Institute Lecture

Waves and Turbulence in Rotating Flows

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Monday, 5th December, 2011; Time: 4:00 PM, Venue: L-1, Lecture Hall Complex

Abstract

In the presence of waves, such as in the case of rotation, stratification or magnetic fields, different regimes for the dynamics of a turbulent flow can emerge according to the parameter measuring the ratio of the wave period to the eddy turn-over time. When this ratio is small, it provides a parameter with which one can close the equations together with the resonance condition of waves. However, this theory of weak turbulence is non uniform in scale and breaks down, leading to other regimes.

In this talk, I shall first briefly review how one can derive the kinetic equations for weak turbulence, comparing them with classical two-point closures. I shall then move on to describe the results of large-scale direct numerical simulations of rotating turbulence up to grids of 30723 points and show that helicity, measuring the degree of alignment between velocity and its curl, the vorticity, plays an essential role, leading to new dynamical ranges. Finally, I will give evidence for the recovery of isotropy in the small scales.

About the speaker

Prof. Annick Pouquet is one of the most prominent researchers in the area of turbulence. She worked in Observatoire de Nice till 2000, after which she has moved to the National Center for Atmospheric Research in Boulder, Colorado. She was the first director of the Earth and Sun Science Laboratory at NCAR. At present she is the Head of the Geophysical Turbulence Group. She has worked on several aspects of turbulence, in two and three dimensions, incompressible or supersonic, with or without magnetic fields, with applications to the Solar Wind, the interstellar medium and to the problem of generation of magnetic fields. The tools used to that effect were theoretical (development of closures, derivation of weak turbulence kinetic equations, modeling) and numerical, mainly through the use of pseudo-spectral codes. She is presently focusing on rotating flows as they are encountered in the atmosphere and the oceans. Prof. Pouquet is a Fellow of the American Physical Society. She has nearly 160 publications in refereed journals and has written reviews and courses such as for Les Houches and San Miniato.

Tea at 3.45 PM **All interested are welcome.**

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