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Transient brightening of Jupiter's aurora observed by the Hisaki satellite and Hubble Space Telescope during approach phase of the Juno spacecraft

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Abstract

[1] In early 2014, continuous monitoring with the Hisaki satellite discovered transient auroral emission at Jupiter during a period when the solar wind was relatively quiet for a few days. Simultaneous imaging made by the Hubble Space Telescope (HST) suggested that the transient aurora is associated with a global magnetospheric disturbance that spans from the inner to outer magnetosphere. However, the temporal and spatial evolutions of the magnetospheric disturbance were not resolved because of the lack of continuous monitoring of the transient aurora simultaneously with the imaging. Here we report the coordinated observation of the aurora and plasma torus made by Hisaki and HST during the approach phase of the Juno spacecraft in mid-2016. On day 142, Hisaki detected a transient aurora with a maximum total H2 emission power of ~8.5 TW. The simultaneous HST imaging was indicative of a large 'dawn storm', which is associated with tail reconnection, at the onset of the transient aurora. The outer emission, which is associated with hot plasma injection in the inner magnetosphere, followed the dawn storm within less than two Jupiter rotations. The monitoring of the torus with Hisaki indicated that the hot plasma population increased in the torus during the transient aurora. These results imply that the magnetospheric disturbance is initiated via the tail reconnection and rapidly expands toward the inner magnetosphere, followed by the hot plasma injection reaching the plasma torus. This corresponds to the radially inward transport of the plasma and/or energy from the outer to the inner magnetosphere.

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