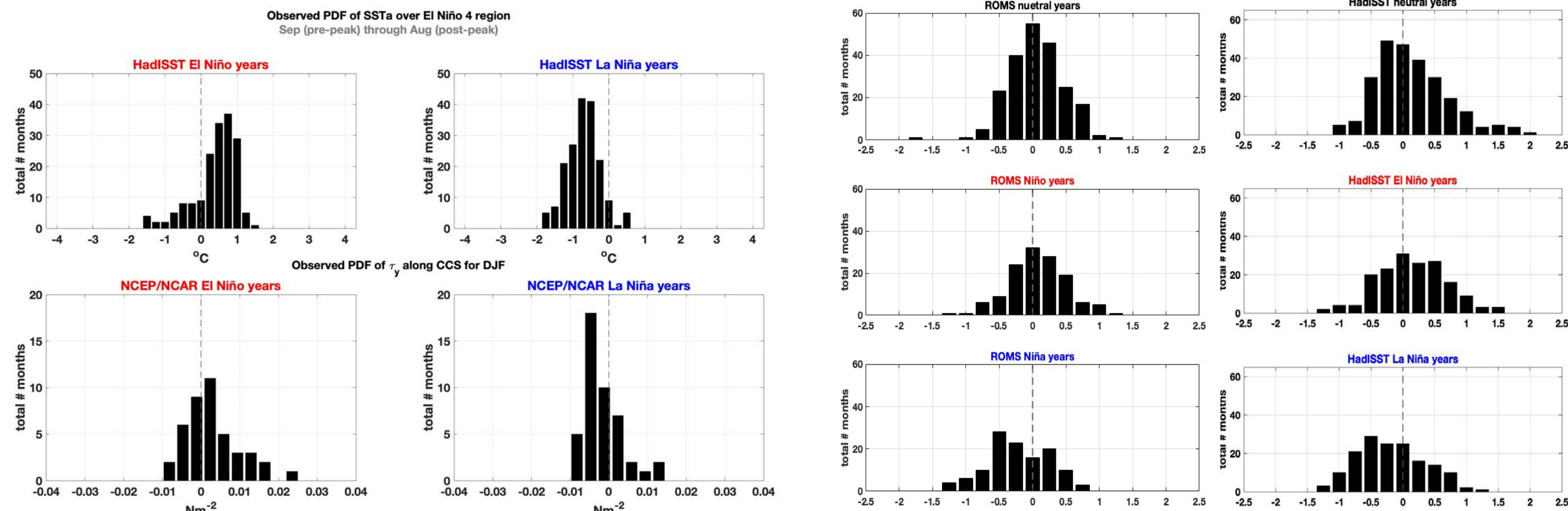
In this study we use products from a simulation with the Regional Oceanographic Model System (ROMS) on a ~7km high resolution grid, coupled to an ecological component (NEMURO) to characterize the physical and biological response of the CCS to ENSO (El Niño Southern Oscillation) over the period from 1958 to 2007.

Composite ENSO winter(DJF) SST anomalies over CCS



Asymmetry in the response of the CCS to ENSO events and its links with the tropical Pacific

The cooling of the CCS during La Niña events is more consistent than the warming related to El Niño. This is also observed in the Niño 4 region over the tropical Pacific, where atmospheric teleconnections originate (PNA pattern)



