Geophysical Research Abstracts,
Vol. 11, EGU2009-3964, 2009
EGU General Assembly 2009

Periodicity of the density wake past a vortex ring in a stratified liquid

V. Prokhorov

Institute for Problems in Mechanics of the RAS, 101 (1), prospekt Vernadskogo, Moscow 119526, Russia,
(prohorov@ipmnet.ru/+7 499 739 95 31)

Spatial coherent structure of the density wake past a vortex ring moving horizontally in viscid stratified liquid is experimentally revealed. It follows from analysis that repetition period of the structure is determined by rotation radial frequency (or mean vorticity) of the vortex core and toward speed of the vortex ring. The wake formation of the ring is considered in respect to vorticity shedding which produces velocity disturbances in ambient medium. In case of stratified liquid velocity fluctuations, in their turn, cause density field distortion. This process is superimposed by vortex core oscillations, and, in result, vorticity shedding will be not monotonous but modulated at some frequency. So, the density wake is periodically structured, and the spatial period is defined by intrinsic frequency of the core and forward speed of the ring. To support analysis, experiments were conducted in which vortex rings excited by spring-piston generator were observed with high-sensitive Schlieren instrument and computer-controlled camera. Experimental tank was filled with salt-stratified water of constant buoyancy period, vortex ring velocities range from 3 to 16 cm/s. Spatial period is derived from schlieren image using two independent methods, both 2D spectral analysis and geometry calculations of the vortex core. Spatial periods and vortex intrinsic frequencies calculated by both algorithms are in good agreement; they vary in power lows depending on vortex speed