Influence of Diffusion on Optimal Mixing Protocols ALESSAN-
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la Sapienza, LUCA CORTELEZZI, McGill University — In recent years several
studies have addressed the optimization of mixing protocols. These studies can be
divided in two classes depending on the treatment of molecular diffusivity. In the
first class of studies, diffusivity is neglected, and the characterization of the flow is, in
general, purely kinematic. In the second class of studies, diffusivity is included, and
the flow is characterized by analyzing and solving the advection-diffusion equation
or performing an experiment. In general, it is not obvious if an optimal proto-
col derived for a given purely advective flow is still optimal for the corresponding
flow with nonzero diffusivity and vice versa. We consider the optimization of mix-
ing protocols for a prototypal flow: the sine flow. We choose this flow because its
dynamics is quite realistic and has been extensively studied. We consider a fluid
with and without diffusivity and derive finite-horizon optimal mixing protocols for
a prescribed initial data. We obtain insight about the role played by diffusivity by
applying protocols derived in the diffusive case to the purely advective case and vice
versa. Results are discussed emphasizing the role of diffusivity and horizon length.

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