Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

PCG040-06 Room: 301A Time: May 28 12:00-12:15

Long term variability of sodium density in Mercury's exosphere

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Mercury has a thin and unstable atmosphere, and the source processes of Na in its atmosphere are unclear. Using the data obtained from 1998 to 2007, we compared Na density with various parameters which are possibly related to release process of Mercury's atmosphere from the surface. The results have revealed that the atmospheric Na density has no or low correlation with the solar flux measured by ACE spacecraft, sunspot number, F10.7 solar flux, EUV flux measured by TIMED spacecraft, heliocentric distance, or solar radiation pressure. We show that the variability of Mercury's atmospheric Na density depends strongly on the interplanetary dust (IPD) distribution. The IPD distribution in the inner solar system is not yet well understood because of lack of direct dust measurements in the inner solar system and so one needs to rely on zodiacal light observations that are difficult to interpret. That is, Na density is low (high) when Mercury is far away from (close to) the symmetry plane of IPD, and so one can infer the IPD distribution near Mercury orbit from the temporal variability of Na density in Mercury's atmosphere. In this presentation, we report the new result of observation performed from 2008 to 2009, and the correlation between sodium density in Mercury's exosphere and interplanetary dust distribution near Mercury. Additionally, we report the current progress in the development of Mercury Sodium Atmosphere Spectral Imager (MSASI) onboard the BepiColombo/MMO spacecraft. We completed to manufacture the Laboratory Test Model in 2009. The result of performance test by observing the Moon will be presented.

Keywords: Mercury, Planetary atmosphere, Ground-based Observation, airglow, sodium