Multi-instrument observations of periodic poleward moving polar cap arcs

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Polar cap arcs (PCAs) are one of the outstanding phenomena in the polar cap region. We examined a case of periodic poleward moving arcs observed on January 3, 2014 by dual all-sky imagers, one at the Chinese Yellow River Station (YRS) and the other at Resolute Bay (RSB), the spaced-based SSUSI imager onboard DMSP spacecraft and Resolute Bay Incoherent Scatter Radar (RISR) during quiet geomagnetic conditions. We found that some poleward moving arcs observed at RSB were repeatedly detached from the dawnside auroral oval, which is consistent with the IMF-By polarity, and some arcs observed at YRS were likely less poleward moving from the duskside auroral oval. We also observed some periodic spatial arcs by DMSP SSUSI imagers and strong plasma velocity shears around these arcs. At the same time, the precipitating particles observed in the ionosphere associated with these PCAs showed magnetospheath-like properties. Moreover, the RISR data show that the F-region plasmas above these arcs were structured, with significant E-region ionization above an intense arc. Based on these observational results, we suggest that these periodic poleward moving PCAs may be triggered by bursts of dayside magnetic reconnection.

Keywords: periodic poleward moving arcs, plasma velocity shears, magnetic reconnection

