RESONANCE EMISSION OF OXYGEN IONS IN THE TERRESTRIAL POLAR WIND (2)

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Classical theories on the mechanisms of the outflow from the polar ionosphere, known as polar wind, indicated that only ions with a light mass such as H^+ and He+ could overcome the terrestrial gravitational potential to escape to the magnetosphere, and that the amount of the O^+ outflow was limited due to its large mass and loss processes. Observations by polar orbiting satellites such as Dynamic Explorer 1 (DE-1) and Akebono (EXOS-D), however, found that the upward flux of O^+ approached that of H^+, especially under an active geomagnetic condition [e.g., Chandler et al., 1991; Abe et al., 1993]. Furthermore, the in-situ plasma measurements in the magnetosphere have shown the cold dense O^+ flow of the ionospheric origin in the distant tail lobe. The results indicate that there should be unknown O^+ transport in the magnetosphere [Seki et al., 1996, 2001].

The remote-sensing methods using the extreme ultraviolet resonance (EUV) emission of O^+ (O II 83.4 nm) have been expected to be powerful tools to provide global perspectives on the escape processes. The optical observations of O^+ in the terrestrial polar wind were not performed so far, because of difficulty to reject the bright H Ly-a line of the geocorona. We had developed a primitive equipment, which had enough high efficiency ratio of the O II emission to the H Ly-a line, for a sounding rocket experiment. The observations indicated the existence of O^+ beyond the polar ionosphere and suggested that O^+ energized in the cusp/cleft region may drift to the uppermost part of the polar ionosphere [Yamazaki et al., 2002]. We have optimized the euipment to develop the Upper atmosphere and Plasma Imager (UPI) to take an imagery of the terrestrial upper atmosphere, ionosphere and plasmasphere from the lunar orbiter, SELENE (Kaguya) [Yamazaki et al., 2003; Yoshikawa et al., 2008].

The UPI-TEX imager is sensitive to resonantly scattering emissions such as He II and O II emissions in the EUV region. Especially the O II imagery is expected to identify unknown transport routes and escape mechanisms of the cold O^+ ions, to reveal a quantitative balance between the supply and loss, and to make clear when, where, and how O^+ outflow from the ionosphere.

In this study, we make the differential image between the two consecutive images for noize reduction to visualize a travelling route of the O^+ outflow. As a result the amount of the O^+ outlow enhances at the time of the solar wind pressure pulse.