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Material Barriers to Diffusive Mixing[1] GEORGE HALLER, ETH Zrich, DANIEL KARRASCH, TU Munich — Transport barriers, as zero-flux surfaces, are ill-defined in purely advective mixing in which the flux of any passive scalar is zero through all material surfaces. For this reason, Lagrangian Coherent Structures (LCSs) have been argued to play the role of mixing barriers as most repelling, attracting or shearing material lines. These three kinematic concepts, however, can also be defined in different ways, both within rigorous mathematical treatments and within the realm of heuristic diagnostics. This has lead to a an ever-growing number of different LCS methods, each generally identifying different objects as transport barriers. In this talk, we examine which of these methods have actual relevance for diffusive transport barriers. The latter barriers are arguably the practically relevant inhibitors in the mixing of physically relevant tracers, such as temperature, salinity, vorticity or potential vorticity. We demonstrate the role of the most effective diffusion barriers in analytical examples and observational data.

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