EGU22-8219
https://doi.org/10.5194/egusphere-egu22-8219
EGU General Assembly 2022

Coastal upwelling variability along the Northern Margin of the Gulf of Cadiz.

Luciano Júnior[1], Erwan Garel[1], and Paulo Relvas[2]
[1]Centre for Marine and Environmental Research. Universidade do Algarve, Faro, Portugal
[2]CCMAR. Universidade do Algarve, Faro, Portugal

The norther margin of the Gulf of Cadiz (NMGC) at the southern limit of the Portuguese branch of the Canary upwelling system is often reported to be affected by local upwelling. However, the oceanic wind field over this region has not been fully documented yet in order to corroborate this effect. This study aims to describe the wind forcing to characterize the wind-driven upwelling over the NMGC and its spatio-temporal variability. The Upwelling Index (UI) and Ekman pumping (Ekp) are estimated using ERA5 reanalysis surface winds with 0.25° resolution. On average, the wind over the shelf is strongest at west and mainly orientated south-eastward. It weakens progressively towards the east and rotates counter-clockwise to eastward. Off the shelf, the wind is mainly south-eastward with a slightly less pronounced counter-clockwise rotation and is stronger than on the shelf. This pattern result in a weak positive (upwelling favourable) mean UI along the coast with minor alongshore variability. By contrast, the mean Ekp is null at east but significant and positive (upwelling favourable) at west, due to sheltering effects induced by the presence of a cape (São Vicente). The highest positive Ekp values are observed near Cape São Vicente during spring summer. The largest range, due to variability between low positive and negative values are observed during autumn and winter. The seasonal mean maps suggest that enhanced upwelling due to Ekp develops in summer near Cape São Vicente, only. This pattern explains the recurrent signal of cold water and high chlorophyll concentrations often observed in the vicinity of the cape during this period. It is also suspected to be important for the development of a mesoscale cyclonic eddy observed when upwelling favourable winds relaxes. In this case, Ekp would promote the rising of the isopycnals slightly off the coast and the adjustment of the pressure field would promote such circulation pattern. UI patterns are consistent along the coast, being persistently positive and moderate during spring and summer and with largest range of variation in autumn and winter too. Thus, the seasonal mean is positive and stronger in spring and summer than in autumn and winter, even though some strong events may cause water to upwell in winter. These winter events do not have clear signal in the temperature variability but may be important in terms of nutrients supply. Overall, this study indicates the predominant seasons and locations for coastal upwelling along the NMGC and evaluates the distinct contributions of UI and Ekp. It confirms the effect of the wind in driving local upwelling as previously described for summer events but also indicate that upwelling in autumn and winter is a recurrent feature.