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Large and small scale oscillations of compound vortex surface trough wall

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We studied the shape of surface trough produced by compound vortex in cylindrical container that reflects distribution of the pressure inside the rotating fluid. Compound vortex flow is activated by rotating disk at the container bottom and consists of rotations around vertical and bounding circular horizontal axes. The shape of the trough is investigated in a wide range of basic flow parameters and was calculated in approximation of ideal fluid. At low rate of activator rotation the trough is smooth. Its depth is defined by both components of vortex flow and exceeds the depth of troughs in the uniformly rotating fluid. Long inertial and short spiral waves disturb the trough wall. The experiments show that the cavern structure at the different angular velocities and sizes of disk-activator tree characteristic forms that are: smooth, mediate (form of trough is disturbed by large scale inertial waves), and complex shape (the indignations like spiral and inertial waves are visible) are distinguished. From comparison of the smoothed trough wall contour with theoretical curve the fitting parameters are defined. Comparison of calculated and observed trough shapes shows that the capillary effects must be taken into account when the angular velocity of disc rotation is high and the complex shape trough touches the disc surface.