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Lagrangian transport by breaking surface waves LUC DEIKE, Princeton Univ, N.E. PIZZO, W.K. MELVILLE, Scripps Institution of Oceanography, UCSD — The Lagrangian transport due to non-breaking and breaking focusing wave packets is examined. We present direct numerical simulations of the two-phase air-water Navier-Stokes equations describing focusing wave packets, investigating the Lagrangian drift by tracking tracer particles in the water before, during, and after the breaking event. The net horizontal transport for non-breaking focusing packets is well described by the classical Stokes drift, both at the surface and in the bulk of the fluid, where the e-folding scale of the evanescent vertical profile is given by the characteristic wavenumber. For focusing wave packets that lead to breaking, we observe an added drift that can be ten times larger than the classical Stokes drift for a non-breaking packet at the surface, while the initial depth of the broken fluid scales with the wave height at breaking. We find that the breaking induced Lagrangian transport scales with the breaking strength. A simple scaling argument is proposed to describe this added drift and is found to be consistent with the direct numerical simulations. Applications to upper ocean processes are discussed.

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