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Spatio-Temporal Variability of the NW African Upwelling System

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The relation of upwelling areas with climate variability is an important issue as these areas, where relatively cold and nutrient-rich waters reach the sea surface, both trap heat excess and become increased biological and physical carbon pumps. Here, we investigate the spatio-temporal evolution of the northwest African Upwelling System, with emphasis on intraseasonal and interannual scales, during the period 2002-2006 using the global high-resolution ocean general circulation model ORCA12-LIM. First, validation of the model is performed by comparison with CTD data collected during CORICA cruise, indicating good agreement between observations and model output. Second, a new criterion, based on the thermal gradient in the normal-to-shore direction, is proposed to determine the upwelled-waters extension. Application of the criterion to the time series of monthly-averaged modelled surface temperatures adequately reproduces the upwelling seasonal cycle as a function of latitude, and shows the presence of interannual variability. The modelled 3D temperature field is combined with the extension of upwelled waters to estimate the amount and variability of upwelling waters. Finally, the response of upwelling to different patterns of wind variability is examined.