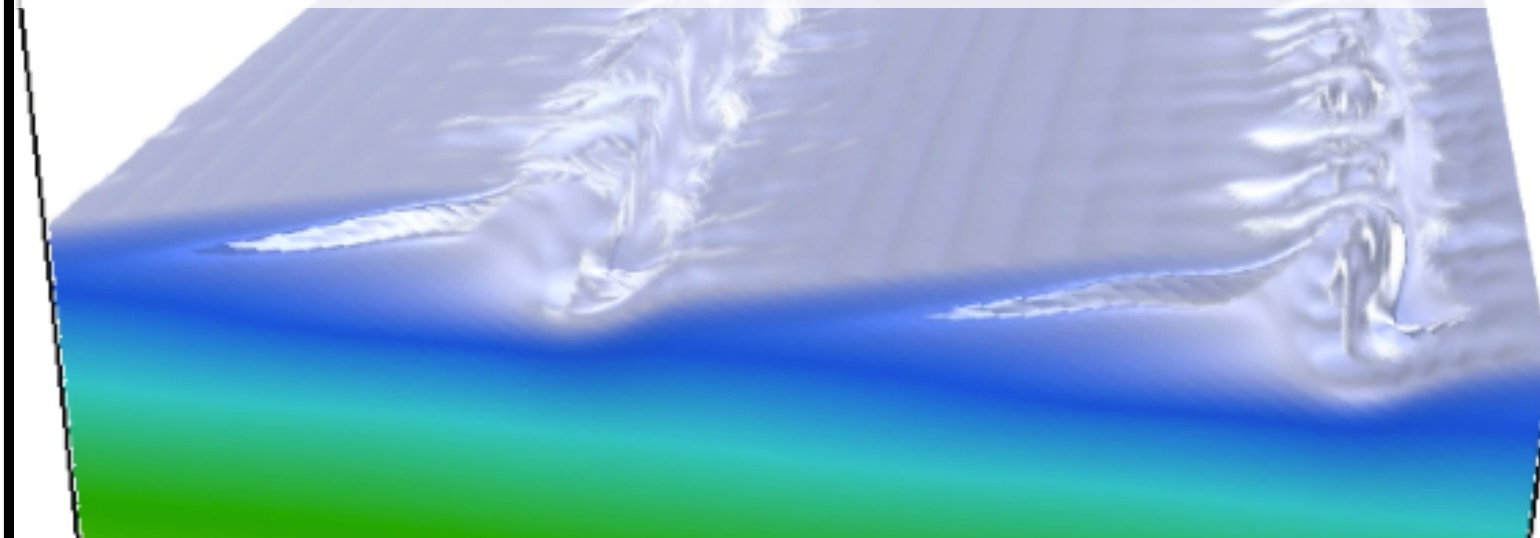
JOINT AMI/IGR/PIMS Seminar

3pm Monday, September 12
CCIS L1-047



Transient growth in strongly-stratified shear layers

Dr. Alexis Kaminski

Dept Applied Mathematics and Theoretical Physics
University of Cambridge

<u>Abstract</u>

Stratified shear flows are ubiquitous features of the ocean and atmosphere, and a large literature is devoted to describing their stability and mixing properties. A classical results is the Miles-Howard theorem, which states that a necessary condition for normal-mode instability in parallel, inviscid, steady stratified shear flows is that the minimum gradient Richardson number, Ri_g, is less than 1/4 somewhere in the flow. However, substantial transient growth may be possible at finite times even in flows violating this condition. Here, the perturbations associated with maximum linear energy gain at finite time T of a stably-stratified shear flow are computed using a direct-adjoint looping technique. Their subsequent nonlinear evolution is then examined using direct numerical simulations. The perturbations may undergo sufficient linear growth to saturate, become susceptible to secondary instabilities, and break down into small scales, even for background flows with Ri_g>1/4. The details of the nonlinear perturbation evolution and associated energetics and mixing are described here for varying initial amplitude and flow parameters.