

Variations of Io's volcanism seen in Jupiter's sodium nebula

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Io, which is one of Jupiter's remarkable moons, is the most volcanically active body in the solar system. Io's volcanic gas forms its atmosphere, but it cannot stay on Io stable. It is ionized due to the solar radiation or impacts by Jupiter's magnetospheric energetic particles, then escapes and forms the Io plasma torus. Sodium chloride molecules included in Io's volcanic gas are also ionized, then picked up by Jupiter's co-rotating magnetic fields and going to the Io plasma torus. In the torus, these molecular ions collide with the torus electron, then they distract and neutral fast sodium atoms are produced. These sodium atoms have velocity of Jupiter's co-rotation at an orbit of Io that corresponds to 74 km/s. This is enough to escape from Jupiter's gravitational-sphere. The sodium atoms whose origin is Io's volcano form a extend cloud around Jupiter, and this is called Jupiter's sodium nebula. This nebula can be seen at sodium D-line wavelengths from the ground. The brightness in the sodium nebula is changing with respect to volcanic activity on Io. We have been making the observations of this sodium nebula from an observatory on Mt. Haleakala in a conjunction with the HISAKI spacecraft whose one of main targets is Jupiter's magnetosphere. The sodium nebula shows a distinct enhancement in its brightness in January-April 2015. In this presentation, volcanic activity on Io in a period of the HISAKI observations will be shown.

Keywords: Io, Jupiter, Volcanism, magnetosphere