

THE DYNAMICS OF THE SPOT OF ADMIXTURE IN THE COMPOUND VORTEX

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Vortex-like structures are involved in processes of mass transfer, therefore the investigation of the vortex dynamics has a great potential for natural system studying. The important role in admixture and contaminant transport is played by vortices of large and small-scale.

The compound vortex formed by rotating disk in the cylindrical container is chosen to study experimentally the substance transfer. The flow in the experimental setup has cylindrical symmetry that is typical for the most destructive natural vortices (e.g. tornadoes). The free surface allows using variety of modes to introduce admixtures and observe their transport in the flow. The free surface's form reflects an overall pattern of the pressure distribution that is determined by distribution of a velocity in a vortex flow.

The finite volume of admixture is placed on the free surface of water in rest or in the steady rotation state. The various frequencies of disk rotation lead to several types of free surface form. Immiscible admixture mostly gathers in the center of surface but spiral arms are detaching from its edges. Soluble dye on the free surface form thin spiral and helical (in the fluid body) filaments. The taken experiments show, that contrast admixture gathers in separate compact areas – spiral arms on a free surface of a fluid and in bounded areas near the vertical axis of compound vortex.

Quantitative characteristics of flow structures depend on values of setup and liquid parameters. The alteration of physical characteristics of free surface by means of admixture injection can influence the dynamics of the large-scale phenomena composed of vortex currents as even the small volume of admixture on the free surface of compound vortex considerably influences upon flow pattern and dynamics of structure component change.