Geophysical Research Abstracts
Vol. 21, EGU2019-10304, 2019
EGU General Assembly 2019

The impact of upwelling on the intensification of anticyclones in the Caribbean Sea

Carine van der Boog (1), Caroline A. Katsman (1), Julie D. Pietrzak (1), and Henk A. Dijkstra (2)

(1) Environmental Fluid Mechanics, Delft University of Technology, Delft, the Netherlands, (2) Institute for Marine and Atmospheric Research, Utrecht University, Utrecht, the Netherlands

The mesoscale variability in the Caribbean Sea is dominated by anticyclonic eddies. These anticyclones transport patches of river water westward and alter the ecosystem by the advection and dispersal of biota. The anticyclones intensify on their path westward while they pass the coastal upwelling region along the Venezuelan and Colombian coast. In this study, we use a regional model to show that the westward intensification of Caribbean anticyclones is driven by the advection of cold upwelling filaments. These cold filaments increase the horizontal density gradients on the western flank of the anticyclones. The increased density gradients result in an increase of the vertical shear of the anticyclone. To test the impact of upwelling on the anticyclones, several simulations are performed in which the northward Ekman transport is altered. As expected, stronger upwelling is associated with stronger offshore cooling and a stronger westward intensification of the anticyclones. The simulations with weaker upwelling show that the Amazon and Orinoco River plumes advect farther into the basin. This apparently affects the formation process of the anticyclones, where the horizontal density gradients are determined by the salinity gradients of the river plume instead of by temperature gradients created by upwelling. The switch from anticyclones with temperature-driven density gradients to anticyclones with salinity-driven density gradients of the anticyclones shows how the upwelling and the river plume both affect the mesoscale variability in the Caribbean Sea.