

2つの全天イメージャによるポーラーパッチの広域イメージング観測

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Global imaging of polar cap patches with dual all-sky airglow imagers

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Polar cap patches are chunks of high density plasma in the polar cap F region ionosphere. It has been believed that patches are generated somewhere near the dayside cusp and transported towards the nightside along the anti-sunward convection in the central polar cap region. Since the electron density within patches is often enhanced by a factor of 2-10 above the background level, airglow measurements at 630.0 nm wavelength are capable of detecting patches. Especially, in recent years, highly-sensitive all-sky airglow imagers have been employed to visualize the spatial distribution of patches. However, all the studies using airglow imagers employed a single all-sky imager to observe patches; thus, it has been very difficult to clarify the distribution/shape/propagation of polar cap patches in a global context.

During a 2-h interval from 2240 to 2440 UT on November 12, 2012, a series of patches was detected by dual all-sky airglow imagers in the polar cap region, one at Longyearbyen, Norway (78.1N, 15.5E) and the other at Resolute Bay, Canada (74.7N, 265.1E), simultaneously. The dawnside (duskside) part of the patches was captured by the imager at Longyearbyen (Resolute Bay). We also employ the Resolute Bay Incoherent scatter radar (RISR-N) to observe the electron density enhancement associated with the patches. The electron density within the patches was as large as 10^{12} m^{-3} on the dayside soon after their initiation. This unique combination enabled us to image the entire patches as a snapshot and estimate their spatial extent. The derived dawn-dusk scale size was as large as 2000 km, while the thickness of patches in the day-night direction was less than 500 km. This suggests that the shape of polar cap patches shows strong anisotropy. This means any of the patch generation mechanisms have to explain such an anisotropic shape of patches.