MODELING THE RESPONSE OF THE NORTH ATLANTIC EASTERN SUBTROPICAL GYRE TO THE COASTAL UPWELLING SYSTEM

Oral

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The classical ocean circulation models for the subtropical gyres consist in an asymmetric clockwise current system. Intense northward currents characterize its western margin, while the recirculation of the flow in the Sverdrup region or interior ocean is considerably less energetic. The eastern region of the North Atlantic Subtropical Gyre (NASG), between about 15° N and 40° N, forms an anticyclonic loop (Azores Current, AC, Canary Current, CC, and North Equatorial Current, NEC). A fraction of the CC recirculates westwards north of the Canary Archipelago or flows south between the islands, but a significant portion flows eastwards into the African slope in what may be called the eastern branch of the CC. In this upwelling favorable region we can found an intense quasi-permanent southward flowing coastal jet which is fed by the eastern branch of the Canary Current.

Despite of the existence of several studies in this region, the coupled problem between the eastern boundary and the coastal upwelling system has not yet been approached. We suggest that the relatively narrow and intense (upwelling associated) coastal jet is really the boundary condition for the interior flow. In order to examine the role of this coastal jet we have used a simple barotropic, wind-forced, quasi-geostrophic model. The traditional eastern boundary condition of no normal flow has been removed to allow the existence of a coastward interior flow. Moreover, a condition of constant potential vorticity has been considered. This condition implies the generation of anticyclonic vorticity at the eastern boundary, as if induced by the coastal jet. When imposing this boundary condition, the numerical results illustrate a variation in the shape of the eastern subtropical gyre, showing the mentioned coastward water flux as a result of the coupling between the NASG and the upwelling system. Those results seem to be in accordance with the observed data.