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Ground-based observation of sodium in Mercury's exosphere

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Since the first detection of sodium in Mercury's exosphere[1], many spectroscopic observations have been performed. Potter et al. (1999) imaged Mercury in sodium D_1 and D_2 emissions using an image slicer coupled to a high-resolution spectrograph, and found enhancements at high latitudes and significant diurnal changes[2]. On the other hand, Sprague et al. (1997) reported a significant difference in brightness between dawn-side and dusk-side. The suggested release mechanisms are chemical sputtering, thermal desorption, photon-stimulated desorption, ion sputtering, and micro-meteoroid impact/vaporization. However, a comprehensive description of Mercury's sodium exosphere is not available.

We observed Mercury's sodium D_1 and D_2 emissions at Iitate Observatory of Tohoku University in Japan. The averaged column density of sodium atoms was 3×10^{11} atoms/cm^2 and did not change during from April 9 to 22, 2003. However, the results do not bring complete understanding of the release mechanism mainly due to the seeing effect. During our observation period, images of Mercury were much smeared by the Earth's atmosphere and expanded twice as large as it was. The spatial distribution of sodium cannot be imaged properly in such an atmospheric condition.

We are planning the observations of sodium in Mercury's exosphere with Fabry-Perot interferometer at Haleakala High Altitude Observatory in Hawaii in March, 2005, where the seeing condition is much better than in Japan. Additionally, we are preparing the spectroscopic observations at Iitate Observatory in March, 2005. In this presentation, we report the results of the observations, and discuss the release mechanism considering the solar EUV flux and solar wind conditions.

Keywords: exosphere; sodium; ground-based observation; Fabry-Perot

References

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