Slow-moving faint aurora in the dayside polar cap for southward IMF

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Poleward motion of the auroral arc in the cusp is a common feature for southward IMF. There is a category of that moving auroral arc in which the arc appears with an initial brightening in a mesoscale region near the equatorward boundary of the cusp, and travels a long distance. This typical poleward moving auroral form is often identified as a detached arc immediately poleward of the main redline auroral band in the daytime sector. In this study, by using the 630-nm aurora image data obtained by an all-sky imager at Longyearbyen, Svalbard, and the particle data from DMSP spacecraft, we present features of the moving redline aurora that can fall in a category that is different from that of the typical poleward-moving auroral form. Those redline auroras are detached from the poleward boundary of the main auroral band, and seen deep in the dayside polar cap during southward IMF. The aurora is very faint; intensities are mostly less than 1 kR. Simultaneous observations from the all-sky imager and the DMSP spacecraft show that there exist multiple mesoscale regions of electron precipitation slightly enhanced from the background polar-rain type precipitation over the faint aurora in the dayside polar cap, demonstrating that the 630-nm emission is caused by electron impact, not recombination. The simultaneous observation also shows that there is no concurrent ion precipitation over the aurora, indicating that this type of auroral arc does not fall in the category of cusp aurora. The detailed analysis of the 630-nm image data shows that the typical longitudinal length of the aurora is 0.2 to 0.4 MLT. The aurora moves poleward at speeds of 100 - 300 m/s. Simultaneous observations with the SuperDARN radar at Hankasalmi shows that those speeds are much lower than the speed of the plasma convection in that region. The solar wind data and the SYM-H geomagnetic index indicate that any significant change in the solar wind dynamic pressure did not occur at the appearance of this type aurora. From these characteristics, we discuss the generation mechanism of the slow-moving redline faint aurora in the dayside polar cap.