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Inter-decadal variations of surface winds off Peruvian coast

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The Peruvian upwelling system (PUS) is the most productive marine ecosystem among the Eastern Boundary upwelling Systems (EBUS). The trade wind system drives a nearly continuous upwelling which is subjected to variations on a wide range of times scales. The wind forced upwelling controls crucially the nutrient supply to the euphotic surface layer and thus, the overall productivity of the system.

Using long term data from ERA5 (1979-2019) the wind forcing in the PUS was analyzed to obtain information about long term trends in the mean state and its variability.

Beside the strong annual cycle, the wind forcing is dominated by interannual and a long term interdecadal oscillation.

The interannual fluctuations with a period of 2-5 years are related to the known events of El Niño and La Niña. The wind anomaly shows a good correlation with Oceanic Niño Index (ONI). Interdecadal variation of wind depict a main period of 15-20 years with negative anomaly values from 1979 to 1996, and positive anomaly values for 1996-2014. These long term variations can be attributed to the Interdecadal Pacific Oscillations (IPO). The spatial distribution of wind stress along the Peruvian coast is not uniform. The highest values are observed in Lima-Marcona area (12°-15.4° S) while it decreases sharply southward and gradually northward. Additionally the coastal upwelling area is modulated locally by the coupling of wind and SST.