

Seminar Announcement

Friday
Nov. 7, 2008
11:00 A.M.

Engineering
Bldg
Room 203E



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Mixing in a stratified environment: high-resolution simulations

Sutanu Sarkar, Professor, UCSD

We will utilize two recent studies to illustrate how high-resolution simulations can serve as numerical probes into small-scale mixing phenomena in the environment. The first problem, a shear layer embedded in the transition zone between a weakly stratified region and a strongly stratified thermocline, is studied using DNS. The evolution of the shear zone and buoyancy field are compared with the classical shear layer between two streams with constant but unequal density. Internal waves, generated by the shear layer, are characterized, and their contribution to momentum transport is assessed. The second problem concerns a high-Reynolds number bottom boundary layer (BBL) subject to an overlying thermal stratification, studied using LES. Stratification effects on BBL thickness, drag, Ekman veering and mixing will be discussed. A modification of the log-law is proposed to analytically represent the mean velocity profile and, thus, infer the bottom stress. Internal gravity waves are found to propagate in the outer layer with a characteristic angle, 35 - 55 degrees with the vertical, and a theory based on frequency-specific viscous decay is offered to explain the propagation angle.

Biographical Sketch

Sutanu Sarkar received his Ph.D. from the Mechanical and Aerospace Engineering Department at Cornell University in 1988. He spent the following years until 1992 as a staff scientist in the Institute for Computer Applications in Science and Engineering (ICASE) at NASA Langley Research Center. He has been on the faculty at the Mechanical and Aerospace Engineering department at UC San Diego as Assistant Professor (1993-95), Associate Professor (1995-1999) and Professor (1999-current). His primary research interests are in the areas of turbulence and computational fluid mechanics. Applications of these interests include environmental flows, compressible flows and combustion. He has received a NASA group achievement award (1994), the Bessel Award from the Humboldt Foundation (2001), and was elected fellow, American Physical Society (2006).

Host: Dr. Gustaaf Jacobs