



On the surface manifestations of ship wakes.

Ivan Kapustin, Stanislav Ermakov, and Tatyana Lazareva

Institute of Applied Physics, RAS, Russian Federation (kia@hydro.appl.sci-nnov.ru)

During the field experiments on the Black Sea and on the Gorky Reservoir for the last 4 years the widening of the turbulent region generated by surface ships and the surface manifestations of the ship wakes has been studied. Measurements of currents in ship wakes have been made using ADCP (Acoustic Doppler Current Profiler) deployed from a motor boat. It was obtained that the time dependence of the wake width could be described approximately by a 0.4-power function, and the depth of wake remained constant at its initial stage, the latter 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 the 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. We also observed in experiment mean circulating currents in the wake region resulting in the wind wave intensification on the boundaries of the wake region. It was shown that the later stage of the wake evolution is characterized by the presence of slicks bands on the edges of the wake. The slick bands formation is a result of the surfactants transport due to air bubbles in the turbulent wake and their compression by the mean currents.

The work was supported by RFBR (projects 08-05-00634, 08-05-97011), the Program RAN Radiophysics, and the IPY THORPEX Project.