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98122. *Conservation Laws for Water Waves and Asymptotic Models*. Preliminary report.

We consider a nonlocal formulation of the water-wave problem for a free surface with an irrotational flow, and show how the problem can be reduced to a single equation for the interface. The formulation is also extended to constant vorticity and interfacial flows of different density fluids. We show how this formulation can be used to systematically derive Benjamin & Olver's conservation laws not only for an irrotational fluid, but for constant vorticity and interfaces. This framework easily lends itself to computing the related conservation laws for various asymptotic models via a nontraditional approach to multiple-scales expansions. (Received August 10, 2021)