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Properties of Saturn's ionosphere derived from radio wave measurements of atmospheric lightning

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In the frequency range from about 1 to 16 MHz the Cassini/RPWS (Radio and Plasma Wave Science) instrument has measured the so-called SEDs (Saturn Electrostatic Discharges) as the radio signatures of lightning from Saturn's atmosphere. In this paper we shall focus on what can be learned about Saturn's ionosphere from the SED measurements. It is important that we actually know the position of the SED source from Cassini images of prominent SED associated cloud features. Knowing the geometry and the low frequency cutoff of the SEDs makes it easy to determine the maximum electron plasma frequency at the position where the radio wave traverses the ionosphere. Furthermore, intensity measurements of SEDs can give us clues about the absorption of radio waves on the day and night side. Another interesting effect for discussion is the existence of "over horizon" SEDs. For a special geometry with the spacecraft located on the morning side of Saturn the SEDs actually start before the visible cloud system appears at the geometric horizon.