Global auroral response to negative pressure impulses

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Abstract: It is well known that sharp increases/decreases in the solar wind dynamic pressure can result in sudden compression/decompression of the magnetosphere and subsequent magnetic positive/negative impulses (SI+/SI-) detected on the ground magnetometers. While the large-scale enhancement of aurora during an SI+ has been well established, the response of aurora to an SI- is still little known. This prompts an interesting question whether the response of the global aurora to an SI- mirrors the response to an SI+. This letter reports results from a study of auroral images, acquired from the ultraviolet imager (UVI) on board the Polar satellite, during 13 SI- events. It is found that, in most cases, the luminosity of the aurora indeed showed a clear decrease almost immediately after the decompression. In some cases, the luminosity decrease exhibits a day-to-night fading effect and is consistent with the tailward propagation of the magnetosphere decompression front. Auroral particle observations from DMSP indicate that reduction of CPS electron precipitation is the major cause of the large-scale auroral dimming. We propose that an induction electric field triggered by the sudden expansion of the magnetosphere at the expansion front along with adiabatic decompression and magnetic reconfiguration are responsible for the observed effect.

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