Boundary effect in the zero viscosity limit and energy dissipation

Claude BARDOS

This talk (covering joint work with E. Titi, L. Szekelyhidi) is based on the two following observations.

First the notion of week convergence is the deterministic avatar of the notion of average in the statistical theory of turbulence.

Second in most cases (even for generation of homogeneous and isotropic turbulence) , the basic effects are due to the boundary.

It turns out that it is a theorem of T. Kato of 1984 that allows through diverse generalizations (object of this presentation) to make a natural connection between these two observations; moreover what is striking is that the hypothesis of this theorem are in full agreement with observations coming from engineering science or fluid mechanic.

Eventually the fact that (even in domain with boundary) weak solutions of the Euler equations are of constant energy as soon as they belong to an Holder space $C^{0,\alpha}(\Omega)$ with $\alpha > \frac{1}{3}$ (the so called Onsager 's conjecture) leads to a comparison between the Kolmogorov $1/3$ law and the Kato hypothesis for the absence of energy dissipation.