



## **Projected changes in upwelling-favorable winds at the ocean's eastern boundaries systems: large scale and synoptic scale**

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The Eastern Boundary Upwelling Systems (EBUS) maintains high productive fisheries and marine ecosystems. A comprehensive understanding of coastal air-sea interaction, the biogeochemical responses, and mechanisms of climate variability and change at the EBUS has gained importance. The CMIP5 simulations under the rcp85 scenario have showed a poleward displacement of the coastal upwelling-favorable winds in the ocean's eastern boundaries, -associated with a poleward migration of the subtropical atmospheric high-pressure cells. In this work we analyze historical and future simulations (rcp85) of 17 CMIP5 models to investigate the relationship between the large-scale response of the upwelling-favorable winds (through a geostrophic adjustment), with the synoptic scale variability associated to the coastal atmospheric low-level jets during the upwelling season in the Humboldt, Bequela, California and Canarias upwelling systems. Results show that the spatial pattern of the alongshore winds trends is highly consistent with that obtained from geostrophic alongshore winds (calculated from the surface pressure field), indicating the importance of the large-scale signal related to the poleward relocation of the subtropical anticyclones. On the other hand, Kolmogorov-Smirnov tests were applied to assess the statistical significance of the differences in the empirical cumulative distributions between the present and future alongshore winds at different latitudes. At higher latitudes most of the models show a significant different cumulative distribution. In particular, the alongshore wind speed values that in the present day data are in the upper quartile, which are typically associated to mid-latitude synoptic perturbations, increases (decreases) its probability 10%-15% (0%-10%) at higher (lower) latitudes to the end of the century. These results suggest that the poleward migration of the subtropical anticyclones is related with a poleward displacement of the mid-latitude atmospheric perturbation that originates coastal low-level jets in these upwelling systems.