

Influence of Kuroshio Extension Variations on the Formation of Marine Heatwaves in the Gulf of Alaska

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Marine Heatwaves are extreme temperature events that happen in the ocean for an extended period.

In 2014/15 a marine heatwave occurred in the Northeast Pacific Ocean's Gulf of Alaska region.

We investigated how the formation of this marine heatwave in the Gulf of Alaska was influenced by the variations of a major oceanic current extending from the eastern part of the North Pacific Ocean near the Japanese coast – The Kuroshio Current.

METHODS

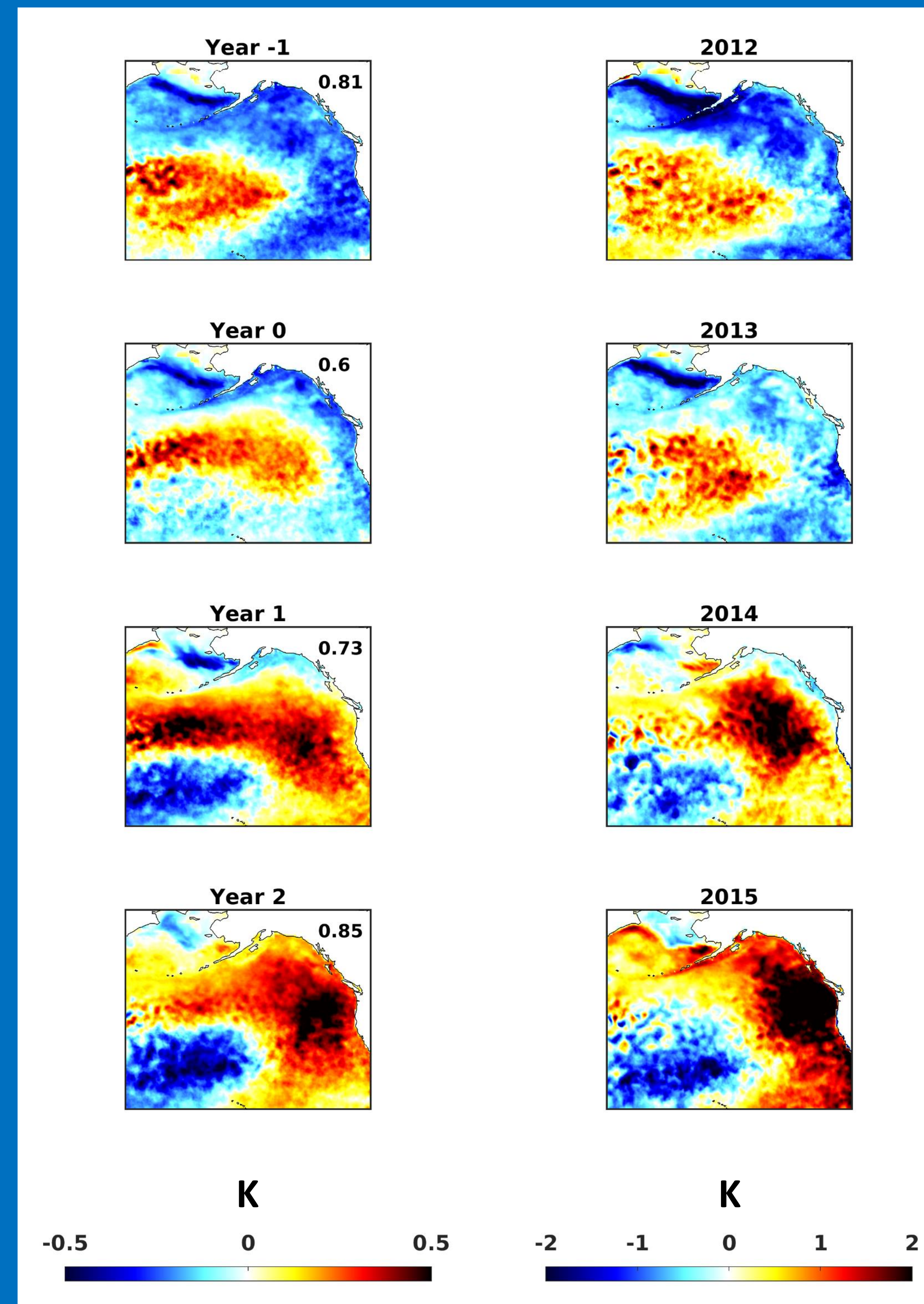
1. Generated a Kuroshio variation index using sea surface temperature (SST) data.
2. Spatially regressed the index with SSTs in the Gulf of Alaska region (lead/lag)
3. Spatially correlated the regression maps with real-time SST evolution of the Gulf of Alaska Heatwave.
4. Influence on biological productivity by the KE variations was investigated using Chlorophyll-a as a parameter (similar to SST evolution).

