Lagrangian Drifter Dispersion in the Mona Passage

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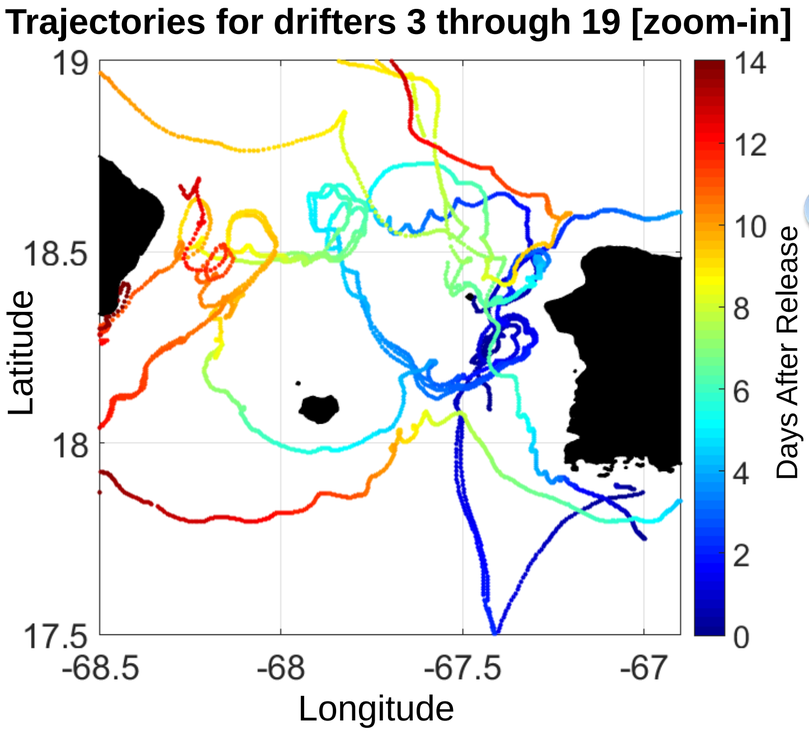
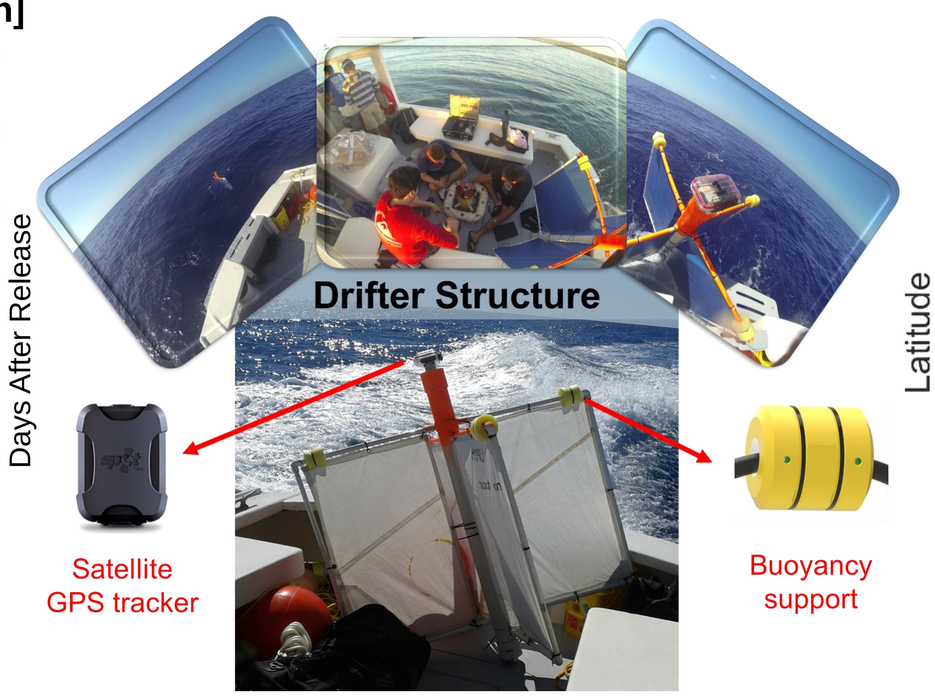
OVERVIEW

