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Interannual to decadal variability of SST off the coast of Peru: connection with the equatorial Kelvin wave.

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The Peru coast behaves as an extension of the equatorial wave guide at a variety of timescales, from intraseasonal to interannual. Although the interannual variability of SST along the coast exhibits the largest amplitude, decadal fluctuations are significant and impact the fish industry in the region. The reason for such decadal variability is not completely known and remains an issue of debate.

In this study, the link between equatorial variability and the regional SST variability (3°S-18°S; coast to 100 km off shore) is investigated by means of historical satellite data and Reanalysis products (such as the pathfinder 4km data sets); As a first step the in situ data are confronted to the satellite data over the overlapping period (1985-2006), which reveals a good agreement between both data sets for the dominant statistics variability modes. The ultra-high-resolution (1km) satellite data available from the Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature Pilot Project (GHRSSST-PP) of the satellite allows for documenting the SST front associated with the narrowly extended coastal upwelling, which is not the case for the historical data from the IMARPE cruises (1950-2006). Statistical analysis of the satellite data combined with the in situ data suggests that this front experienced cross-shore displacement at decadal timescales, which provides an index of upwelling variability at low frequency. Second, the equatorial Kelvin waves are estimated from a modal decomposition of the SODA Reanalysis and indices of low frequency Kelvin wave activity are derived with a focus on the intraseasonal Kelvin wave and its modulation at low frequency. The analysis indicates that those indices are significantly correlated to the interannual and decadal modes of SST along the coast, which suggests that the high-frequency equatorial variability translate to the decadal mode along the coast of Peru. Another contribution to the decadal variability along the coast appears to be related to the asymmetry of the seasonal to interannual variability along the coast resulting from the asymmetrical equatorial forcing. Our results illustrate the specificity of the response of the Peru coastal system to the equatorial Kelvin waves and the importance of scale interactions associated to this forcing.