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Ship wakes and their manifestations on the sea surface

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Spatial/temporal evolution of turbulence generated by surface ships and the effect of the wake on short wind waves has been studied on the Black Sea and on the Gorky Water Reservoir. Measurements of currents in ship wakes were conducted using an Acoustic Doppler Current Profiler deployed from a motor boat. It was obtained that the temporal/spatial evolution of the wake width could be described approximately by a 0.4-power dependence, and the wake depth remained nearly constant at its initial stage. This allowed one to consider the wake widening as a one-dimensional process. We have developed a simple one-dimensional model of ship wake evolution using a semi-empirical theory of turbulence, and the initial stage of the wake widening (when neglecting dissipation) was described by the equation of turbulent energy balance with the pulse initial condition.
Mean circulating currents in the wake zone resulting in the wind wave intensification ("suloi" areas) at the boundaries of the wake were detected in experiment. The asymmetry of the "suloi" bands was observed when the wind was blowing nearly perpendicular to the wake axis. It was shown that the later stage of the wake evolution is characterized by the formation of slick bands at the edges of the wake. The slick bands is a result of the transport of surfactants to the water surface by air bubbles in the wake and their compression due to the mean circulating currents.
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