Ground-space observations of Pc 5 poleward moving auroral arc (PMAA) pulsations and field-line resonance (FLR) oscillations in the post midnight sector

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Pc 5 poleward moving auroral arc (PMAA) pulsation appears as a series of east-west elongated arc and behaves poleward moving form with recurrence period of ~ 2-10 minutes (Pc 5 range). Previous study reported that this type of pulsation could be generated by the field-line resonances (FLRs) in the magnetosphere. In this study we examines the characteristics of Pc 5 PMAA pulsations observed in the post midnight sector using the data of all-sky imager and magnetometer network observed by THEMIS ground-based observations and the data of THEMIS spacecraft located near the geomagnetic equator. It is found from the ground-base observations that overall occurrence region of PMAA drifts equatorward in many cases, whose feature may be relating to the effect of IMF Bz negative, and the recurrence period becomes shorter when the occurrence region moves to lower latitude. Though PMAA pulsation appears in association with the activation of geomagnetic Pc 5 pulsation, it is difficult to find one to one correlation between the oscillations of both phenomena in a large number of cases. It is interesting feature that the onset time of Pc 5 geomagnetic pulsation is ahead of that of auroral pulsation. Spacecraft data demonstrate specific FLR oscillations and the electric field and velocity modulation signatures are clearer than magnetic field variations. Magnetic pulsation of FLR oscillation shows linear polarization in longitudinal direction. It is found from the coordinated space-ground observation that there is not one-to-one correlation between the auroral pulsations in the ionosphere and FLR oscillations in the magnetosphere though Pc 5 PMAA pulsation is enhanced in association with the activation of FLR oscillations. Enhancement of FLR oscillations in the magnetosphere is ahead of auroral pulsations in the ionosphere and the period of FLR oscillations is longer than that of auroral pulsations. We will discuss the reason why the period is different between FLR oscillations and auroral pulsations and the reason why the FLR oscillations and the geomagnetic pulsations are ahead of auroral pulsations. We will also discuss the mechanism how to produce field-aligned electric field that is directly relating to the generation of auroral pulsation.

Keywords: auroral arc, Pc 5 pulsation, field-line resonance, auroral pulsation, THEMIS spacecraft

