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# Production of polar cap patches

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A highly sensitive all-sky EMCCD airglow imager has been operative in Longyearbyen, Norway (78.1N, 15.5E) since October 2011. One of the primary targets of this optical observation is a polar cap patch which is defined as an island of enhanced plasma density in the F region drifting anti-sunward across the central polar cap. Since the electron density within patches is often increased by a factor of 2?10 above that in the surrounding region, all-sky airglow measurements at 630.0 nm wavelength are capable of visualizing their spatial distribution in 2D fashion.

Although, in the last two decades, several efforts were made to capture the birth of patches in their generation region near the dayside cusp, it has been very difficult to directly image such an instant because the dayside part of the polar cap ionosphere is mostly illuminated by the Sun even in winter. In Longyearbyen, however, it is well-known that daytime aurorae can be observed using ground-based optical instruments in a limited period near the winter solstice. This enables us to directly image how polar cap patches are born near the dayside cusp region.

We present an event of polar cap patches on November 24, 2012, in which patches were generated within the field-of-view of the all-sky camera located on the dayside. During a 4-h interval from 0500 to 0900 UT on this day, we identified several signatures of poleward moving auroral forms (PMAF) in the equatorward half of the field-of-view, which are known as ionospheric manifestations of dayside reconnection. Interestingly, patches were directly produced from such poleward moving auroral signatures and propagated poleward along the anti-sunward convection near the cusp. From this observation, we strongly suggest that polar cap patches can be directly produced by poleward moving aurora forms, i.e., the periodic occurrence of dayside equatorial reconnection process.