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Linear and nonlinear effects in 3D periodic internal waves

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We study analytically and experimentally permanent and twinkled flow pattern components produced by a piston oscillating in a continuously stratified fluid. Constructed solutions of Navier-Stokes-D'Alemberd equations with no-slip and no-flux boundary conditions in approximation of an incompressible fluid describe regular and singular disturbed functions. Numerical visualization of the solution for infinitesimal disturbances shows that regular functions describe periodic internal wave beams. Twinkled singular disturbed functions characterise flows in vicinity of boundaries and on the wave beam edges. Calculated flow pattern fit observed in experiments. With piston oscillation amplitude increasing nonlinear effect manifests itself in formation of interfaces at the beam edge and small-scale vortices near the body. Intensive vortices are formed directly in the fluid interior far from the source in domains of singular disturbed solutions convergence.