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A Synoptic and Statistical Description of the Gulf Stream and Subtropical Gyre Using SOFAR Floats

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ABSTRACT

Trajectories of 17 SOFAR floats ballasted to nominal depth of 700 and 2000 m and tracked for 15 months have been analyzed to produce synoptic and statistical descriptions of the Gulf Stream and subtropical gyre. SOFAR floats launched in and near the Gulf Stream along with positions of the surface Gulf Stream and satellite tracked buoys demonstrate strong baroclinic shear. Nevertheless, the horizontal patterns of the Gulf Stream meanders and Gulf Stream rings are the same at the surface and at 700 and 2000 m depth. Above the thermocline, particle speeds greater than the propagation speed of the meanders cause parcels of water to move with the flow pattern. At greater depths, the velocities are at most equal to the propagation speed and the deep trajectories are free to pass through the Gulf Stream or ring.

Strong temporal variability is found near the tail of the Grand Banks. Instances of flow both southward into a narrow Gulf Stream recirculation and northward into the North Atlantic Current can be seen.

Statistical averages along 55°W are consistent with other measurements at that longitude. Eddy kinetic energy varies by over two orders of magnitude from the Gulf Stream to mid-gyre. A mean Gulf Stream, flowing eastward at all depths, can be seen. In the interior, the zonal velocity has a short meridional scale with bands of flow in either direction.

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