イオ火山活動による木星磁気圏現象の変化

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Jupiter’s magnetosphric change caused by Io’s volcamism

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Io is the most volcanically active body in the solar system. Io’s atmosphere consists of volcanic gas, and this volcanic gas continuously escapes from Io into Jupiter’s inner magnetosphere. Jupiter’s inner magnetosphere is therefore occupied by plasma which consists of heavy ions (e.g., S+, S++, S+++, O+, O++ and O+++). This magnetospheric environment is very different from that of the earth because its magnetospheric plasma has its origin almost only in solar wind. It is well-known that magnetospheric phenomena of the earth like magnetic storms are actually triggered or controlled by the solar wind or solar activity. Influence of the solar wind on Jupiter’s magnetosphere is also known. However, Io’s contribution on Jupiter’s magnetospheric changes has not been investigated well while we know Jupiter’s inner magnetosphere is filled with Iogenic plasma. In this study, we tried to reveal this outstanding issue. Jupiter’s sodium nebula, extending beyond Jupiter’s gravitational-sphere and even magnetosphere, is a result of atmospheric escape of sodium atoms originated from Io through Jupiter’s inner magnetospheric structure called Io plasma torus. A distinct enhancement in the sodium nebula brightness was seen in 2007. In addition, we found that activity of Jupiter’s radio emissions called HOM had decreased with respect to the sodium nebula enhancement. The HOM is believed to a radio emission due to aurora activity. Actually, certain changes in Jupiter’s aurora were seen with respect to brightness and morphology from the HST data (courtesy of Bertrand Bonfond, University of Luick, Belgium). These finding may be indicative of Io’s volcanic effect on Jupiter’s magnetosphere.