Methods

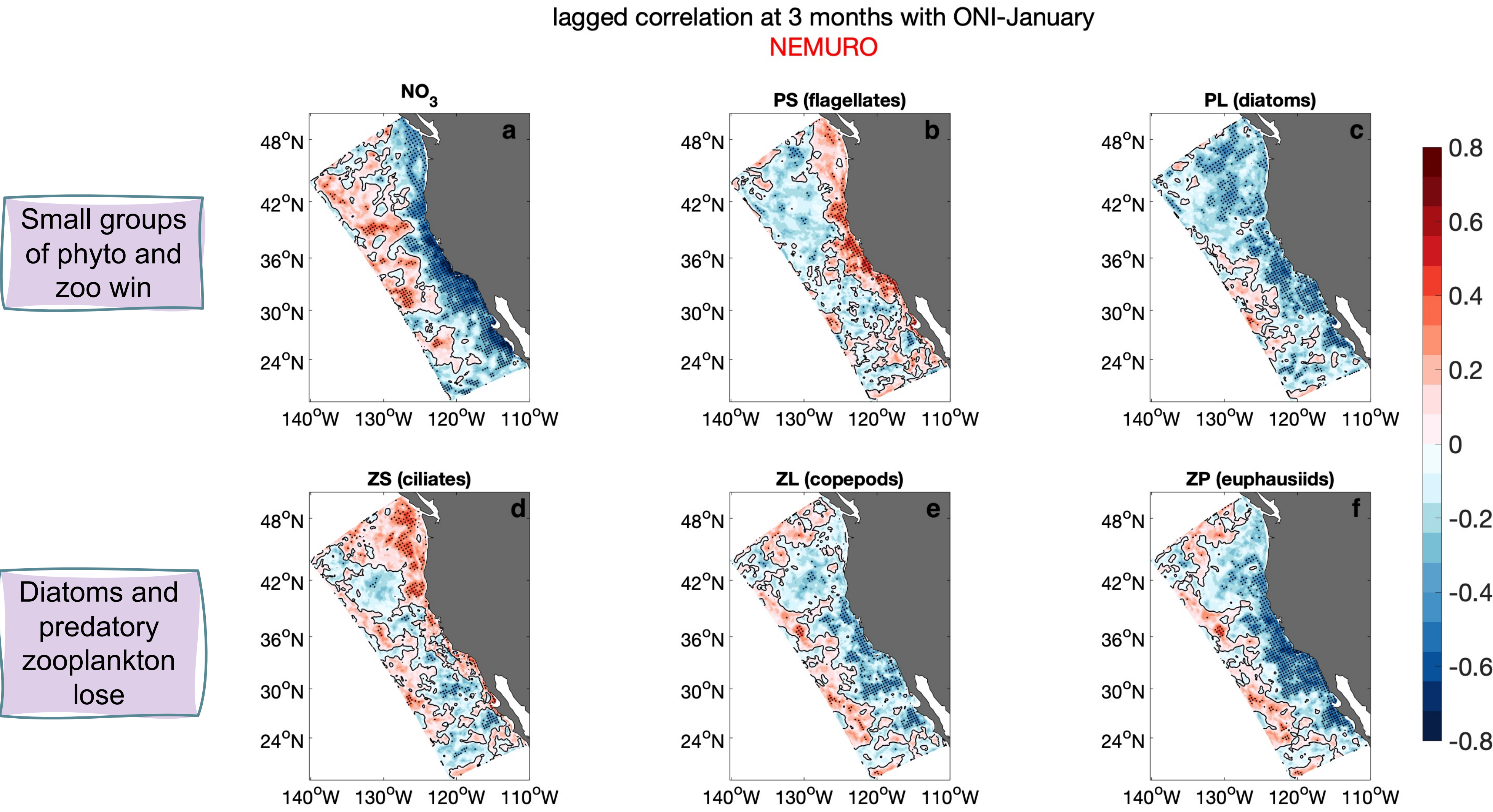
The selection criteria for ENSO years follows the NOAA protocol: every time that SSTa reach values of $\geq 1^\circ\text{C}$ ($\leq -0.5^\circ\text{C}$) during the winter (DJF) over the Tropical Pacific region (5°S - 5°N), that particular year is included in the composite from January through August, along with the precursor months of Sept-Dec. The pairs of **El Niño** years included in the 12-month composite are: 1963-1964, 1965-1966, 1968-1969, 1972-1973, 1982-1983, 1986-1987, 1987-1988, 1991-1992, 1994-1995, 1997-1998, 2002-2003, and 2009-2010. The pairs for **La Niña** composites are: 1970-1971, 1971-1972, 1973-1974, 1975-1976, 1983-1984, 1984-1985, 1988-1989, 1995-1996, 1998-1999, 1999-2000, 2007-2008, 2010-2011, and 2011-2012.

Each physical and biological field from the model was filtered with a high-pass Lanczos filter with a cut-off frequency of 10 years.

