

## The relationship between the amount of the outflow oxygen ions and the solar wind condition and geomagnetic activity

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In 1960s, hydrogen ions, helium ions, and electrons generated in the ionosphere are theoretically thought to outflow into magnetosphere due to the pressure gradient in the polar cap region where the magnetic field is open. In 1980s and 1990s, the existence of these plasma outflows was verified due to the in-situ observation operated by polar orbit satellites such as Dynamic Explorers and Akebono. On the other hand, oxygen ions outflow was observed much more than expected amount even though it was thought few oxygen ions would outflow because of its heavy mass. In previous studies, oxygen ions outflow was discovered at the cleft region and the auroral region or in the polar wind at the polar cap and energization mechanism caused by polarization electric field and wave are introduced. However, it is not obvious when and how much outflow ions are produced and it is difficult to solve this problem by the in-situ observation.

To solve this problem, it is important to conduct in-situ observations and imaging observations at the same time so as to observe ions comprehensively. In order to observe circum-terrestrial plasma from moon orbit, Upper Atmosphere and Plasma Imager - Telescope of Extreme ultraviolet (UPI-TEX) on board the lunar orbiter, SELENE (KAGUYA) operates imaging observations of the resonance scattering emission from oxygen ions and helium ions. Since it can observe both temporal and spatial variations of circum-terrestrial plasma comprehensively, it can be a significant measurement to understand the mechanism of the outflow. Given sufficient signal-noise ratio, the time resolution of oxygen ion imaging is 2 hours and it is possible to understand the temporal variation of outflow ions amount result from the magnetospheric variation of a few hours scale.

The purpose of this research is to evaluate the temporal variation of the outflow ions amount depending on the solar wind condition and understand what produce the outflow ions and when the outflow ions are produced. In this research, we focused on the relationship between solar wind condition and geomagnetic activity and the amount of outflow oxygen ions. Since the UPI-TEX instrument observes the resonance scattering emission from oxygen ions in 2 dimensional images, we can see comprehensive variation of the circum-terrestrial outflow oxygen ions. In the obtained image, we calculated the intensity of the outflow oxygen ions along the open magnetic field given by Tsyganenko 96 magnetic field model, compared its temporal variation with the temporal variation of the solar wind parameters and geomagnetic activity and discussed their relationship.