

Simultaneous satellite-ground observations of shock triggered substorm expansion

*Jianjun Liu¹, Hongqiao Hu¹, Desheng Han¹

1. Polar Research Institute of China

Interplanetary (IP) shock encountering the terrestrial magnetosphere can greatly disturb the Earth's electromagnetic environment and hence intensify the global current system. Here, we examine a distinguishable compression associated auroral event caused by an IP shock sudden impingement to the magnetosphere. We utilize IMAGE satellite auroral imager to obtain the broad global-scale auroral oval over Southern Hemisphere. It is fortunate that part of the nightside poleward branch of the oval was monitored by simultaneous ground-based high temporal-spatial resolution all-sky camera at Antarctic Zhongshan Station (-74.5° magnetic latitude). Satellite imager recorded aurora sudden brightening in pre-midnight just after the IP shock arrival to the magnetosphere. Intensified large-scale aurora experienced interesting azimuthal movement. The poleward and equatorward boundary of the nightside aurora oval featured dramatically enhanced auroral emission with broaden oval width, which presented obvious so-called double auroral oval structure. It is shown that ground-based optical auroral sequential images present prominent westward surge in the poleward branch of the nightside auroral oval, and the westward surge structure shows typical poleward boundary intensifications with periodical signature. This auroral periodical enhancement corresponds well to the geomagnetic variation recorded by the fluxgate magnetometer at Zhongshan station. It is suggested that for substorm triggered by sudden enhanced solar wind dynamic pressure in the precondition of southward IMF, the triggering could occur quite instant after increased dynamic pressure hits on the magnetopause.

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