RESULTS

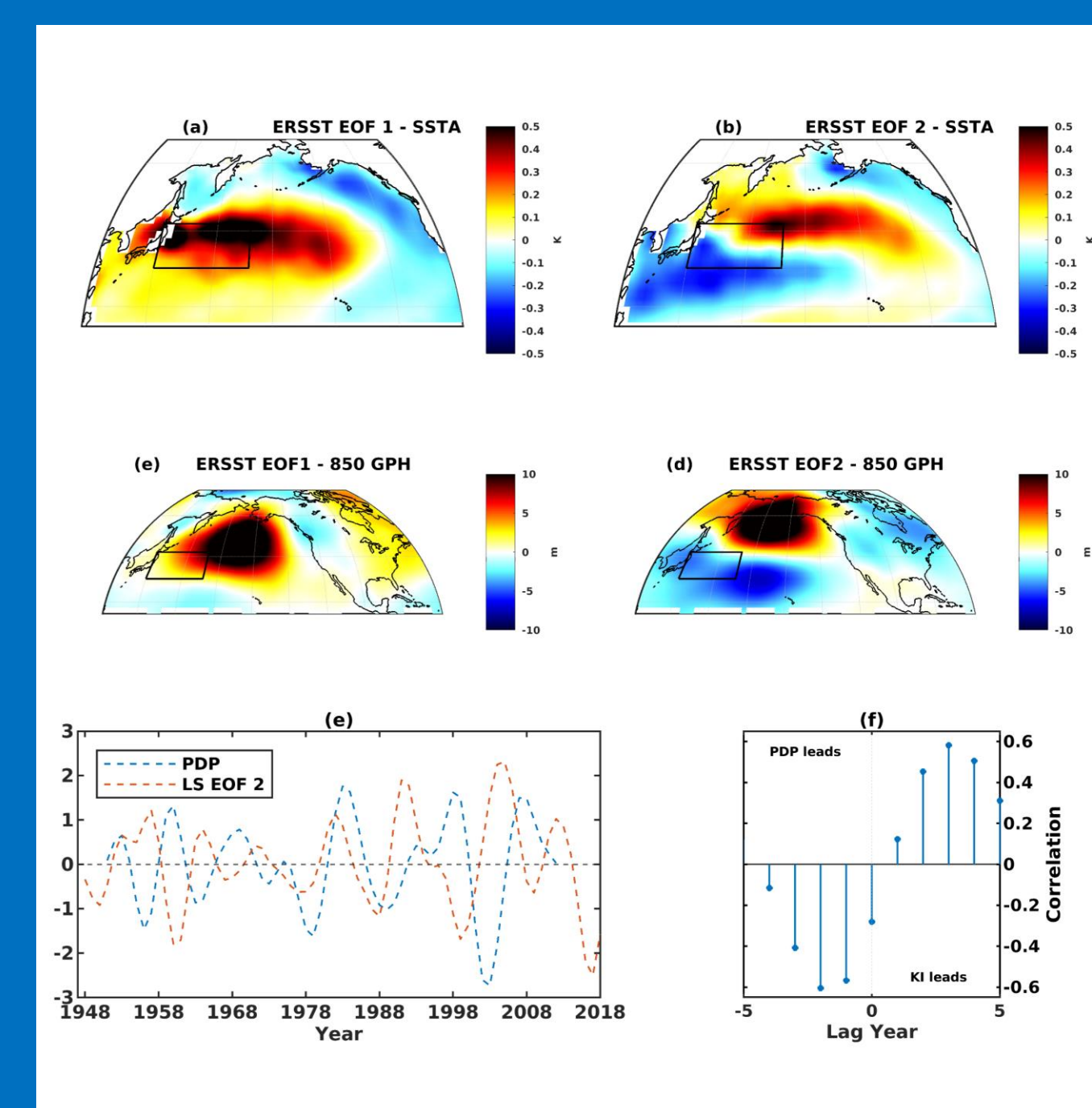
- There is a strong relationship between the formation of marine heatwaves in the Gulf of Alaska region and the variations in the KE region.
- The connection between this remote response and variations in the KE region results from the KE's influence on atmospheric circulations that will later force heating in the Gulf of Alaska region.

