Observation of sodium exosphere during the transit of Mercury on Nov 9, 2006

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The existence of sodium atoms in Mercury's exosphere was identified by the ground-based observations. It arises that the regolith of Mercury releases a fraction of its content to the exosphere. Some responsible processes are suggested as release mechanisms, e.g. (1)Photon-stimulated desorption, (2)Solar wind ion sputtering, (3)Thermal desorption, and (4)Micro-meteoroid vaporization etc, but each of them cannot completely explain phenomena. The morning-evening asymmetry was reported by the statistics of past observations (Sprague et al., 1997). According to the model calculation (Leblanc and Johnson., 2003) and the results of the laboratory experiments (Yakshinskiy et al., 2000), it is thought that thermal desorption is the dominant release mechanism. To examine this asymmetry, the simultaneous observation in the morning and evening is highly significant. In the ground-based observation, it is only necessary to use the transit of Mercury across the solar disk.

We succeeded in observing sodium's absorption lines during the transit of Mercury on November 9, 2006 with Domeless Solar Telescope (DST) at Hida Observatory. We derive 6-7 x 10^{10} [atoms/cm^2] for the average column densities in the morning and 3-4 x 10^{10} [atoms/cm^2] in the evening and then present the morning-evening asymmetry. We also compare the column densities at low latitude to high latitude and discuss dominant release mechanisms.