

## Seasonal variation of Mercury's exosphere deduced from the analysis MESSENGER data

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Celestial bodies with surface-bound exosphere are valuable because we can directly see the interaction between the bodies and space environment to which they are exposed. This interaction is especially expected to be clearly observed around Mercury. This research aims to clarify the generation process of neutral sodium exosphere, through the comparison between the data from MASCS onboard MESSENGER spacecraft and 3-D model calculation considering generation, transportation and dissipation processes.

First, seasonal variability of the amount of sodium exosphere is analyzed for each local time (LT) using MASCS data. Previous research has shown that the amount of sodium above LT12 reaches a maximum at aphelion, and it is found that this maximum is seen only above LT12. In addition, two hypotheses proposed by the research: the increase in the surface sodium density of the dayside due to fast rotation of terminator, and the expansion of exosphere owing to weaker radiation pressure, were turned out to be inconsistent with seasonal variability above LT06 and the results of test particle calculations.

Following these results, in order to understand the key process of the seasonal variation of the amount of sodium especially around LT12, 3-D sodium exosphere model including release from the surface, transport due to gravity and solar radiation pressure, and dissipation due to ionization caused by solar radiation is constructed. The results from numerical calculation is consistent with the observations by MASCS in terms of the vertical profile and the seasonal variability above LT06 and LT18, but the maximum at aphelion above LT12 could not be reproduced. Then, when the existence of the impact of comet dust stream is assumed as a local and short-term sodium source, the model with impact of comets per Mercury year could reproduce observations.

Using the model constructed in this study, the sodium distribution which would be observed by MSASI onboard MIO spacecraft is predicted. The comparison between the calculation and observation by MSASI will provide us new insights into the interaction between the celestial bodies and space environment. In this presentation, we will summarize the results of comparison between observations by MASCS and 3-D Monte Carlo simulation about the seasonal variability of Mercury's sodium exosphere.

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