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Horizontal Diffusion Characteristics in Lake Ontario

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ABSTRACT

Experimental data on the diffusion of fluorescent dye patches were obtained in Lake Ontario, to study large-scale horizontal diffusion characteristics. In each experiment, a slug of water-soluble rhodamine dye solution was introduced at appropriate depths. The growth of the diffusing dye patch was followed up to 80 h after dye release, using fluorometric sampling. The data covered a length scale (i.e., patch size) of 100 m to 15 km and the corresponding eddy diffusivities varied from 10^2 to 10^6 $\text{cm}^2 \text{s}^{-1}$. Several horizontal diffusion characteristics are constructed based on a simple theoretical framework. Although the diffusion characteristics cannot be justified entirely from theoretical arguments, they could be viewed as purely statistical since they have been constructed from experimental data obtained in widely varying environmental conditions and provide useful guidelines for modeling practical diffusion problems.

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