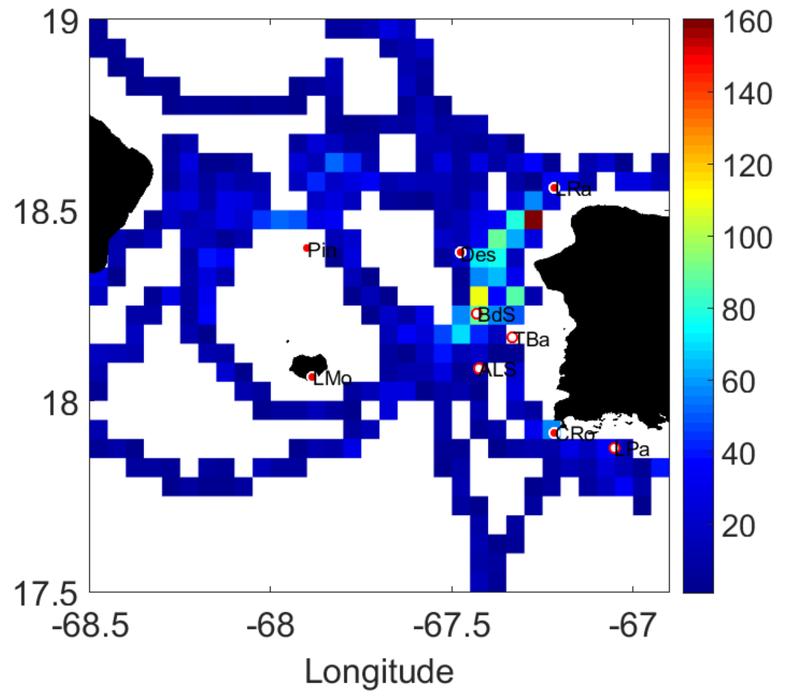
The Mona Passage is dominated by very complex circulation patterns caused by the interaction between strong tidal currents, large-scale circulation and mesoscale phenomena. Seventeen satellite-tracked drifters were deployed on or near the Mona Passage between February 2015 and August 2015. The acquired data from these deployments allowed the direct observation of the main features of the circulation in the Mona Passage and a preliminary analysis of the particle dispersion in the region. The drifters transmitted their location every half hour, individually providing continuous data for up to two months.

Trajectories for drifters 3 through 19 [zoom-in]



