ひのでSOTによる昼面水星大気分布観測

亀田 真吾 [1]; 布施川 綾花 [2]
[1] 立教大; [2] 立教大・理

Observation of dayside exospheric sodium distribution on Mercury by Hinode SOT

Shingo Kameda[1]; Ayaka Fusegawa[2]
[1] Rikkyo Univ.; [2] Science, Rikkyo Univ.

The Mariner 10 UVS (ultraviolet spectrometer) detected H, He and O in Mercury's atmosphere [Broadfoot et al., 1974, 1976]. The presence of Na, K and Ca was subsequently detected in ground-based observations [Potter and Morgan, 1985, 1986; Bida et al., 2000]. Because Mercury's atmosphere is extremely thin (n ˜10^5 atoms/cm^3, P < 10^{12} bar), even near the surface the mean free path is greater than the scale height. Because of this thinness,

Mercury's atmosphere is often called a surface-bounded exosphere. Although the observed density of sodium is low, it is visible in Mercury's exosphere because of its bright emission lines, the sodium D lines (589 nm). The observations of Potter and Morgan (1985) were the first observations of Mercury's sodium emission. Two emission lines can be clearly seen in the spectrum. From the observations the column density of sodium atoms was estimated to be ˜10^{11} atoms/cm^2.Sprague et al. (1997) reported from their 4 years of observations that average column density of Na atoms in the dawn side is larger than that in the dusk side by a factor of 3 [Hunten and Sparague, 1997]. Based on their observations, Sprague et al. (1998) proposed that ejection of Na atoms from the surface by the sun light (photon-stimulated and thermal desorptions) is the cause of the asymmetry. In the dawn side, there are larger amount of Na atoms, which wereimplanted on cold surface during the night. Most of Na atoms start to eject from the surface at the terminator of the morning. On the contrary in the dusk side, most of Na atoms on the surface have already been exhausted. This is a scenario we have derived from ground-based observations.

Schleicher et al. (2004) observed an excess absorption in the solar sodium D_2 line during the transit of Mercury across the solar disk. Along the western planetary limb (the sun rising terminator), we find a sodium density ˜40% of that above the poles, but no significant absorption could be detected along the eastern planetary limb (the sun setting terminator). Differences between morning and evening terminator of the same sense were also found by Sprague et al. (1997) from observations of line emission between 1985-1988. Several theoretical investigations on transportmechanisms (Ip 1990, 1993; Sprague 1992) predict enhancement of re-impacting sodium at the night-side surface of Mercury, with subsequent evaporation at sun rise.

In this presentation, we will report the result of the observation of full-dayside exospheric sodium on Mercury at its superior conjunction by Hinode SOT.