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Eulerian Measures for Lagrangian Stirring in a Thermally Driven Flow

R.J. Keane(1), P.L. Read(1), G.P. King(2)

(1) *Dept. of Physics, University of Oxford, UK*
(2) *School of Engineering, University of Warwick, UK*

Lagrangian stirring in a thermally driven rotating annulus is investigated numerically using a Navier–Stokes model and a two dimensional Runge-Kutta integration routine. The stirring is quantified using geometrical and dynamical Eulerian symmetry measures, as well as more commonly used Lagrangian measures, such as finite time Lyapunov exponents and box counting dimensions. The ability of the measures to identify transport barriers and regions of well and poorly stirred flow is investigated, and space and time averages of the Eulerian symmetry measures are compared to those of the Lagrangian measures for various flow regimes. The flow regimes considered include axisymmetric flow regimes with time dependent temperature forcing as well as more dynamically consistent three dimensional time dependent baroclinic wave flow regimes.

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