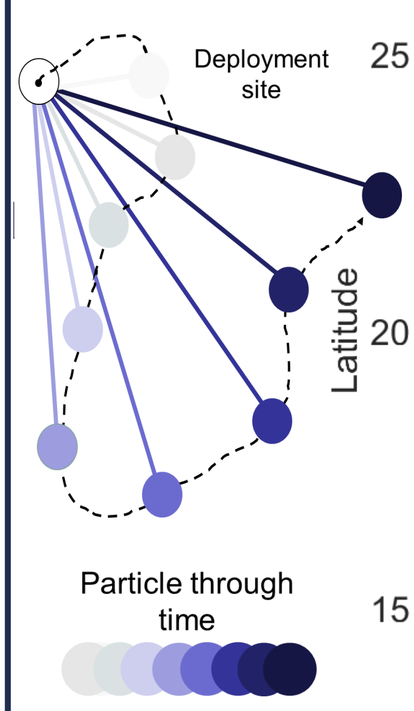


Drifter Data Distribution

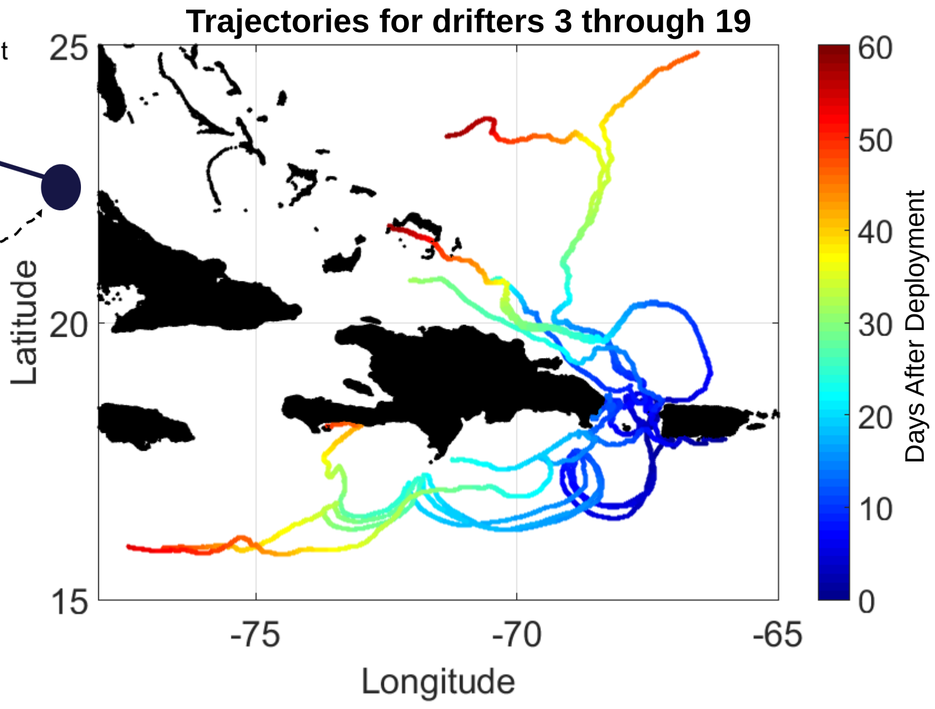


[Left] This close-up shows the drifters' sensitivity to tidal fluctuations and the dominant northward direction of the currents in the Mona Passage. [Right] The area of interest was divided in 0.05º x 0.05º bins (coverage area of ~30 km^2 per bin). Colorbar represents the data density; darker reds indicate higher traffic.

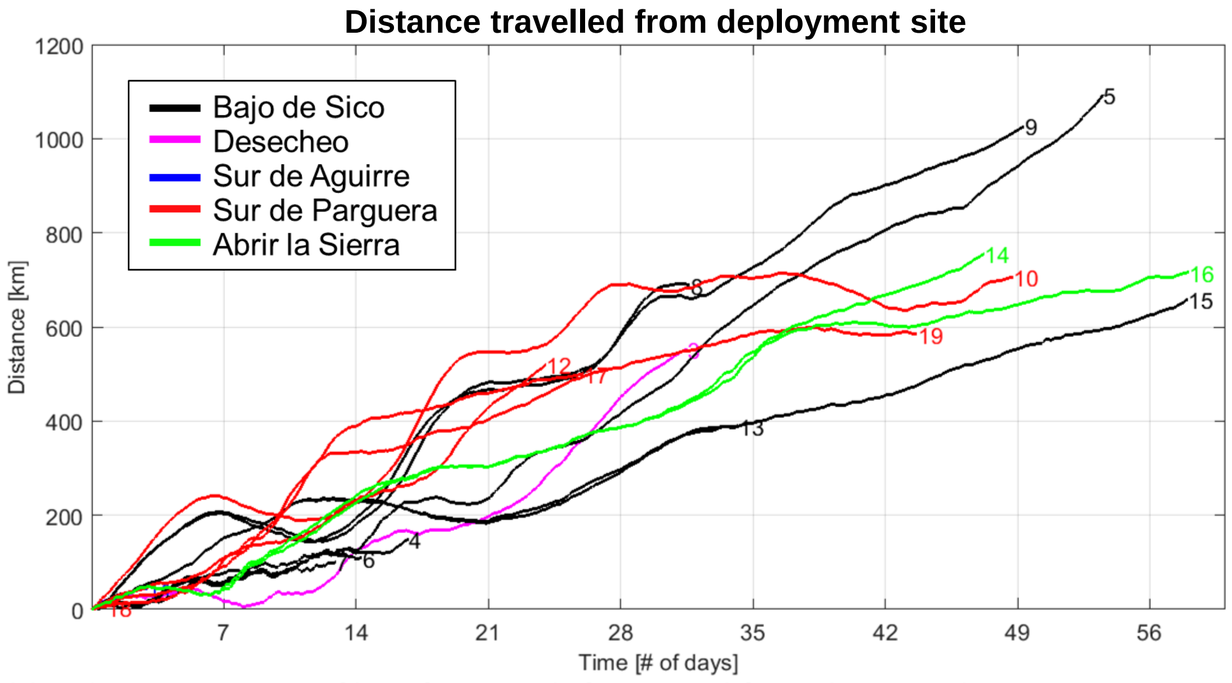
SINGLE PARTICLE STATISTICS / ABSOLUTE DISPERSION



