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Eigenmode analysis of scalar transport in distributive mixing PATRICK ANDERSON, Materials Technology, M.K. SINGH, MICHEL SPEETJES, Materials Technology, Eindhoven, MATERIALS TECHNOLOGY, EINDHOVEN COLLABORATION — In this study we explore the spectral properties of the distribution matrices of the mapping method and its relation to the distributive mixing of passive scalars. The spectral decomposition of these matrices constitutes a discrete approximations to the eigenmodes of the continuous advection operator in periodic flows. The asymptotic state of a fully-chaotic mixing flow is dominated by the eigenmode corresponding with the eigenvalue closest to the unit circle. This eigenvalue determines the decay rate; its eigenvector determines the asymptotic mixing pattern. The closer this eigenvalue value is to the origin, the faster is the homogenization by the chaotic mixing. Its magnitude can be used as a quantitative mixing measure for comparison of different mixing protocols. Eigenvalues on the unit circle are qualitative indicators of inefficient mixing; the properties of its eigenvectors enable isolation of the non-mixing zones. Results are demonstrated of two different prototypical mixing flows: the time-periodic sine flow and the spatially-periodic partitioned-pipe mixer.

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