Frontiers of Mathematics Lecture
On the global stability of large Fourier mode for 3-D Navier-Stokes equations

Abstract

We first prove the global existence of strong solutions to 3-D incompressible Navier-Stokes equations with solenoidal initial data, which is of the form: A *(r, z) cos* $N\theta$ + B *(r, z) sin* $N\theta$ when written in the cylindrical coordinates provided that N is large enough. In particular, we prove that the corresponding solution has almost the same frequency N for any positive time. The main idea of the proof is first to write the solution in trigonometrical series in θ variable and estimate the coefficients separately in some scale-invariant spaces, then we handle a sort of weighted sum of these norms of the coefficients in order to close the *a priori* estimate of the solution.

Furthermore, we shall extend the above well-posedness result for initial data which is a linear combination of axisymmetric data without swirl and infinitely many large mode trigonometric series in the angular variable.

(This is a joint work with Yanlin Liu.)

Professor Ping ZHANG
(Academy of Mathematics and System Sciences, Chinese Academy of Sciences)

Date :
15 February, 2024 (Thursday)

Time :
5:00 – 6:00pm
(Tea Reception starts at 4:30 pm)

Venue :
Lecture Theatre A, G/F,
Chow Yei Ching Building,
The University of Hong Kong

Biography

Professor Ping Zhang is now president of Academy of Mathematics and System Sciences, The Chinese Academy of Sciences (CAS). He received his BS in Mathematics from Nanjing University in 1991, and PhD from Nanjing University in 1997. He was a postdoctoral fellow in the Institute of Mathematics, CAS, from 1997 to 1999. From 1999 on, he has been working in the Academy of Mathematics and System Sciences, CAS. He was promoted to the full professor position in 2003.

Professor Zhang's research lies in the mathematical theory of viscous fluid dynamical equations and semi-classical limit of nonlinear Schrödinger equations. His honors include: Outstanding Youth Grant from Natural Sciences Foundation of China in 2005; China Youth Science and Technology Innovation Award in 2007: State Natural Science Award of second class in 2011: Changjiang chair professor of The University of the Chinese Academy of Sciences in 2015; Chern Shiing-Shen Prize of Chinese Mathematical Society in 2019. He was elected Academician of The Chinese Academy of Sciences in 2021.