Meeting: 1001, Evanston, Illinois, SS 11A, Special Session on Stability Issues in Fluid Dynamics

1001-35-23 **Raymond T Pierrehumbert*** (rtp1@geosci.uchicago.edu), Department of the Geophysical Sciences, The University of Chicago, 5734 S. Ellis Ave, Chicago, IL 60637. *Strange eigenmodes of linear operators occuring in stability theory.*

For ODE eigenvalue problems such as those appearing in stability analysis of parallel flow, Frobenius theory provides a complete characterization of the possible singularities of the eigenmodes. In two or more dimensions, the situation is more challenging. Linear operators with no manifest singularities in their coefficients can have eigenmodes with δ-function or logarithmic singularities concentrated on curves. In three dimensional steady problems or two dimensional problems with time-periodic coefficients, the eigenmodes can even have fractal level sets, in the limit of zero diffusivity. Spatial complexity of linear operators appears also in "quantum chaos," in which nonlinear classical problems having chaotic trajectories turn into linear eigenmode problems exhibiting spatial complexity.

In this talk I shall discuss some examples of the appearance of spatial complexity in eigenmodes. In particular, I will analyze some model problems deriving from iterated maps on the plane, and their approximation in terms of eigenvalues of elements of permutation groups. Some results on smoothness of modes are discussed, as well as a program for more complete resolution of the problem. (Received June 27, 2004)