Auroral explosion at Jupiter observed by the Hisaki satellite and Hubble Space Telescope during approaching phase of the Juno spacecraft

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In early 2014, the continuous monitoring with the Hisaki satellite discovered the transient auroral emission at Jupiter during the period when the solar wind was relatively quiet. The simultaneous imaging made by the Hubble Space Telescope (HST) suggested that the transient aurora is associated with the global magnetospheric disturbance that spans from the inner to outer magnetosphere. However, the temporal sequence of the magnetospheric disturbance is not resolved yet because we still lack the sufficient 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 approaching phase of the Juno spacecraft in mid-2016. On day of year 142, Hisaki detected the transient aurora with a peak of the total emission power of ~6 TW at the entire ultraviolet wavelengths. This emission power is one of the largest values that have been measured by Hisaki. The simultaneous HST imaging was indicative of the large “dawn storm”, which is associated with the tail reconnection, in the main oval at the onset of the transient aurora. The outer emission, which is associated with the hot plasma injection in the inner magnetosphere, followed the dawn storm. The monitoring of the dawn and dusk side torus with Hisaki indicated that the hot plasma population corotating with Jupiter appeared in the torus during the transient aurora. These results imply that the magnetospheric disturbance associated with the transient aurora is initiated via the tail reconnection, and expands toward the inner magnetosphere, and followed by the hot plasma injection reaching to 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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