



## **A new topside profiler based on Alouette/ISIS topside sounding**

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A new empirical model of the topside ionospheric density was developed to describe the measured topside profile accurately. This profiler is a composite of two separate layers of different ion species in the topside ionosphere, the O<sup>+</sup> layer and the light-ions (H<sup>+</sup> and He<sup>+</sup>) layer. The light-ions layer is characterized by an a-Chapman function with a linearly increasing scale height with altitude. This new model appears to perform the best as compared to five other typical topside profilers in representing data from ISIS-1&2 and Alouette-1&2 observations. We also analyzed the magnetic latitude dependence, seasonal variation, and day–night difference of the characteristic parameters of the light-ions layer during the magnetic quiet ( $K_p < 4$ ) and low solar activity ( $f_{107} < 120$  solar flux unit, sfu) period within magnetic latitudes from 60 to 90 degree. The statistical results show the expected different behaviors of light-ions and O<sup>+</sup> parameters. In addition, the portion of the light-ion components contributing to the topside-ionospheric total electron content (TTEC) was studied also. The results suggest that the light ions make a great contribution to the TTEC, especially in magnetic low- and middle-latitudes at night.