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Three-dimensional Diffusive Strip Method. DANIEL MARTINEZ-RUIZ, PATRICE MEUNIER, LAURENT DUCHEMIN, EMMANUEL VILLERMAUX, Aix Marseille Université, CNRS, Centrale Marseille, IRPHE UMR 7342, 13384 Marseille, France — The Diffusive Strip Method (DSM) is a near-exact numerical method developed for mixing computations at large Pclet number in two-dimensions (*J. Fluid Mech.* **662**, (2010)). The method consists in following stretched material lines to compute a-posteriori the resulting scalar field is extended here to three-dimensional flows, following surfaces. We describe its 3D peculiarities, and show how it applies to a simple Taylor-Couette configuration with non-rotating boundary conditions at the top end, bottom and outer cylinder. This flow produces an elaborate, although controlled, steady 3D flow which relies on the Ekman pumping arising from the rotation of the inner cylinder is both studied experimentally, and numerically modeled. A recurrent two-cells structure appears formed by stream tubes shaped as nested tori. A scalar blob in the flow experiences a Lagrangian oscillating dynamics with stretchings and compressions, driving the mixing process, and yielding both rapidly-mixed and nearly pure-diffusive regions. A triangulated-surface method is developed to calculate the blob elongation and scalar concentration PDFs through a single variable computation along the advected blob surface, capturing the rich evolution observed in the experiments.

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