BRUCE SUTHERLAND, University of Alberta
The Growth and Rise of Anelastic Internal Waves

The diagnoses of internal wave propagation, anelastic growth and breaking in the middle atmosphere are assessed in general circulation models through heuristics based upon observations and the predictions of linear theory. Before wave breaking occurs, however, internal waves grow to moderately large amplitude and so the predictions of linear theory are drawn into question. In this talk weakly nonlinear theory is used to derive the nonlinear Schrodinger equation, which reveals that the dominant weakly nonlinear dynamics are determined by interactions between internal waves and the mean flow that they induce (their "Stokes drift"). In particular, this predicts that hydrostatic internal waves are modulationally stable, meaning that their anelastic amplitude growth is retarded as the wavepacket nonlinearly disperses. Fully nonlinear simulations show, as a consequence, that hydrostatic waves can overturn tens of kilometers higher in the atmosphere than predicted by linear theory.