

Title: Numerical simulation of plasma sheath for near space hypersonic vehicles

Abstract: Near space is the region of Earth's atmosphere that lies between 20 to 100 km above sea level, encompassing the stratosphere, mesosphere, and the lower thermosphere. As one of the most important research fields in near space technology, several near space hypersonic vehicle projects have been carried out such as 'Falcon project', 'Hyper-X project', and 'Promethee project'. During hypersonic flight, a large amount of neutral particles, free electrons and ions produced by real gas effects form plasma sheath which will result in the reflection, refraction, and scattering of electromagnetic wave and then vastly disturbs the communication and navigation of vehicles. Nevertheless, we still don't comprehensively understand the characteristics of plasma sheath especially under the condition of complex near space environment. Here I will concentrate on the three key influencing factors on the formation and distribution of plasma sheath enveloping near space hypersonic vehicles including rarefied gas effect, dynamic effect and ablation effect to construct more complete physical models and numerical methods. Some eventual or preliminary simulation results will be presented and discussed as well.