Abstract Submitted
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**Is turbulent or laminar mixing more efficient in two-dimensional wall-bounded flow?**[1] BENJAMIN KADOCH, Aix-Marseille Université, IUSTI–CNRS, Marseille, France, WOUTER J. T. BOS, LMFA-CNRS - Ecole Centrale de Lyon, France, KAI SCHNEIDER, Aix-Marseille Université, I2M–CNRS, Marseille, France — A turbulent flow mixes in general more rapidly a passive scalar than a laminar flow does. From an energetic point of view, for statistically homogeneous or periodic flows, the laminar regime is more efficient. However, the presence of walls may change this picture and it is not *a priori* known whether energetically it is desirable to mix a system in turbulent flow or that a laminar flow will succeed a given level of mixedness using less energy. In the present work we will consider a simple two-dimensional flow in a circular container with a circular rod, stirring a passive scalar, considering a broad range of values of the Reynolds and Schmidt numbers. The flows are computed by direct numerical simulation using FLUSI, a Fourier pseudo-spectral code with volume penalization (https://github.com/pseudospectators/FLUSI). We show that for sufficiently large Schmidt number, turbulent flows more efficiently mix a wall-bounded scalar field than a chaotic or laminar flow does. The mixing efficiency is shown to be a function of the Péclet number, and a phenomenological explanation yields a scaling law, consistent with the observations (Phys. Rev. E, 101, 043104, 2020).

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