Abstract View

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Towards a Lagrangian Description of the Gulf Stream

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ABSTRACT

Downstream velocity relative to the axis of the Gulf Stream is examined through the use of data from SOFAR floats. The speed calculated from the position of the floats along constant pressure surfaces is expressed in terms of a transformed cross-stream coordinate given by temperature, which is telemetered from the floats. The result is a distribution of downstream velocity unaffected by meanders from Cape Hatteras to 46°W. The speed at 700 m is about 75 cm s^{-1} west of 57°W and decreases sharply to 40 cm s^{-1} to the east. In the deep water from 1300 to 2200 m, the core speed is 35 cm s^{-1} between 65° and 50°W, if it is present. The flow in the Gulf Stream may be disturbed by local processes, which are frequently observed in satellite imagery. Examples am shingles, ring formation and meanders.

Although SOFAR floats are quasi-Lagrangian (isobaric) devices, the float data can give a Lagrangian description of the Gulf Stream. Above the main thermocline, a current coinciding with the tilting isotherms from Cape Hatteras to 46°W implies that water is efficiently transported downstream. In the deep ocean, water is accelerated by the surface Stream off Cape Hatteras and is at times transported downstream by the deep flow thus formed. The New England Seamounts can block this deep flow. There is little evidence of a deep current and thus, water transport east of the Seamounts.