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Modelling meteor layers in the ionospheres of Mars and Venus

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Abstract

Direct rocket measurements in the Earth atmosphere revealed accumulations of metallic ions in the lower ionospheric region. A meteoroidic origin for this phenomenon is now generally accepted. The radio science experiments MaRS on board of the spacecraft Mars Express and VeRa on board of Venus Express detected in some of the observed ionospheric electron density profiles additional enhancements of electron density, accumulated below the M1-layer (< 100 km) and V1-layer (< 115 km). Sources may be meteoroids, which enter the atmosphere as part of the sporadic component or part of a meteor stream, ablate and deposit metallic atoms in the atmosphere.

Input parameters for a meteor layer model are the solar flux in the EUV and X-ray range (Solar2000), a model of the neutral atmosphere (Mars Climate Database, Venus-GRAM) and a photochemical model of the planetary ionosphere (MIA-Mars, MIA-Venus). This model database allows it to select adequate input parameters for the modeling of each meteor layer observation. The mechanisms within the atmosphere, ionosphere and solar activity which may contribute to the appearance of meteor layers can be isolated and modeled in detail. This presentation will compare MIA-Mars model outputs with observed MaRS electron density profiles. Meteor layer model results will be compared with MaRS meteor layer observations. Additionally MIA-Venus electron density profiles will be compared to VeRa observations as a first step to model meteor layers for the Venusian ionosphere.

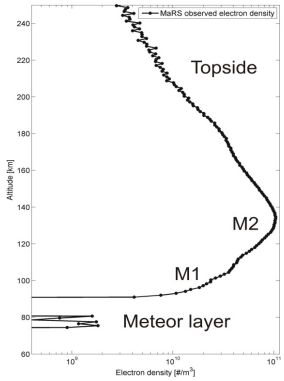

Fig. 1: Meteor layer in the Martian ionosphere
Day of year: 034, 2006

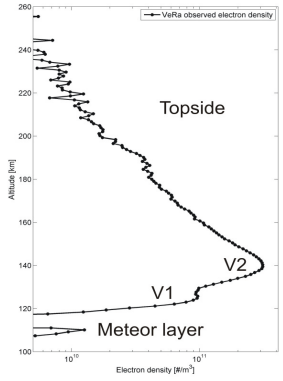

Fig. 2: Meteor layer in the Venusian ionosphere
Day of year: 344, 2008