

Morphology and dynamics of proton aurora observed at the South Pole Station

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The South Pole Station (90S, -74 CGLAT) is an exceptional platform for observing H Balmer lines (proton aurora) for 24 hours a day during the austral winter with less contamination from the solar radiance. The H Balmer lines are emitted by energetic hydrogen through charge exchange with incident protons. For the South Pole Station, the source region of the incident protons includes the cusp, LLBL, and the outer plasma sheet. Thus, their observations allow us to identify the associated magnetospheric processes in these regions. We have observed the proton aurora at 486 nm between 2003 and 2005 as well as atomic oxygen emissions at 558 nm and 630 nm. In this paper, we show morphology and dynamics of the high latitude proton aurora. On the morning side, a band-like structure of the proton aurora is typically observed, which is collocated with the poleward edge of the diffuse electron aurora that probably corresponds to the electron plasma sheet. On the dayside, a spot of the proton aurora with a characteristic scale of a few hundreds km at 150 km altitude suddenly appears and sometimes shows a bifurcation sequence. The spot seems to be independent of structure of the electron aurora. On the evening side, diffuse proton aurora is typically observed, which probably corresponds to the proton plasma sheet. All these morphology and dynamics are different from those of electron aurora, and should include vital information on the magnetospheric processes that have not been viewed by in-situ satellite and other ground-based observations.