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Impact of higher spatial resolution on the representation of Canary upwelling system

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The oceanic region located off the of the Iberian Peninsula at 43°N to south of Senegal at about 10°N, coasts is one of the most productive in the world in terms of marine ecosystems. This is due to the presence of the Canary Upwelling System (CUS). This upwelling region is separated into two distinct areas: the Iberian coast and the Northwest African coast. Improving our knowledge of the functioning and long term changes in the CUS is of crucial importance, since the much of the food resources and economy of neighboring countries greatly depends on its characteristics. Most of research efforts aimed at the understanding of the functioning of the CUS and its seasonal to long term variations, are based on observations and regional models operating at very high resolution. However, observational datasets based on satellite products, which are suitable to study upwelling systems, cover short periods of time, which does not allow for a robust estimate of long-term variations (i.e. climate change) of the upwellings and the associated mechanisms. The use of very high-resolution regional ocean models leads to a correct representation of the physical mechanisms associated to the upwellings, but the numerical experiments entail an important computational cost, which also limits the study of long-term changes. Standard coupled ocean-atmosphere models, such as those used in the international exercises like Coupled Model Experiment Phase (CMIP), provide an interesting alternative to study decadal to long-term changes in the upwellings. Recently, studies based on coupled models, focusing on the response of the upwellings to climate change, have received increasing attention. However, these studies show contradictory results on the question whether coastal upwelling will be more intense or weak in the next decades. One of the reasons for this uncertainty is the low resolution of climate models, making it difficult to properly resolve coastal zone processes.

The main goal of this study is to evaluate the ability of an ensemble of global coupled models in simulating the properties of the CUS (seasonal cycle, intensity and thermal signatures). The numerical experiments used here were performed within the H2020 PRIMAVERA European project, which is part of the HighResMIP initiative at European level. We will use pairs of models operating at diverse nominal resolutions under present-day climate conditions. Our objective will be to study the impact of model resolution in the representation of the CUS.