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First experimental measurement of the Melnikov function PATRICE MEUNIER, PETER HUCK, EMMANUEL VILLERMAUX, IRPHE, Aix-Marseille Univ., CNRS, Ecole Centrale Marseille — The problem of scalar mixing in a 2D flow has been extensively studied numerically by following Lagrangian tracers or theoretically using the tools of dynamical systems (KAM tori, quasi-periodic orbits, chaotic attractors...). However, in all these modelisations, the diffusion of the scalar is usually neglected for the purposes of the numerical/theoretical tools. We present here an experiment with an exactly 2D flow, which allows to study properly the diffusive and mixing problem at very large Peclet number. To avoid any 3D flow, the fluid is stratified with a linear density gradient using salted water. Moreover, the viscosity of the water is decreased of an order of magnitude by adding 10% ucon oil in the water. The flow under study is created by the co-rotation of two vertical cylinders, leading to a homoclinc point at the center. This base flow is perturbed periodically by a third oscillating cylinder. The dye injected at the center settles on the stable manifold of the homoclinic point. The distance between the stable and the unstable manifold is measured as half the distance between the maximum and the minimum of the dye's undulation. The results are in good quantitative agreement with the theoretical prediction of the Melnikov function for this flow.

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