R009-16
Zoom meeting D ：11/1 PM1 (13:45-15:30)
14:45〜15:00

次世代紫外線宇宙望遠鏡によるエウロパプルーム検出可能性の検討

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Feasibility study of Earth-orbiting UV telescope required to detect the Europa plume signatures

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Inside Jupiter's moon Europa, Ganymede, and Saturn's moon Enceladus, the global putative oceans under the ice shells could be sustained. In the previous study of Roth et al (2014), Hubble Space Telescope (HST) observed the enhancement of HI 121.6 nm and OI 130.4 nm emissions near the Europa south pole. They considered the electron impact of H_2O in the plume yields HI and OI emissions. Geological conditions of ejecting gas and dust form Europa plumes are not understood because the number of observations which succeed to detect Europa plume signatures is very small. Although the water vapor in the plumes do not necessarily pass through the underground ocean, it may include important information to consider the habitable environment of the icy moons.

LAPYUTA (Life-environmentology, Astronomy, and PlanetarY Ultraviolet Telescope Assembly) is the future Earth-orbiting UV telescope project. One of the main goals of LAPYUTA is to observe icy moon's atmosphere continuously, and confine the occurrence conditions such as locations and frequencies of the plume events. In case of spatial resolution of 0.1, 0.2, 0.4 and 0.8 arcsec, we considered the detectability of the Europa plume by UV space telescope with integration time of 10 hours and apparent area of ˜350 cm^2. We calculated the signal of OI 130.4 nm and HI 121.6 nm counts from the plume, and the noise from Europa atmosphere (OI only), solar reflection, Earth geocorona and interplanetary medium. Two-dimensional symmetric Lorentzian function is applied as the point spread function whose FWHM corresponds to the spatial resolution. The emission due to solar reflection at the limb is estimated to be a few percentages of that at the center of the disk when the subsolar point is at the disk center. Therefore, the plume position and region of interest in this study are assumed to be near the south pole in the limb. The space telescope is assumed to orbit at 1000 km from the Earth ground. The calculation shows that a spatial resolution of 0.1 arcsec should be needed to detect both OI 130.4 nm and HI 121.6 nm emission originated from the Europa plume under the conditions of an apparent area of about 350 cm^2 and an integration time of 10 hours.