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Cassini's early approaches to Saturn's auroral regions: A hint of things to come

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During the fall of 2006 Cassini's orbit carried it to higher inclinations, allowing the spacecraft to cross L=15 field lines at radial distances between 5 and 6 R_S in Saturn's southern hemisphere. This brought the spacecraft tantalizingly close to Saturn on or close to auroral field lines. During some of these high latitude, low altitude passes, Saturn kilometric radiation (SKR) was observed within a few kHz of the electron cyclotron frequency, suggesting that the spacecraft was close to the high altitude end of the SKR source region. Further, electromagnetic noise at low frequencies resembling auroral hiss was commonly found in this geometry. The outbound leg of these same orbits took the spacecraft to high northern latitudes for long distances. Low-frequency emissions similar in many respects to the auroral hiss were observed over long time intervals, but modulated in intensity at a period close to the SKR diurnal period and also at periods near 1 hour. Simultaneous measurements of energetic particles by the MIMI instrument showed beams with similar periodicities of $\sim$1 hour. While orbits late in the prime mission will take Cassini even closer to Saturn's auroras, the late 2006 observations provide an early opportunity to consider similarities and differences with terrestrial auroral processes.