The Geometry and Dynamics of a Propagating Front in a Chaotic Flow Field MARK PAUL, Virginia Tech — There are many important problems regarding transport in complex fluid flows with implications in science, nature, and technology. Examples include the combustion of pre-mixed gases in a turbulent flow, the complex patterns of reagents in a chemical system, the spread of a forest fire, and the outbreak of an epidemic. This talk explores the transport and dynamics of a reacting species in a chaotic fluid flow field. Large-scale parallel numerical simulations are used to explore the dynamics of propagating fronts in complex three-dimensional time-dependent fluid flows for the precise conditions of the laboratory. It is shown that a chaotic flow field enhances the front propagation when compared with a purely cellular flow field. This enhancement is quantified by computing measures of the spreading rate of the products and by quantifying the complexity of the three-dimensional front geometry for a range of chaotic flow conditions.

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