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The motion of buoyant point vortices[1] ANIRBAN GUHA, School of Science and Engineering, University of Dundee, JEFF CARPENTER, Institute of Coastal Research, Helmholtz Zentrum Geesthacht — A general formulation is presented for studying the motion of buoyant vortices. It extends the well-known Hamiltonian framework for interacting homogeneous point vortices to include buoyancy effects acting on the vortices. This is then used to systematically examine the buoyant 1-, 2-, and 3-vortex problems. In doing so we find that 2 buoyant vortices may either evolve as a pair in bounded circular orbits, or as two independent unbounded vortices that drift apart, and a criteria is found to distinguish these cases. Special attention is given to the buoyant vortex couple, consisting of two vortices of equal and opposite circulation, and equal buoyancy anomaly. We show that a theoretical maximum height is generally possible for the rise (or fall) of such couples against buoyancy forces. Finally, the possibility and onset of chaotic motions in the buoyant 3-vortex problem is addressed. In contrast to the homogeneous 3-vortex problem, the buoyant vortex system shows evidence that chaos is present. We also demonstrate the chaotic advection of tracer parcels arising from the flow field induced by just 2 buoyant vortices.

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