Speaker: Dr. Devanandhan S.
Title: Plasma wave observation in the Venusian atmosphere permeated by the solar wind

Abstract:

Venus has fascinated researchers for decades as it constitutes a perfect laboratory to study solar wind interaction with an unmagnetized body. Although a number of satellite missions have been launched to study different aspects of Venus, only a few cater to the investigation of its ionosphere (e. g. Venera, Mariner, Pioneer Venus Orbiter (PVO), Venus Express etc.). Early observations from Venera and Mariner provided insights into the basic structures of atmosphere and ionosphere and absence of a global magnetic field. Subsequently, observations from 14 years of PVO substantially advanced our knowledge of solar wind interaction with near-Venus plasma environment. Afterwards, Venus Express not only complemented the results from PVO by making measurements in the polar and terminator regions but also significantly enhanced our knowledge of atmospheric loss processes and ionospheric dynamics. Although these space missions have broadened our understanding of Venusian atmosphere, there are many scientific questions that still remain open. For example, "how the neutral-plasma interaction affects the ionospheric dynamics in Venus?" and/or "what is protecting the Venusian ionosphere from increased stripping at solar maximum?" Answering such questions would require simultaneous measurements of neutral, ion/electron, and field measurements (electric and magnetic).

In this presentation, we will discuss the current state of knowledge about Venusian atmosphere. Further, we will study the electrostatic solitary waves that are ubiquitous in the space plasmas which could possibly be observed at the Venus where the solar wind interacts with the bow shock, magnetosheath and magnetotail of its induced magnetosphere [1-3]. The plasma double layers with/without streaming instabilities are found at the boundary between Venus and the Solar wind co-located with observations of non-Maxwellian electrons [4]. A multi-component theoretical model consisting of Venusian H+ and O+ ions, Maxwellian electrons, streaming solar wind protons and superthermal electrons modeled by kappa distribution is studied. The theoretical model predicts the positive potential slow and fast ion-acoustic solitons. Detailed parametric investigations of soliton velocities, width and electric field amplitudes will be discussed and the results will be applied to the observations made by Venus Express, VEX [5].

References:

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