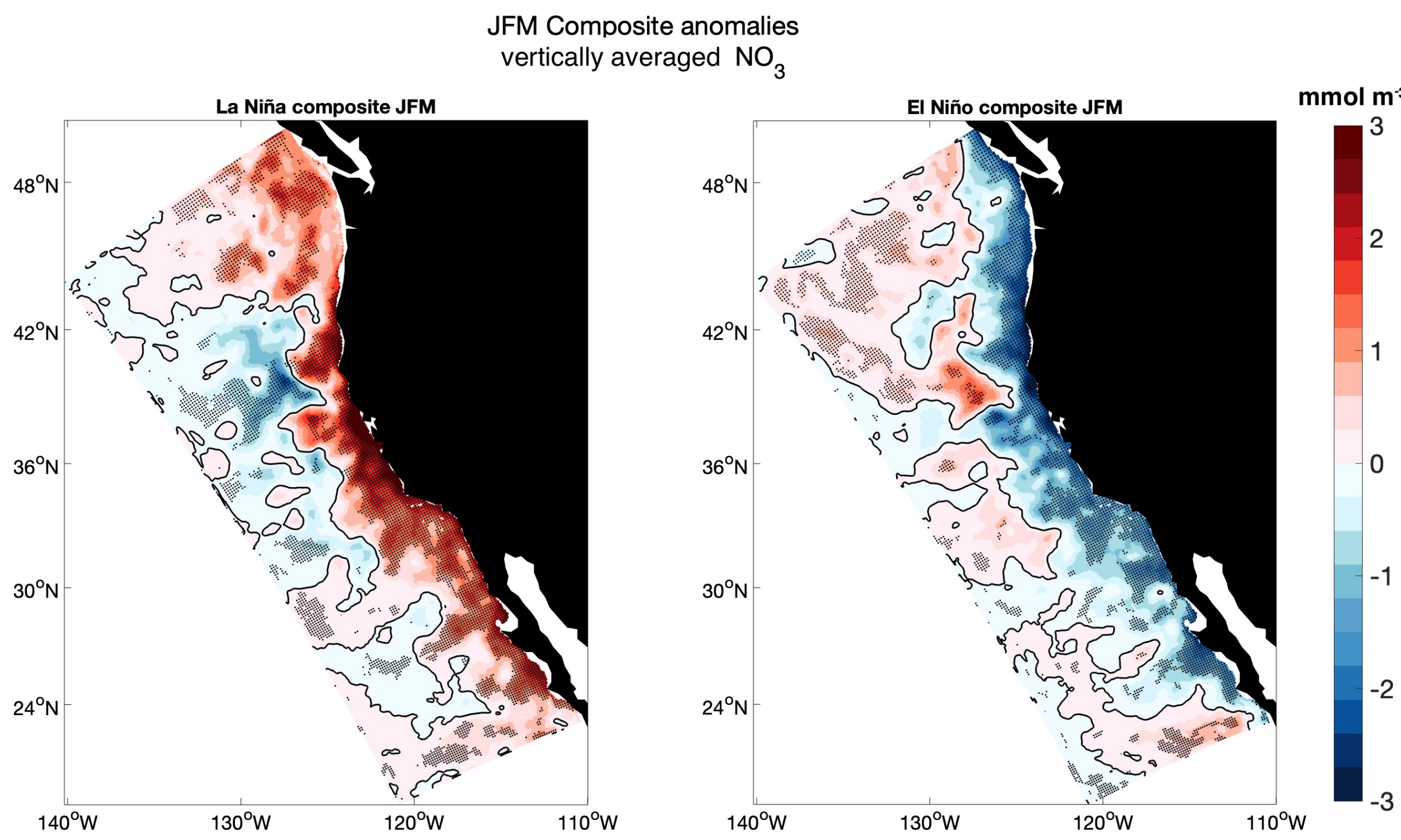
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Composite results from ROMS-NEMURO over CCS

Winners and losers of the California Current Ecosystem (CCE) during ENSO events



Bottom-up controls of the CCE and potential links to mesoscale field



*Nathali Cordero-Quirós, Arthur J. Miller, Yunchun Pan, Lawrence Balitaan, Enrique Curchitser, and Raphael Dussin. (2021). Physical-Ecological Response of the California Current System to ENSO events in ROMS-NEMURO. Ocean Dynamics (2022) 72:21–36
<https://doi.org/10.1007/s10236-021-01490-9>

Composite NO_3 shows a structure that is spatially locked and follows the meanders of the CCS mesoscale field.

CURRENT AND FUTURE WORK...

What is the variability of the mesoscale field in the CCS, and can we use it to predict some ecological features?

Stay tuned for publication

*Future changes in Eddy Kinetic Energy in the California Current System from dynamically downscaled climate projections (under review); Cordero-Quirós, Jacox, Pozo-Buil, Bograd.

