

Abstract Submitted
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Measuring stretching to predict the progress of diffusively limited chemical reactions P.E. ARRATIA, Haverford College, J.P. GOLLUB, Haverford College and University of Pennsylvania — We investigate an acid-base reaction in the presence of chaotic advection and diffusion using experimentally measured stretching fields and fluorescent monitoring of the product. Both the flow symmetry and the Reynolds number (Re) affect the spatial distribution and time dependence of the reaction product, which grows more slowly than expected, possibly as a result of highly non-uniform stretching. A single parameter, the product of the mean Lyapunov exponent $\bar{\lambda}$ and the number of cycles N , can be used to predict the spatial average time-dependent product concentration for flows possessing different degrees of spatial symmetry and various Re . Unexpected oscillations occur on a time-scale much slower than the basic flow period, a phenomenon that is not reproduced by the usual model for fast reactions. This work was supported by National Science Foundation grant DMR-0405187.

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