

Investigations of the dawn-dusk asymmetry of Mercury's sodium exosphere based on a numerical simulation

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Mercury has the surface bounded exosphere similar to that of the moon and one of the exosphere's components, sodium, was discovered by the ground-based observation [Potter and Morgan, 1985]. According to several optical observations, significant differences of sodium emission distribution between morning and afternoon sides have been discovered [Sprague et al., 1997; Barbieri et al., 2004; Schleicher et al., 2004]. This characteristic distribution has been called as dawn-dusk asymmetry (local time dependence or diurnal variation, etc.). One explanation for this asymmetry is that the distribution results from the thermal desorption followed by depletion of sodium atoms exist on Mercury's surface. Concerning the depletion, Leblanc and Johnson (2003) suggested that the amount changes depending on the true anomaly angle of Mercury (TAA).

We have investigated origin of the dawn-dusk asymmetry of Mercury's sodium exosphere by a numerical simulation with the Monte Carlo method. In this simulation study, we examined effects of thermal desorption and depletion processes on the surface of Mercury.