

The Sodium Exosphere and Extended Coma of Mercury

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Abstract

The tenuous surface-bounded atmosphere of Mercury consists of H, He, O, Na, K, Ca atoms. According to observations from the ground in the Na D-line emission, the brightness and spatial distribution of the sodium atoms could have large time variations possibly as a result of solar wind interaction. To address this interesting issue, we have developed a time-dependent numerical model to simulate the steady state and transient distributions of the sodium atoms and other gas species on the surface of Mercury. Because of the strong effect of solar radiation pressure acceleration, the sodium atoms when ejected above a certain threshold speed will be blown away in the antisolar direction forming a tail-like coma structure. Such simulations will be useful in the comparison of the ground-based observations and in-situ measurements by the MESSENGER and BepiColombo spacecraft at Mercury.