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Buoyancy effects on added mass in density-stratified fluids[1]
BRUNO VOISIN, LEGI, CNRS-UJF-GINP — In the presence of stable density stratification, owing to buoyancy, fluid motion gives rise to internal gravity waves which redistribute momentum and energy through the fluid. As a result, the added mass of moving bodies is modified and becomes anisotropic and frequency-dependent. The influence of these modifications on the definition itself of added mass and on its relation to hydrodynamic pressure, impulse, energy and to the dipole strength of the bodies is discussed. Coefficients of added mass are calculated explicitly for the small oscillations of spheres and circular cylinders. Implications for energy radiation and for the motion of floats are considered. In the first case the existence of a maximum at a frequency of oscillation equal to a fixed fraction 0.8 of the buoyancy frequency, practically independent of the direction of oscillation, is pointed out together with possible inferences for turbulent motion. In the second case classical results by Larsen on neutrally buoyant spheres and cylinders are recovered.

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