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Visualization periodic flows in a continuously stratified fluid.

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To visualize the flow pattern of viscous continuously stratified fluid both experimental and computational methods were developed. Computational procedures were based on exact solutions of set of the fundamental equations. Solutions of the problems of flows producing by periodically oscillating disk (linear and torsion oscillations) were visualized with a high resolutions to distinguish small-scale the singular components on the background of strong internal waves.
Numerical algorithm of visualization allows to represent both the scalar and vector fields, such as velocity, density, pressure, vorticity, stream function. The size of the source, buoyancy and oscillation frequency, kinematic viscosity of the medium effects were traced in 2D an 3D posing problems.
Precision schlieren instrument was used to visualize the flow pattern produced by linear and torsion oscillations of strip and disk in a continuously stratified fluid. Uniform stratification was created by the continuous displacement method. The buoyancy period ranged from 7.5 to 14 s. In the experiments disks with diameters from 9 to 30 cm and a thickness of 1 mm to 10 mm were used. Different schlieren methods that are conventional vertical slit – Foucault knife, vertical slit – filament (Maksoutov's method) and horizontal slit – horizontal grating (natural "rainbow" schlieren method) help to produce supplementing flow patterns. Both internal wave beams and fine flow components were visualized in vicinity and far from the source. Intensity of high gradient envelopes increased proportionally the amplitude of the source. In domains of envelopes convergence isolated small scale vortices and extended mushroom like jets were formed. Experiments have shown that in the case of torsion oscillations pattern of currents is more complicated than in case of forced linear oscillations. Comparison with known theoretical model shows that nonlinear interactions between the regular and singular flow components must be taken into account.
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