MAS21-2021-000104

Abstract for an Invited Paper
for the MAS21 Meeting of
the American Physical Society

Numerical Modeling of Space and Laboratory Plasmas

CHUANFEI DONG, Princeton University

In the past decades, plasma physics has witnessed a tremendous surge. Research in this area now encompasses a wide spectrum of fields ranging from plasma astrophysics to heliophysics, and laboratory plasma physics. One of the primary objectives of plasma physics is to understand the behavior of diverse plasmas subjected to different external conditions, e.g., how planetary plasmas respond to magnetized stellar winds, and how laboratory plasmas respond to high-power, short-pulsed lasers. The former has a major societal impact in the context of space weather forecasts and human space exploration, while the latter can facilitate our understanding of extreme plasma astrophysics. In order to address these questions of different scales, a broad array of numerical models with different physics capabilities, such as magnetohydrodynamic (MHD), multi-moment, test particle, and particle-in-cell methods, will be necessary. In this presentation, I will first highlight several similarities and differences between space and laboratory plasma problems. I will subsequently cover research topics including, but not limited to, magnetized stellar wind interactions with planets in our solar system and beyond, laser-driven magnetic reconnection, and fundamental plasma physics problems such as the interplay between magnetohydrodynamic turbulence and magnetic reconnection.