Trajectories for drifters 3 through 19

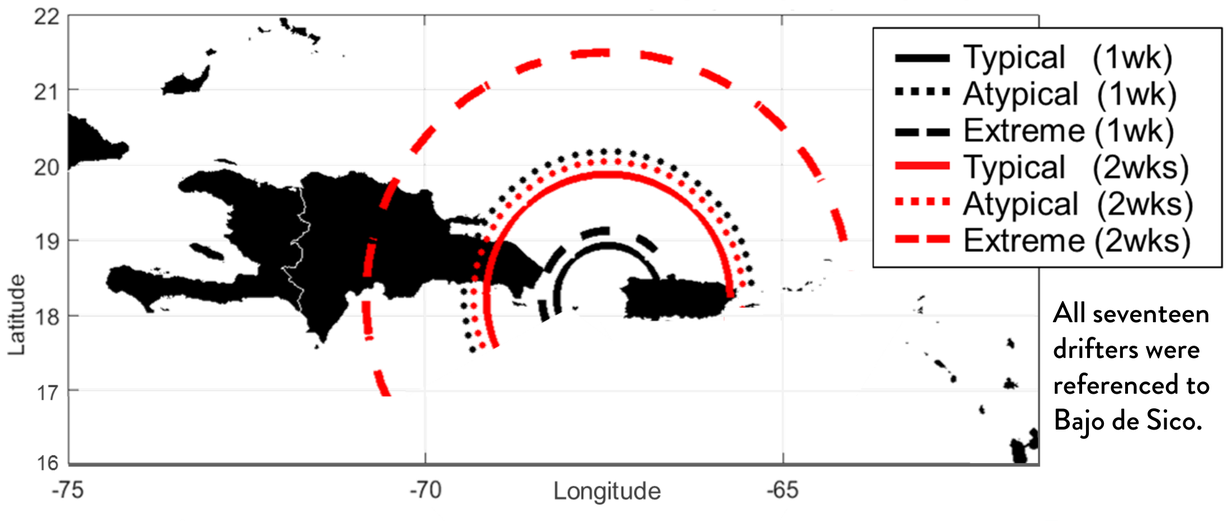


Distance travelled from deployment site



Visual representation of how far away drifters travel from their initial position.

Radial distance from source in 1(black) and 2(red) weeks



All seventeen drifters were referenced to Bajo de Sico.

