Geophysical Research Abstracts,
Vol. 11, EGU2009-2003, 2009
EGU General Assembly 2009


# Analytical and experimental study of free oscillations of neutral buoyancy bodies in a continuously stratified fluid

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We study analytically and experimentally flow pattern forming by free oscillating sphere and vertical cylinder near a neutral buoyancy horizon. Calculations of the free body displacements are based on complete set of fundamental governing equations including continuity and Navier-Stokes equations and incompressibility equation for the fluid with no-slip boundary conditions and the Newton's second law for the body. The set is transformed into system of integro-differential equations which is solved by multi-scale perturbation method. Solutions for different variables are constructed in infinite series, then truncated and the first approximation which depended on two empiric parameters is analysed. The parameters, characterising frequency and typical rate of decay of oscillations are defined from experiments. Experiments are performed in a stratified tank using markers, schlieren instruments and conductivity sensors. Internal waves and autocumulative jets were observed in the fluid. Analytical calculations rather good fit the dates of measurements. Extrapolation of theoretical and experimental data on environmental condition shows that singular surfaces around free oscillating marine "ARGO" buoys can impact on measurement accuracy.