Astronomy Colloquium

Prof. Xuening Bai（白雪宁）

(Tsinghua University)

Planet formation in the outer protoplanetary disks

Time: 15:00-16:00, April 2nd (Tuesday), Shanghai time

Venue: N602（TDLI）

Host: Longqing Yi

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Meeting ID: 950910372

Abstract:

The prevalence of substructures in the outer protoplanetary disks (PPDs), as a major observational revolution over the past few years, calls for new perspectives in our understandings of planet formation. Among various stages of planet assembly, the most uncertain include the formation of planetesimals out of dust particles, and how planet embryos interact with the PPD and accrete gas. I will start from an overview on the gas dynamics of the outer protoplanetary disks, highlighting the role of magnetic fields and turbulence. I will then present high-resolution hybrid simulations of gas and dust under realistic level of disk turbulence, showing that planetesimal formation preferentially occur in disk substructures. I will next present simulations of planet-disk interaction in magnetized PPDs, where a Jupiter-mass planet carves deeper gaps with distinct features in gas kinematics. Further zooming in leads to the formation of a circumplanetary disk (CPD), and I will finally describe our ongoing radiation hydrodynamic simulations of CPDs with implications on satellite formation.

Biography:

Prof. Xuening Bai is a professor at the Institute for Advanced Study, Tsinghua University, and is jointly affiliated with department of astronomy. He graduated from Tsinghua University with a B.S. in mathematics and physics in 2007, and obtained his PhD in astrophysics from Princeton University in 2012. He was a Hubble Fellow and Institute for Theory and Computation (ITC) fellow at the Harvard-Smithsonian Center for Astrophysics from 2012-2017. He joined Tsinghua University as a research professor in 2017, and became a full professor in 2023. He is a theoretical and computational astrophysicist. His research group studies protoplanetary disks and planet formation, as well as several aspects of plasma astrophysics especially on cosmic-ray acceleration and transport, and develops computational tools for related applications.