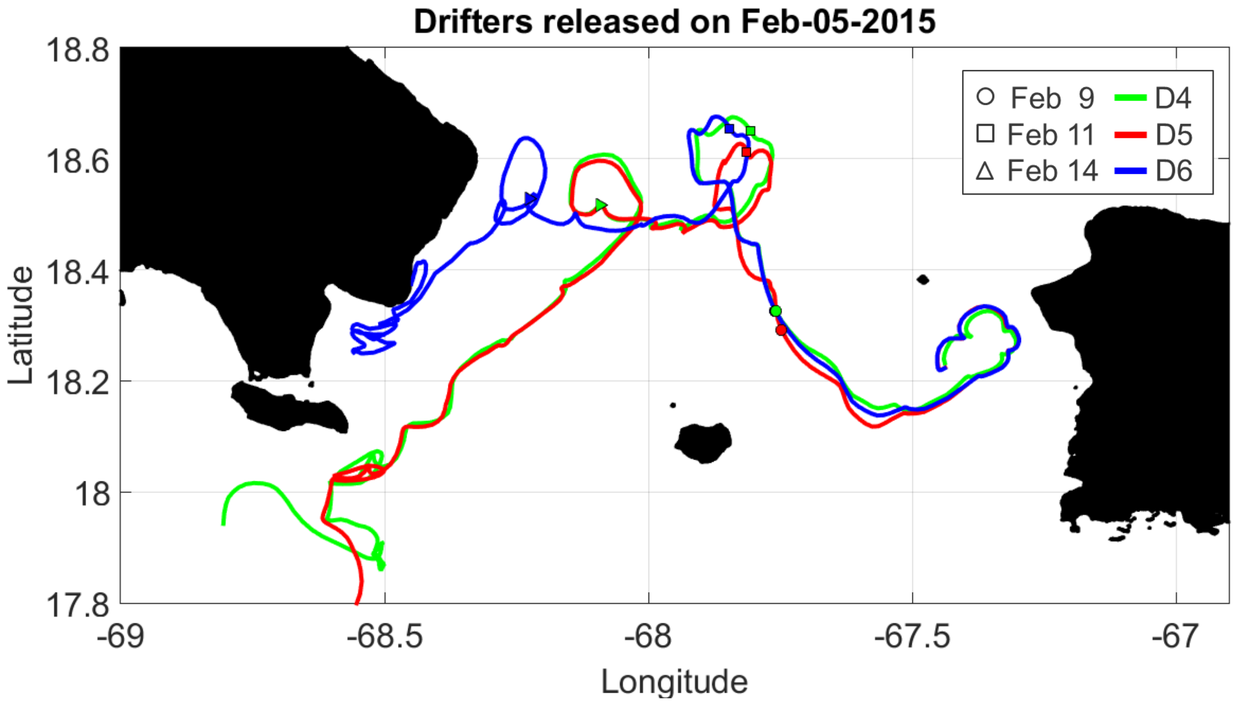
Typical Conditions
Net transport in the Mona Passage towards the North.

Atypical Conditions
Eddies traveling westward to the South of Puerto Rico.

Extreme Conditions
Tropical Storm Erika passes to the Southwest of Puerto Rico.

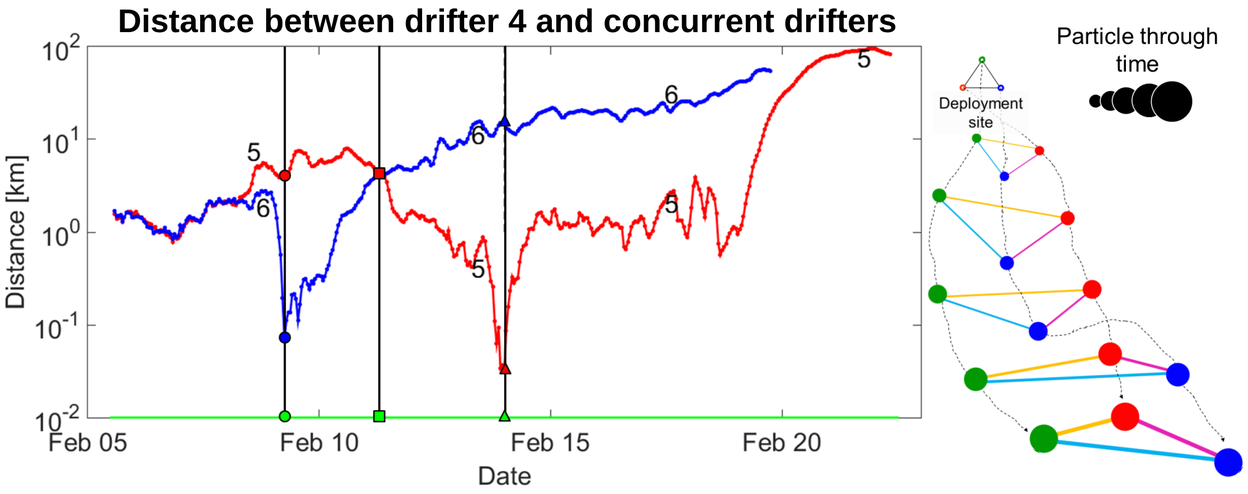
TWO-PARTICLE STATISTICS / RELATIVE DISPERSION

