ひさき衛星が捉えた火山活動中におけるイオ起源の酸素原子発光の時空間変動

Time and spatial variations in atomic oxygen emission around Io during the volcanic active event observed with Hisaki/EXCEED

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We report time and spatial variations of atomic oxygen supplied from Io during the volcanic active event. The atmosphere of a Jovian satellite Io has been thought to be mainly supplied by volcanism and sublimation of surface frost. Dominant atmospheric gases are sulfur dioxide, and dissociative product such as atomic oxygen and sulfur, which are produced mainly by electron impact dissociation and photolysis. Neutral oxygen and sulfur escape from exobase to neutral cloud (> 5.8 Io radius) mainly by atmospheric sputtering (torus ions collide with several neutrals). However, the characteristics of spatial and time variations of atomic oxygen and sulfur escaping from Io are not well understood.
The brightening event of the Io's extended sodium nebula was reported by the ground imaging observation in the spring of 2015 [*Yoneda et al.,* 2015]. We therefore examined the time variation of atomic oxygen emission at 130.4 nm around Io obtained with Hisaki/EXCEED from 27 November 2014 to 14 May 2015 (from day of year (DOY) -35 to 134) and compare the result with the brightening event of the Io's extended sodium nebula. We accumulated observed counts within 46" centering at Io for one day to obtain enough signal to noise ratio. We found the atomic oxygen emission increased by 2.5 during the volcanically active period of DOY 20-110 of 2015. The time variation of atomic oxygen emission was well correlated with that of sodium emission until the brightness maximum on DOY 50 of 2015. In the meanwhile, the duration of atomic oxygen brightness declining from the maximum to the quiet level (60 days) was longer than that of sodium nebula (40 days).
In addition, we investigated Io phase angle (IPA) dependence of atomic oxygen emission at 130.4 nm averaged for the distance range of 4.5-6.5 Jupiter radius from Jupiter in the dawn and dusk sides, respectively during volcanically quiet period (DOY -35 and -1). Then, we found following two important observation fact. First, weak atomic oxygen emission (4-6 Rayleighs (R)) continuously existed on both dawn and dusk sides not depending on the phase angle. This suggests that small amount of atomic oxygen distributes uniformly along the Io's orbit. Second, the emission averaged between IPA 60-90 degrees (14.0 R) was larger than that between IPA 90-120 degrees (10.5 R) for the dawn side, and the emission between IPA 240-270 degrees (15.8 R) was larger than that between IPA 270-300 degrees (12.3 R) for the dusk side. We can explain this difference if the large amount of atomic oxygen spread inward and ahead of Io's orbit and shape like banana expected by the model of atomic oxygen neutral clouds such as *Smyth and Marconi* [2003]. The emission of this banana-shape neutral oxygen cloud was almost included in the region between the distance of 4.5-6.5 Jupiter radius from Jupiter when IPA 60-90 degrees, but that was partly excluded in the same region when IPA 90-120 degrees. The similar tendency was also seen in the dusk side. In this poster, we also present the IPA dependence of atomic oxygen

emission during volcanically active period (DOY 20-110), and show different and common points between atomic oxygen distribution around the Io's orbit during volcanically quiet period and that during volcanically active period.

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