

## **PLASMASPHERE/IONOSPHERE DENSITY MODELS DERIVED FROM RADIO SOUNDING OBSERVATIONS**

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Space borne radio sounders have measured the electron density distribution in the plasmasphere and ionosphere with great accuracy. The radio plasma imager (RPI) onboard NASA's IMAGE satellite measured the electron density distribution in the inner magnetosphere, and topside sounders on satellites like ISIS-1 and -2 measured the topside electron density profiles. Radio sounders transmit RF pulses and measure the echo delay times of signals reflected at the respective plasma cutoff frequencies, stepping through a frequency range that is appropriate for the targeted plasma densities. The echo traces in the RPI plasmagrams are measured in less than a minute giving an instantaneous electron density profile in contrast to previous "in situ" measurements from which profiles had to be statistically composed by averaging data over many orbits. Several thousand RPI profiles were analyzed for the plasmasphere and polar cap, and empirical models of the electron density distribution in the plasmasphere and the polar cap region were developed from the ensemble of profiles.

ISIS topside sounder measurements have been analyzed to derive a new Vary-Chap model of the topside ionosphere representing the topside profile by a Chapman function with continuously varying scale height. This topside model is connected to the RPI plasmasphere model. The possibility of a fleet of modern topside ionospheric sounders is discussed which, in cooperation with the ground-based ionosonde network, would provide real time density measurements from the ionosphere to the plasmasphere.

Radio sounding; Plasmasphere-Ionosphere; Electron density profiles

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