Detail evolution of nightside auroral and magnetospheric phenomena after SC observed by ground and MMS simultaneous observations

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Detail evolution of nightside auroral and magnetospheric phenomena after an SC were analyzed by using the ground-based data at Syowa Station, Antarctica and the data observed by the MMS satellites for the event on June 22, 2015.
SSC occurred at 18:33 UT due to the arrival of an interplanetary shockwave. At that time, the MMS satellites were located in a pre-midnight region around (X, Y, Z) = (-5.6, 7.5, 1.5) Re in GSM coordinate, and their footprints were located about 6 degree north and 19 degree east from Syowa Station (69.0S, 39.6E) in geographic coordinate.
During the magnetic PI (Preliminary Impulse) period after the SSC, a diffuse proton auroral appeared at lowest latitudes in the FOV at Syowa and started to expand poleward. At MMS, tailward and dawnward plasma motion was observed.
During the magnetic MI (Main Impulse) period, the lower latitude proton auroral was further enhanced, and diffuse electron auroral was bifurcated into two in the FOV. Around the peak of the MI variation, a discrete auroral arc appeared around the higher latitude edge of the electron diffuse auroral region. At MMS, plasma motion changed to duskward, and the tailward velocity started to decrease. Around the time of the MI peak, magnetic configuration at MMS showed an acceleration of the taillike change.
At 18:38 UT, the higher latitude discrete arc became multiple arcs, and a gap between the discrete auroras and the lower latitude diffuse aurora became clear. At MMS, earthward flow appeared at 18:38:30 UT.
At 18:39:05 UT, the earthward flow velocity increased, became maximum (400km/s) at 18:39:15 UT, and then decreased to zero at 18:40:15 UT. During that period, a clear dipolarization occurred. At ground, an intense discrete arc appeared in the gap region and moved poleward with an overall poleward expansion of the whole auroral activity.
At 18:40:45 - 41:00 UT, a clear spiral form, moving westward, appeared in the discrete aurora and its size became larger. At MMS, tailward flow started at 18:40:35 UT.
At 18:41:30 –42:40 UT, another larger spiral appeared from eastern side, extended to the lower latitudes. At MMS, tailward flow speed reached maximum (300km/s).
In our presentation, we will discuss about a possible scenario to understand those correspondence between the ground-based and magnetospheric phenomena.

Keywords: SC, shock aurora, magnetospheric compression

