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Links between interannual climate variability and marine ecosystems in the Tropical Atlantic

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The interannual climate variability in the Tropical Atlantic is mainly controlled by two air-sea coupled modes denoted as Meridional Mode (MM) and Equatorial Mode (EM). The MM, peaking in boreal spring, is characterized by an anomalous Sea Surface Temperature (SST) interhemispheric gradient associated with anomalous surface cross-equatorial winds blowing to the warmer hemisphere. On the other hand, the positive phase of the EM exhibits an anomalous warming in the equatorial band and along the African coast, related to a weakening of the climatological trade winds. Both interannual modes illustrate significant SST and surface wind changes in the eastern boundary upwelling systems (EBUS) of the tropical Atlantic: the Senegal-Mauritanian and Angola-Benguela. The EBUS are characterized by wind-induced coastal upwelling of deep cold waters rich in nutrients supporting high primary productivity and an abundance of food resources. Hence, the physical or climate characteristics associated with the MM and EM may have a potential effect on marine organisms and ecosystems. The goal of this study is to understand the links between the main modes of tropical Atlantic variability and biogeochemical (BGC) variables such as oxygen, net primary production and ph. These are known to be the main drivers for marine ecosystems. Firstly we study the influence of MM and AM on the EBUS and how these links are represented by the coupled ESM CNRM-ESM2.1 against observations. Second, we use the ESM to investigate the links between the SST anomalies associated to MM and EM and the main BGC stressors mentioned above. For this purpose, a set of numerical experiments performed with CMIP6 climate models are used. This work is supported by the H2020 TRIATLAS project, whose main goal is to understand and evaluate the future evolution of living marine resources in the Atlantic Ocean.