



# 偏微分方程及其应用中心

# 学术报告

**报告题目:** Some progress on incompressible flows with helical symmetry

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**时间:** 2023年6月14日(星期三)上午10:00-11:00

**地点:** 数学院南楼 N602

**摘要:** Helical symmetry is invariance under a one-dimensional group of rigid motions generated by a simultaneous rotation around a fixed axis and translation along the same axis. In this talk, we mainly investigate the following two questions: 1) we are concerned with the vanishing viscosity problem for the three-dimensional Navier-Stokes equations with helical symmetry in the whole space. A new decomposition of a helical vector field is introduced to make it available to obtain uniform estimates of the vorticity; 2) we prove that the weak solutions of the three-dimensional incompressible Euler equations with helical symmetry in the whole space exist when the initial vorticity lies in  $L^1 \cap L^p$  with  $p > 1$ . The key ingredient here involves the explicit analysis of Biot-Savart law with helical symmetry in domain  $\mathbb{R}^2 \times [-\pi, \pi]$  via the theories of singular integral operators and second order elliptic equations. In particular, the assumption with vanishing helical swirl is necessary.