Drifters released on Feb-05-2015



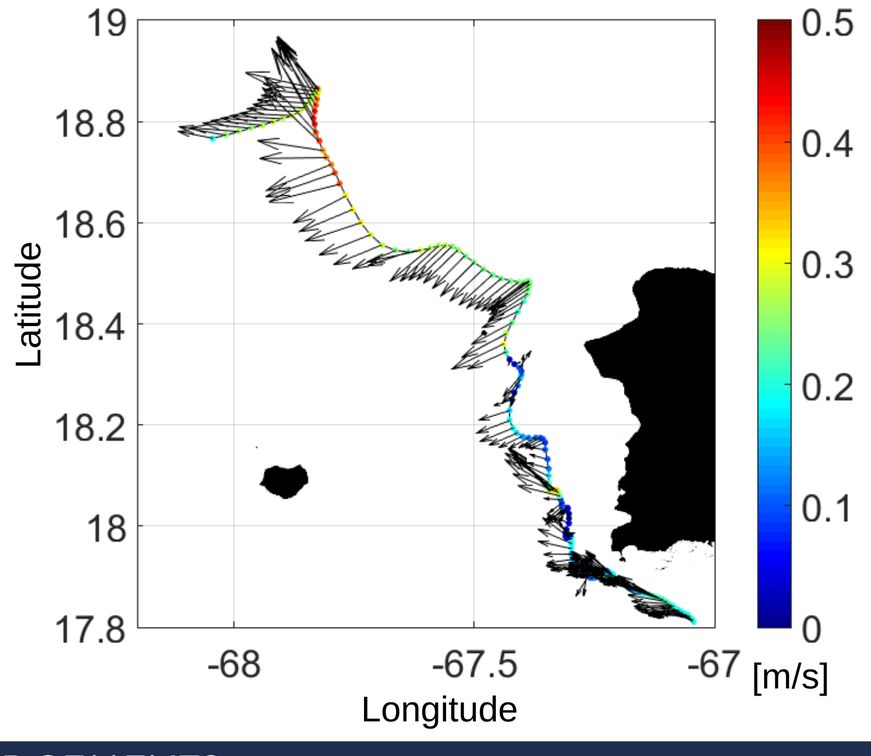
Trajectories for drifters 4, 5, and 6 after interpolating the position data to an hourly time step. Drifters' locations for February 9, 11, and 14 are highlighted.

Distance between drifter 4 and concurrent drifters



[Left] Distances between pairs of drifters active at the same time were calculated. The case for pairs 4-5 and 4-6 is shown. [Right] Schematic diagram of the relative dispersion between drifters 4 (green), 5 (red), and 6 (blue).

3% WRF wind velocity at drifter 17's positions



C.O.D.E. drifters were designed to reduce wind slippage, but the effect still persists under high wind and sea conditions. It is estimated to be about 3% of the wind speed (Poulain, P., et al., 2008). We calculated the 3% of CariCOOS's WRF wind model and plotted it on top of drifter 17's path for a better visualization.

ACKNOWLEDGEMENTS

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