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Lagrangian particle drift and surface deformation in a rotating wave on a free liquid surface. PAUL W. FONTANA, Seattle University, NICOLAS FRANCOIS, HUA XIA, HORST PUNZMANN, MICHAEL SHATS, Australian National University — A nonlinear model of a rotating wave on the free surface of a liquid is presented. The flow is assumed to be inviscid and irrotational. The wave is constructed as a superposition of two perpendicular, monochromatic standing Stokes waves and is standing-wave-like, but with "antinodes" or cells consisting of rotating surface gradients of alternating polarity. Lagrangian fluid particle trajectories show a rotational drift about each cell in the direction of wave rotation, corresponding to a rotating Stokes drift. Each cell therefore has a circulating flow and localized angular momentum even though the Eulerian flow is irrotational. Meanwhile, the wave sets up a static displacement of the free surface, making a trough in each cell. This static surface gradient provides a centripetal force that may account for additional rotation seen in experiments. [Francois *et al., Nat. Commun.* 8:14325 (2017).]

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