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Diurnal Variability of the inner-shelf circulation in the lee of a cape under upwelling conditions

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The circulation over the inner-shelf is a key component of shelf dynamics and an important mechanism for cross-shore exchange on most shelves. Yet our understanding of the cross-shore circulation and how it depends on different forcing conditions, bathymetry and stratification remains poor due in part to sparse observations and the difficulty of resolving spatial and temporal scales within the inner-shelf.
Most studies of cross-shore transport on the inner-shelf consider only a 2D circulation, due to coastal upwelling or downwelling and assume along-shore uniformity. However, divergence in the along-shore and cross-shore flows may occur with the presence of complex coastline topography or subtle bathymetric features, and can drive substantial horizontal cross-shore exchange, with same order of magnitude as coastal upwelling and downwelling.
A recent study using observational data collected near cape Sines, Portugal, showed that not only wind, waves and tides are important forcing mechanisms of the inner-shelf circulation, but also that the along-shore pressure gradient plays a major role on driving cross-shore exchange.
A modeling study was conducted in order to study the complexity of the inner-shelf dynamics, in the presence of a cape. A simplified configuration was used in order to isolate the effects of individual processes: wind, heat fluxes, tides and waves.
The preliminary results of the effects of these processes on the inner-shelf circulation will be presented.