Date: **November 21st**

Time: **11:00 AM**

Location: **Ames 234**

Speaker: **Dr. Jackson R. Herring**
NCAR, Boulder

Title: **"Statistical and Dynamical Aspects of Isotropic and Stably Stratified Turbulence"**

Abstract

We examine homogeneous turbulence under stably stratified and neutral conditions, including both decaying and randomly forced cases. Our tools include both direct numerical simulation (DNS) and elements of statistical theory. Our DNS are at 512^3, which permits large--scales to develop from the dynamics at smaller energy containing scales. The above resolution permits a Taylor microscale $R_\lambda \sim 150$. The development of such large-scales is closely related to conservation principles, such as angular momentum, energy, and scalar variance, and we relate these principles to our DNS results. Stratified turbulence decays more slowly that isotropic turbulence with the same initial conditions, and we offer a simple explanation in terms of the diminution of energy transfer to small scales resulting from phase--mixing of gravity waves. Enstrophy structures in stratified flows (scattered pancakes) are distinctly different from those found from isotropic turbulence (vortex tubes). We note that rapid distortion theory (RDT) may give valid insights into such structures, although the quantitative degree of anisotropy in the DNS exceeds that suggested by RDT.

For the forced case, we examine the modification of the inertial range induced by strong stratification ($k^{-5/3} \rightarrow k^{-2}$), as well as the development of the vertically sheared horizontal flow (VSHF) discovered by Smith and Waleffe. We note that The development of the VSHF mode is closely associated with strong gravity waves at large scales.

Finally we compare probability distribution functions (PDF) of both stratified and neutral flows. Stably stratified flows have acceleration PDFs significantly more Gaussian than those of isotropic turbulence.