

Mercury's Sodium Exosphere: Observations During the MESSENGER Orbital Phase [1471132](#)

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The MErcury Surface, Space ENvironment, GEOchemistry, and Ranging (MESSENGER) spacecraft entered into orbit about Mercury on March 18, 2011. We now have approximately five Mercury years of data from orbit. Prior to the MESSENGER mission, Mercury's surface-bounded exosphere was known to contain H, He, Na, K, and Ca. The Ultraviolet and Visible Spectrometer (UVVS) began routine orbital observations of both the dayside and nightside exosphere on March 29, 2011, measuring altitude profiles for all previously detected neutral species except for He and K. We focus here on what we have learned about the sodium exosphere: its spatial, seasonal, and sporadic variation. Observations to date permit delineation of the relative roles of photon-stimulated desorption (PSD) and impact vaporization (IV) from seasonal and spatial effects, as well as of the roles of ions both as sputtering agents and in their possible role to enhance the efficiency of PSD. Correlations of Mercury's neutral sodium exosphere with measurements from MESSENGER's Magnetometer (MAG) and Energetic Particle and Plasma Spectrometer (EPPS) provide insight into the roles of ions and electrons. Models incorporating MAG observations provide a basis for identifying the location and area of the surface exposed to solar wind plasma, and EPPS observations reveal episodic populations of energetic electrons in the magnetosphere and the presence of planetary He⁺, O⁺, and Na⁺.