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The edge in models of shear flows NORMAN LEBOVITZ, University of Chicago, GIULIO MARIOTTI, Boston University — A characteristic feature of the onset of turbulence in shear flows is the appearance of an "edge," a codimension-one invariant manifold that separates orbits that decay rapidly to the laminar state from orbits that decay more slowly. We investigate its structure by considering a series of models of successively higher dimension. We hope in this way to isolate geometric features that are robust under the increase of dimension and are therefore candidates for extrapolation to arbitrarily high dimension. We find in the cases considered that there are extensive ranges of the Reynolds number in which all or part of the boundary of the basin of attraction of the laminar state indeed has the character of an edge. The edge is also the stable manifold of an edge state (a "lower-branch" state). An important feature of the edge is that it lies in a region of phase space which, while unbounded in some directions, is bounded in others. This allows orbits on either side of it to connect to the laminar state. The boundedness of the edge is associated with the presence of a further invariant ("upper-branch") state.

Norman Lebovitz
University of Chicago

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