
On the influence of Pacific climate variations on the Peruvian upwelling system

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Abstract

Wind is the major driving force of the Peruvian Upwelling Systems (PUS) that controls the nutrient supply from the deep water pool to the euphotic surface layer. Strength, spatial and temporal variability of the wind forcing are subjected to seasonal, interannual and decadal changes.

Understanding the evolution of wind field under climate change is of vital importance for EBUSs functioning. Using long term data from ERA5 (1950-2019) 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 signatures of the Tropical Pacific well known events of El Niño and La Niña. An interdecadal variation of wind with a negative anomaly values from 1950 to 1979, a positive period of 1979 to 1997 and a shift from positive to negative in 2015 are observed. The long term variations of the wind field can be related to Interdecadal Pacific Oscillations (IPO) which is an important characteristics of the Pacific Ocean.

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.

Keywords: Peruvian upwelling, Pacific climate

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