

# **ICTP DIPLOMA PROGRAMME IN EARTH SYSTEM PHYSICS 2012-2013**

## **Fluid Mechanics (ESP-FM) (12 lectures : 18 hrs)**

- 1 Introduction to Fluid Mechanics and Properties of Fluids I
- 2 Properties of Fluids II and Statics
- 3 Scalars, Vectors, Tensors, Gradient, Divergence, Curl
- 4 Kinematics: Material derivative, streamline, streamfunction, strain rates, relative motion near a point, Vorticity and circulation
- 5 Conservation laws I: Mass, tracer, Advection-Diffusion Equation
- 6 Conservation laws II: Momentum and the Navier-Stokes Equations
- 7 Conservation laws II: Energy and Bernoulli equations
- 8 Boussinesq approximation and the Governing equations of Geophysical Fluid Dynamics
- 9 Dynamic similarity / Instabilities: Rayleigh-Benard Convection, Kelvin-Helmholtz instability
- 10 Geostrophic flow and Vorticity dynamics
- 11 Linear waves: Kelvin, Poincare', Rossby
- 12 Stratification and Internal waves

NOTE: THIS IS A TENTATIVE SCHEDULE AND MAY BE REVISED DURING THE COURSE.

TEXTBOOKS: any textbook on Fluid Mechanics, but particularly: 'Fluid Mechanics' by P. K. Kundu and 'Physical Fluid Dynamics' by D. J. Tritton.