Interplanetary dust distribution near Mercury's orbit inferred from the long-term variability of Mercury's exospheric sodium density.

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Mercury's atmosphere is very thin. Its exobase is on the planetary surface and it is often called "surface-bounded exosphere". Sodium is the most abundant in the species detected in Mercury's exosphere and has been observed for a long time. The results clearly show that neutral sodium density changes diurnally by a factor of ~4 in a Mercury year (88 days). The ionization lifetime of neutral sodium is 1–3 hours. This suggests that neutral sodium atoms are continuously supplied to exosphere and its source rate is not constant. In this study, we discuss the possible source processes using the data obtained from 1998 to 2003 by Potter et al. (2007) and from 2005 to 2009 by Kameda et al. We compare the sodium density with the solar EUV flux, the solar wind proton flux, the distance between Mercury and the ecliptic plane, and solar tides. The experimental results shows that the source rate of UV/EUV photon-stimulated desorption should be highest and stable. However, the sodium density changes diurnally from the observational results. In this presentation, we discuss the effect of micrometeoroid and interplanetary dust impact vaporization. The dust flux changes seasonally in one Mercury year because the orbit plane is tilted against the ecliptic plane and interplanetary dust symmetry plane. Since it is difficult to observe the zodiacal light from near Mercury orbit, the interplanetary dust distribution at the heliocentric distance of 0.3-0.47 AU is still unclear. If we assume that the impact vaporization is the dominant source of sodium exosphere, the interplanetary dust distribution can be inferred.