The Current Feedback to the Atmosphere: Implications for the Ocean Dynamic, Air-Sea Interactions, and How to Best Force an Ocean Model

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The Ocean-Atmosphere interactions have a large influence on the climate and on the ecosystems at the basin scale. The main climatic modes of variability (e.g., El Nino, NAO, ...) are coupled modes between the Ocean and the Atmosphere. The ecosystems have a strong response to those variations through the influence of the wind, the light, and the temperature on the nutrient stock and, thus, on the primary production and the oxygen concentration. Systematic biases in sea surface temperature in global models have highlighted the limitations of studies based on the global models and have, thus, spurred the investigation of the Ocean-Atmosphere interactions based on the regional modeling approach. In the past few years, it has been demonstrated that the regional Ocean-Atmosphere interactions can strongly modulate the variability and the mean physical and biogeochemical state of the ocean. In this presentation, the focus will be on the influence of the surface current on the atmosphere (i.e., current feedback). Based on satellite observations and using a set of regional ocean and atmosphere coupled simulations carried out over different regions encompassing Eastern and Western boundary current systems, we will illustrate to which extent those interactions can control the exchange of energy between the Ocean and the Atmosphere, the mean, mesoscale, and submesoscale circulations, and the Western Boundary Currents Dynamic. Implications for thermal air-sea interactions and how to force an oceanic model is furthermore discussed.