1035-35-792 **JACK XIN*** (jxin@math.uci.edu), Department of Mathematics, UC Irvine, Irvine, CA 92697.

Reaction-diffusion fronts in random flows. Preliminary report.

Reaction-diffusion front propagation in random flows arises in turbulent combustion or interface motion in random advection (flames in winds). Due to the notorious closure problems, solutions are difficult to analyze rigorously. However, large time asymptotic closure of front speeds is possible for quadratic reactions, known in general as Kolmogorov-Petrovsky-Piskunov (KPP) reactions. In recent work with James Nolen, the almost sure existence of KPP front speeds is established for space-time random incompressible flows in several space dimensions. The flow field can become unbounded at large times. If the flow field is stationary, ergodic, and obeys a suitable moment condition, the large time front speeds (spreading rates) are deterministic in all directions for compactly supported initial data. The front speeds are characterized by a variational principle involving the convex rate function of large deviations of the associated diffusion in the random flow. The convex rate function is also related to the principal Lyapunov exponents of a reduced stochastic parabolic equation. The variational principle allows analytical bounds as well as fast and accurate computation of front speeds. (Received September 15, 2007)