"The outputs of this study provide initial inputs for climate scientists and policymakers to use decadal changes in Kuroshio Extension to predict marine heatwave occurrences in the Gulf of Alaska in the long-term future."

"Evolution of SSTs in the Gulf of Alaska region due to the influence of KE variations mimics the real-time evolution of the marine heatwave in the Gulf of Alaska."

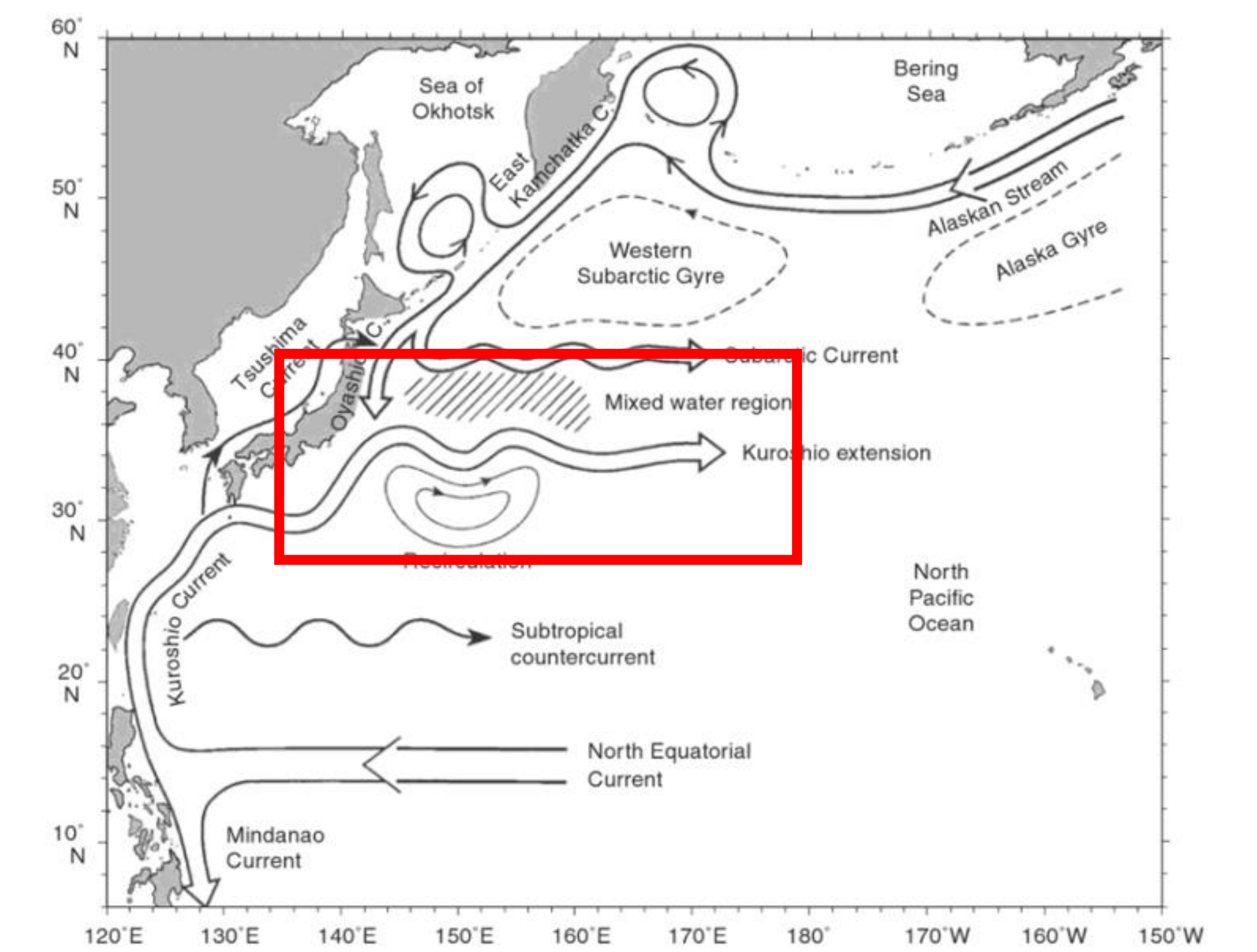


Kuroshio Influence on SSTs and Atmosphere and its relationship with the Pacific Decadal Precession – a decadal varying atmospheric phenomenon over the North Pacific Ocean



