JOHNS HOPKINS
Center for Environmental
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3:00 PM, 132 Gilman Hall

"Energy Transfer in Plasma turbulence: From Macro to Micro Scales"

Presented by Dr. Yan Yang
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Turbulence enters into space and astrophysical plasmas in many guises. Richness of scales, spanning from macroscopic fluid scales to sub-electron scales, makes the wealth of physical behaviors that take place in plasma turbulence. Based on what plasma properties we are interested in studying, be they dominant at small or large scales, a plasma can be treated as tractable models in various limits, such as the kinetic theory and magnetohydrodynamic theory. Whatever it is, an essential way that can tie them all together is the cross-scale energy transfer scenario. In this talk I will first briefly review some possibilities for turbulence applications in space and astrophysical plasmas, which motivate our study on the energy transfer process. Then I will give an overview of the reduced descriptions of plasmas and how they are related to each other, which serve as the theoretical foundation of our work. Magnetohydrodynamic (MHD) model remains a credible approximation for a kinetic plasma at scales large enough to be well separated from kinetic effects, while more refined kinetic description is required at kinetic scales. Therefore, in order to voyage from MHD scales to kinetic scales and in a hope to clarify the key steps of energy transfer, I will present some results based on both magnetohydrodynamic (MHD) and Vlasov models.