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Changes in the Jupiter's inner magnetosphere caused by Io's volcanic activity

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Ground-based monitoring observations of Jupiter's sodium nebula and [SII] 673.1 nm emission on Io plasma torus were made for 20 days in 2003. Both the sodium nebula and Sulfur ion in the Io plasma torus have their origin in Io's volcanic atmosphere. Because the sodium nebula consists of neutral particles which are not under control of any electromagnetic force, its brightness should faithfully reflect Io's volcanic supply. On the other hand, sulfurs ion in the Io plasma torus are expected not to show distinct enhancements like the sodium nebula because plasma is trapped by Jupiter's magnetic field, and it cannot move radially. During these observations, brightness of the sodium nebula showed a small enhancement probably caused by a volcanic out-burst. This means that the sodium nebula can react to Io's small volcanic out-burst of which duration time is only a few days. During this enhancement of the sodium nebula, [SII] 673.1 nm brightness increased gradually, and the ion temperature (scale height) along Jupiter's magnetic fields had been disturbed. Magnetic flux tube content of S+ ion was calculated from the [SII] 673.1 nm brightness and the scale height, and increase of the ion flux tube content was clearly identified. Thus, increase of supplied plasma from Io seems to be reflected in both plasma density and ion temperature. We conclude that even a small enhancement of Io's volcanic activity can change the Jupiter's inner magnetospheric environment.