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SST/Wind stress mesoscale coupling in the South East Pacific : what drives its spatial and temporal variations ?

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Air-sea interaction studies show that, on the large-scale, the ocean is primarily forced by the atmosphere. However, it has also been evidenced that mesoscale ($\sim$10-100 km) oceanic structures, e.g. fronts and eddies, induce an atmospheric response which also affect in return the oceanic mesoscale. In this study we focus on the oceanic feedback on the surface wind stress (SWS) in the Peru-Chile region.

Understanding the dynamics of eastern boundary upwelling systems such as the Peru-Chile region is of major interest as these regions host an intense biological activity. These regions are generally poorly represented in global climate models partly because of a misrepresentation of mesoscale processes. The mesoscale activity has been studied quite extensively with ocean models which generally do not take into account the feedback of the ocean mesoscale on the atmospheric forcing. In the Peru-Chile region, mesoscale air-sea interactions studies are needed to evaluate the importance of this feedback.

We use a regional coupled model (WRF-NEMO) at $\sim$ 9 km horizontal resolution to characterize the interaction between sea surface temperature (SST) and SWS. We compare this coupling to observed values. The SST-SWS interaction presents spatial and temporal variations. Spatial variations appear to be related to the large-scale fields (wind steadiness and intensity). We discuss the seasonal variations of the coupling characteristics by examining the underlying mechanisms. We show that here the key mechanism is the momentum vertical mixing response to SST anomalies. This response is mainly modulated by the seasonal variations of the large-scale wind vertical shear.