Anatomy of the Lee-Side Hydraulic Jump

Richard Rotunno
NCAR/MMM

From the point of view of the shallow-water equations (SWE), the hydraulic jump is a discontinuity in fluid-layer depth and velocity at which kinetic energy is dissipated. To provide an understanding of the origin and internal dynamics of the hydraulic jump, three-dimensional numerical solutions of the Navier-Stokes Equations (NSE) are carried out alongside SWE solutions for nearly identical physical initial-value problems. Analysis of the solutions to the initial-value problem shows that the tendency to form either the lee-side height/velocity discontinuity in the SWE, or the overturning density interface in the NSE, is a feature of inviscid, nonturbulent fluid dynamics. Dissipative turbulent processes associated with the lee-side hydraulic jump are a consequence of the inviscid fluid dynamics that initiate and maintain the locally unstable conditions. Implications for the modeling of atmospheric mountain waves and lee vortices are discussed.

This seminar will be webcast live at:
http://ucarconnect.ucar.edu/live

Recorded seminar link can be viewed here:
https://www.mmm.ucar.edu/events/seminars

Thursday, 9 November 2017, 3:30 PM
Refreshments 3:15 PM
NCAR-Foothills Laboratory
3450 Mitchell Lane
Bldg. 2, Main Auditorium, Room 1022

NCAR

NSF