

Nader MASMOUDI (Courant Institute of Mathematical Sciences)

Stability of the 3D Couette Flow

We will discuss the dynamics of small perturbations of the plane, periodic Couette flow in the 3D incompressible Navier-Stokes equations at high Reynolds number.

For sufficiently regular initial data, we determine the stability threshold for small perturbations and characterize the long time dynamics of solutions near this threshold.

For rougher data, we obtain an estimate of the stability threshold which agrees closely with numerical experiments.

The primary linear stability mechanism is an anisotropic enhanced dissipation resulting from the mixing caused by the large mean shear; the main linear instability is a non-normal instability known as the lift-up effect.

Understanding the variety of nonlinear resonances and devising the correct norms to estimate them form the core of the analysis we undertake.

This is based on joint works with Pierre Germain and Jacob Bedrossian