Io's volcanic influence on the Jovian magnetosphere: HISAKI observation

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The satellite Io which has many active volcanos supplies volcanic gases to the Jovian magnetosphere with a typical rate of 1 ton/sec and has is a primary source of plasmas in the magnetosphere. Change in the volcanic activity would cause change in plasma supply rate to the magnetosphere and could affect structure of the magnetosphere and dynamics occurring in it. However, responses of the magnetosphere to the plasma supply rate change is still not fully understood. The extreme ultraviolet (EUV) spectroscope, EXCEED, onboard the HISAKI satellite made observations of Io plasma torus and Jovian northern aurora from the end of Nov. 2014 to middle of May 2015 continuously. On middle of Jan. 2015, HISAKI detected gradual increase in intensity of S^{+} emission lines and decrease of S^{3+} ones in the plasma torus. The S+ intensity showed a maximum around the end of Feb. and S^{2+} and S^{3+} intensities also showed maxima subsequently. Simultaneous ground based observation of the sodium nebula showed increase of the emission intensity from the middle of Jan. to Feb. These observations suggest that the volcanic activity enhancement started at the middle of Jan. and increase neutral atom and ion densities in the Io torus. Change in radial structure of the plasma torus was also detected. The intensity of S^{+} ion began to increase around the orbit of Io (6 Jovian radii). The brightened region propagated outward and reached at 8.5 Jovian radii from Jupiter at the beginning of Feb. Further one month later, HISAKI found unusual activity of Jovian EUV aurora intensity. It began at the beginning of Mar. and continued for 1 month. The enhancement of the aurora activity may be caused by the enhanced loading of heavy ion plasma into the middle magnetosphere.

