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Advection and the Efficiency of Spectral Energy Transfer in Two-Dimensional Turbulence NICHOLAS OUELLETTE, LEI FANG, Stanford University — We report measurements of the geometric alignment of the small-scale turbulent stress and the large-scale rate of strain that together lead to the net flux of energy from small scales to large scales in two-dimensional turbulence. We find that the instantaneous alignment between these two tensors is weak, and thus that the spectral transport of energy is inefficient. We show, however, that the strain rate is much better aligned with the stress at times in the past, suggesting that the differential advection of the two is responsible for the inefficient spectral transfer. We provide evidence for this conjecture by measuring the alignment statistics conditioned on weakly changing stress history. Our results give new insight into the relationship between scale-to-scale energy transfer, geometric alignment, and advection in turbulent flows.

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