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Response of Saturn's ionosphere to auroral electron precipitation

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Abstract

In the high latitude regions of Saturn, the ionosphere is strongly coupled to the magnetosphere though the exchange of particles and energy. Beside the generation of the well-known atmospheric auroral emissions, the influx of energetic particles from Saturns magnetosphere upon the high latitude upper atmosphere enhances the ionospheric densities and temperatures, affects the electrodynamical properties of the ionosphere, and contributes to the heating of the thermosphere. It is therefore critical to accurately model the transport and energy degradation of these magnetospheric particles in the upper atmosphere in order to evaluate key quantities of the coupled magnetosphere-ionosphere system. We will present results of our Saturn Thermosphere-Ionosphere Model (STIM) focusing on the auroral oval. The electron and ion production rates induced by electron precipitation are derived from the kinetic component of STIM solving the Boltzmanns equation applied to suprathermal electrons. The atmospheric conditions are self-consistently derived from the STIM 3D General Circulation Model which includes contribution by electron precipitation. We will present an estimate of the electron and ion temperatures and compare the latter with infrared H_3^+ observations. We will also provide an assessment of the ionospheres electrical conductances in the auroral main oval and compare them with the current values used in the models of the magnetosphere-ionosphere coupling at Saturn, as well as with empirical values derived from Cassini RSS observations.