

Determination of the Lateral Eddy Diffusivity in the Climatological Mean Gulf Stream

By H. STOMMEL, Woods Hole Oceanographic Institution

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The spread of positions of the Gulf Stream as exhibited in fig. 1 of the paper by FUGLISTER and WORTHINGTON (1951) published in this issue of *Tellus* suggests that one should be able to compute a rough value of the lateral eddy diffusivity produced by the meandering and shifts of position of the stream, although the number of points at any section, taken across the stream at any distance along the axis of the stream is quite small for statistical purposes.

If σ represents the standard deviation of the position of the actual stream from the mean axis of the stream at any point along the axis, then, roughly speaking, the eddy A should be given by the equation

$$A \equiv \sigma^2 V/2 L,$$

where L is the distance of the section from Cape Hatteras and V is the mean velocity of the stream. σ has been evaluated for two sections for which L is 500 kilometers and 1,000

kilometers. The results of the computation are given in the following table.

L	0.5×10^8	10^8	cm
V	2.0×10^3	2.0×10^2	cm sec ⁻¹
σ	9.7×10^6	15.4×10^6	cm
σ^2	0.94×10^{14}	2.3×10^{14}	cm ²
A	1.8×10^8	2.3×10^8	cm ² sec ⁻¹

It must be remembered that this determination of the lateral eddy diffusivity is based on the assumption that the actual Gulf Stream is a turbulent flow. The numerical values are roughly of the same order of magnitude as those used by MUNK (1950), though somewhat smaller.

The result of this computation seems to support the contention that the western intensification exhibited in the Munk-Stommel theories are climatological or statistical in nature and that the very thin, filament-like nature of the individual turbulent element of the Gulf Stream may be due to another cause.

REFERENCES

- FUGLISTER and WORTHINGTON 1951: Some Results of a Multiple Ship Survey of the Gulf Stream. *Tellus*, 3, 1. p. 1.
- MUNK, W. H. 1950: On the Wind-driven Ocean Circulation. *Journ. of Met.*, 7. pp. 79—93.