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Positive ion composition and electron density in a combined auroral and NLC event

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Abstract

The positive ion composition and electron density were measured in the lower ionosphere above Kiruna in salvo A of CAMP (Cold Arctic Mesopause Project). The CAMP/P (S37/P) payload carrying a magnetic ion spectrometer, positive ion and electron probes, and propagation experiments was launched on 3 August 1982 2332 UT during extended Noctilucent Clouds (NLC) and auroral activities over Kiruna. The measured electron density was $5\text{--}10^3\text{ cm}^{-3}$ at 80 km and $2.5\text{--}10^5\text{ cm}^{-3}$ at 90 km. The increase of ion and electron densities in the D- and E-region during twilight was caused by precipitating auroral particles. The height distribution of the positive ions measured by the mass spectrometer in the mass range 19–280 amu is different from a winter flight with similar auroral conditions. Below 85.5 km proton hydrates $\text{H}^+(\text{H}_2\text{O})_3$ and $\text{H}^+(\text{H}_2\text{O})_8$ were the dominant ions. The heaviest proton hydrates $\text{H}^+(\text{H}_2\text{O})_7$ and $\text{H}^+(\text{H}_2\text{O})_8$ were most abundant at 82–85.5 km, the altitude of visible NLC. Above 85.5 km O_2^+ and

NO^+ became dominant. A small metal ion layer was observed between 90.5–93 km with a maximum ion density of 10% of the total positive ion density at 91 km altitude. The metal ion density disappeared within about a km below 90.5 km.



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