In this talk we discuss our recently introduced methods for obtaining strictly positive lower bounds on the top Lyapunov exponent of high-dimensional, stochastic differential equations such as the weakly-damped Lorenz-96 (L96) model or Galerkin truncations of the 2d Navier-Stokes equations (joint with Alex Blumenthal and Sam Punshon-Smith) and earlier results on Lagrangian chaos and exponential mixing of passive scalars (also joint with Alex Blumenthal and Sam Punshon-Smith).