

## ***Interactive comment on “Sea surface temperature anomalies, seasonal cycle and trend regimes in the eastern Pacific coast” by A. Ramos-Rodríguez et al.***

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This paper provides a new analysis of changes in sea surface temperature 1950-2010 along the eastern Pacific coast of the Americas. Although the temporal patterns of climate variability are well known, the new science here is the spatial pattern of these temporal changes and the attempt to relate these changes to variations in solar forcing. In general, the results and interpretation provide new and useful knowledge about spatial-temporal patterns of coastal SST variability, but the paper needs revision as detailed below.

The paper needs a thorough editing for English usage. For example, page 1217 lines

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3-4, page 1219 lines 13-14, page 1225 lines 6-7, page 1227 lines 1-5.

Page 1216 line 25: “alternance” is a French word not commonly used in English. Change to “alternation” or “cycling”.

Introduction: Isaacs (1976, Some ideas and frustrations about fishery science. CalCOFI Reports 18, 34-43) is regarded as the first to use “regime” in the sense of alternative states of ocean ecosystems, an idea which is part of the “alternative stable states” paradigm since about 1970. Lluch-Belda and sons were leaders in developing and applying this idea to sardine/anchovy cycles and other problems in fisheries oceanography, but the concept of climate or ecosystem regimes originated earlier.

Section 2.2: Rodionov’s RSD detects points in time series when discontinuities occur. The authors need to explain the RSD plot in Fig. 2c. It looks like they have colored the time periods (regimes) between detected regime shifts, but then what does the color scale mean?

Section 2.3: The explanation of how the theoretical or expected seasonal amplitude of SST was derived is not at all clear. How did you calculate annual mean and range of solar irradiance by latitude and then how did you regress observed annual ranges of SST and irradiance to get the expected annual range of SST? The applications of these data in 3.1 and 3.3 is very interesting and informative, but we readers want to be sure we understand what you did.

Section 3.1: The description of these results would be easier to read if it was presented as a list. For each latitudinal band, does the observed annual SST range differ from the expected, and why? I understand that for the California Current, summer upwelling results in summer SST lower than expected, and this results in an annual SST range less than expected. Please explain how seasonal upwelling in the Peru Current system is different and results in an annual SST range greater than expected.

Page 1222 line 9: “Southern Oscillation” should be capitalized

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Section 3.2: It would help in this discussion to consistently use the labels “solar cycle” and “SST regime”. As now written, it is not always obvious what is meant by cycle, regime, or period.

The authors argue that the cold and warm regimes (1 and 2) have significantly different areas under the TSI curves. Solar irradiance is the power of solar radiation and is normally measured per unit area ( $W m^{-2}$ ). Solar irradiation is the total amount of solar energy that is accumulated on an area over a period of time. So one refers to power and the other to energy. Therefore, the authors are correct that integrating the TSI curve over time does give irradiation or energy. The problem is that integrating 11 to 12-year cycles over two successive regimes depend on (1) where the regime shift is located relative to the cycles, (2) the lengths of the regimes, and (3) actual changes in solar radiation. The abstract says TSI was integrated over 1952-1975 (24 years) and 1977-1999 (23 years), but the SST regimes are 1950-1978 and 1979-1999. The low-irradiance solar cycle during the second half of the 1950-1978 cold regime may be important, but the authors should be careful about how they present these results.

Page 1224 lines 5-6: This sentence is meaningless. Rewrite and/or expand.

Page 1224 line 6: “Warmer values of the RSD”? see comment on section 2.2

Page 1224 line 15: change “zonal” to “meridional” or “latitudinal”

Section 3.3: There are some valuable results here, but the discussion would be easier to understand if the authors explicitly stated that (1) changes in the annual (=seasonal) amplitude of SST (TA) are not caused by overall warming or cooling, but by processes that result in seasonal warming or cooling, and (2) changes in the residuals (TR) are caused by seasonal warming or cooling that is out of phase with the seasonal cycle warming/cooling due to solar irradiance (TC).

I think this is implied in the words “interaction with the Humboldt Current” on page 1224 lines 24-25. However, there is confusion about this in the sentences on page 1225 lines

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4-6 and lines 13-15.

Page 1226 lines 5-6: replace “as evidence of the power of the currents” with “by”.

Page 1226 line 26: replace “on earth” with “of the time series”

Page 1227 lines 6-7: Considering my comment on section 3.3 above, the alteration of TA or TR by ENSO events is not a new observation. El Niño has long been known to be a seasonally phase-locked event (peak SSTA along Peru coast in December-January), hence its name.

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Interactive comment on Ocean Sci. Discuss., 8, 1215, 2011.

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