

# **Models for the Venus Upper Atmosphere and Plasma Environment**

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Venus lacks a global magnetic field, and the solar wind interacts directly with its upper atmosphere and ionosphere. Our understanding of the interacting ions and neutrals in the thermosphere-exosphere-ionosphere-plasmasphere system has come primarily from a combination of spacecraft observations and models. Relevant observations were obtained primarily by the long-lived Pioneer Venus mission, and the more recent Venus Express mission. Many of the supporting models developed to explain early observations were later adapted for study of other unmagnetized planets, such as Mars and Titan - and are only recently being reapplied to Venus in order to provide context for new measurements. In this presentation I will provide a brief history of modeling efforts for the Venus upper atmosphere and plasma environment, summarize the current state of models, and discuss outstanding questions and future needs for the models.