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Quantifying mixing in vesicle suspensions using numerical simulations in two dimensions GOKBERK KABACAOGLU, GEORGE BIROS, BRYAN QUAIFE, Univ of Texas, Austin — Vesicles, which resist bending and are locally inextensible, serve as an experimental and numerical proxy for red blood cells. In this work, we study the effect of the presence of vesicles to mixing. The motivating application is the study of transport phenomena in microcirculation. We investigate transport specifically in a Couette apparatus, which is governed by an advection-diffusion equation, and we consider mixing in the absence and presence of vesicles using numerical simulations in two dimensions. The advection-diffusion equation is discretized spectrally in space, and with a second-order L-stable Strang splitting in time. To our knowledge, there are no universally accepted measures of mixing. Here, we study two measures: the "mix-norm" defined by a Sobolev norm of negative index and a standard moment fluctuation of the transported species. We define mixing efficiency in terms of mixing measure in the absence of vesicles relative to the measure in the presence of vesicles. We then study the correlation of mixing efficiency with the Peclet number, the volume fraction of the vesicle suspension, and the type of initial conditions.

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