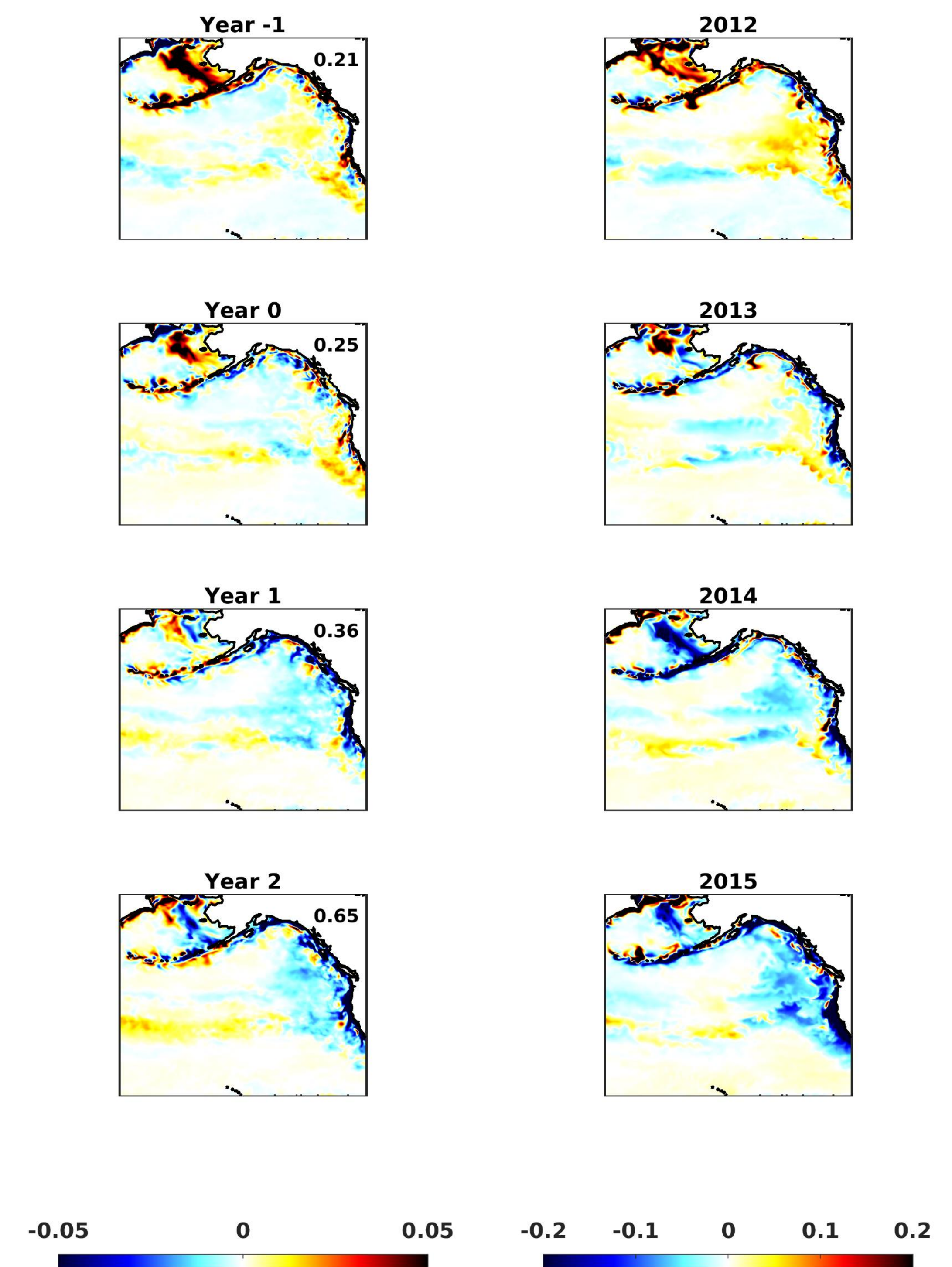
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Schematic of Kuroshio Current



Source: Qiu (2001)

Spatial regression of Chlorophylls



Chlorophyll and SST relationship

