On Solutions to the Euler Equations of Incompressible Fluids

ORGANIZER: Xinyu He (*University of Warwick, UK*)

Thursday, July 5, 16:15–18:15, Medium Hall A

TALKS:

Luigi Carlo Berselli (*Pisa University, IT*), **On the long-time behavior of 2D dissipative Euler equations**

Philip Boyland (*University of Florida, USA*), **Topology and exponential growth in two-dimensional Euler flow**

Camillo De Lellis (*Universität Zürich, CH*), **Dissipative Hoelder solutions of the incompressible Euler equations**

Stephen Carl Preston (*University of Colorado at Boulder, USA*), **Geometric aspects of blowup for axisymmetric fluids**

On the long-time behavior of 2D dissipative Euler equations

Luigi Carlo Berselli
Pisa University, IT

We study the long-time behavior of the 2D dissipative Euler equations as those considered. In particular, to construct certain attractors, we will study carefully the transport equation for the vorticity. The classical solutions of the transport equation for the vorticity field will make it possible for us to identify strong attractors in the phase space.

Topology and exponential growth in two-dimensional Euler flow

Philip Boyland
University of Florida, USA

In two-dimensional multi-connected fluid regions the Thurston-Nielsen (TN) theory implies that the essential topological length of material lines grows either exponentially or linearly; the TN theory and subsequent results provide many procedures for determining which growth rate occurs. Applying this theory to Euler flows our main theorem is that there are periodic stirring protocols for which generic smooth initial vorticity yields a solution to Euler's equations which is not periodic and further, the sup norm of the gradient of the vorticity grows exponentially in time.

Dissipative Hoelder solutions of the incompressible Euler equations

Camillo De Lellis
Universität Zürich, CH

In this talk I will give some details about my most recent result with Laszlo Szekelyhidi, where we prove the existence of Hoelder solutions to the incompressible Euler equations which dissipate the kinetic energy.

Geometric aspects of blowup for axisymmetric fluids

Stephen Carl Preston
University of Colorado at Boulder, USA

Following Arnold, we view the Euler equations of incompressible fluid mechanics as a geodesic equation in the space of volume-preserving diffeomorphisms. This viewpoint allows us to reinterpret the Beale-Kato-Majda condition for blowup geometrically, in terms of how long a geodesic can minimize length. We demonstrate some simplifications that occur in the case of axisymmetric Euler flow with swirl.