AAPPS-DPP 2018 Plenary speaker Name: Prof. Xueng Bai
Affiliation: Institute for advanced study, Tsinghua University

Rationale: Dr. Bai is a theoretical and computational astrophysicists, currently an associate professor at Tsinghua University. He has very broad research interest including protoplanetary disks (PPDs) and planet formation, accretion disks and winds, pulsar magnetosphere, and particle acceleration in shocks and turbulence. He is a leading expert on the theory of PPD gas dynamics, and his work has led to a paradigm shift in the general understanding of the PPD physics with major implications on planet formation. Just after 5 years of his PhD, he has published more than 40 papers with more than 2000 citations.

Talk Title: Gas Dynamics of Weakly Ionized Protoplanetary Disks and Implications for Planet Formation

Short abstract: Protoplanetary disks (PPDs) are gaseous disks orbiting newly born stars in which planets form. Being weakly ionized, PPD gas dynamics is strongly governed by non-ideal magnetohydrodynamic (MHD) effects including resistivity, Hall effect, and ambipolar diffusion. I will discuss how these effects affect the gas dynamics in different ways, and show via detailed local and global MHD simulations that the magnetorotational instability (MRI) is largely suppressed or strongly damped in PPDs. Instead, accretion and disk evolution is primarily driven by a MHD disk wind with significant mass loss comparable to accretion rate. The overall gas dynamics strongly depends on the polarity of large-scale poloidal magnetic field threading the disk owing to the Hall effect, and the structure of the accretion flow is highly unconventional. Finally, I will discuss implications of these results upon various stages of planet formation.

List of related published papers
[1] Bai, X. N. & Stone, J. M. 2011, ApJ, 736, 144
[2] Bai, X. N. & Stone, J. M. 2013, ApJ, 767, 30
[3] Bai, X. N. & Stone, J. M. 2013, ApJ, 769, 76
[4] Bai, X. N. 2015, ApJ, 798, 84
[5] Bai, X. N. 2017, ApJ, 845, 75