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Abstract

Radio Sounding in the Polar Regions

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The four polar-orbiting Alouette and ISIS satellites had a combined 60 satellite-years of ionospheric topside sounding, which included the polar regions, from the launch of Alouette 1 in 1962 to the termination of the International Satellites for Ionospheric Studies (ISIS) program in 1990. In addition to supplementing ground based sounders, and providing a wealth of information concerning the polar ionosphere, these space-borne sounders provided key information concerning the generation mechanism of high-latitude emissions such as Auroral Kilometric Radiation (AKR). The two dual-payload auroral rocket-sounders OEDIPUS A & C (Observations of Electric-field Distributions in the Ionospheric Plasma – a Unique Strategy) provided unique information concerning the characteristics of magnetic-field-aligned electron-density (N_e) irregularities. The Radio Plasma Imager (RPI) on the IMAGE satellite determined the polar magnetospheric N_e response to a magnetic storm. After briefly reviewing these radio-sounder contributions to our polar plasma environment, we will present observations that illustrate the use of ionospheric sounders to obtain information concerning polar surface features from "ground" reflections. We will review earlier work in this area and present new observations, based on ISIS-2 digital ionograms that illustrate the decreasing intensity of these reflections with increasing ice thickness. Investigating such reflections over conditions with good ground-truth information, such as in Antarctica, provides valuable

calibration information for aiding the interpretation of surface reflections from sounders on planetary missions.