

Spectroscopic observation of the Mercury's atmosphere

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The UV spectroscopy measurement carried out by Mariner-10 revealed that there is a significant amount of H and He in the Mercurian atmosphere [Broadfoot et al., 1974]. But due to the limited coverage, we have not known the dependency of global spatial distributions on the dynamic solar wind pressure and the magnetic activity. And also, we have known only the upper limit of total amounts of the atmospheric constituents such as Ne, Ar, C, OH, and O. [Broadfoot et al., 1974, 1976]. In other words, we identify only 5 elements, H, He, Na, K, Ca up to now. (The latter 3 elements were identified by ground-based observations.)

In the 1960s, many scientists expected to proceed the discussion on the evolution and origin of the Mercurian atmosphere based on the Mariner-10 results. Helium and Argon in the atmosphere are produced by the radioactive decay of K, Th, U in the interior, and are supposed to be supplied from the interior depending on the internal activity. On the other hand, Neon is not created from radioactive decay, therefore, its origin is supposed to be either/both solar wind or/and ancient atmosphere. Such information is important to discuss the evolution of the Mercury atmosphere.

In the 1960s, there were some difficulties to realize a high efficient UV spectrometer. In order to improve it, we have developed the multilayer-coated grating for the upcoming Mercury mission, Bepi-Colombo. This optics has high efficiency below 50 nm, especially an order of magnitude higher efficiency at He II (30.4 nm) than that of Mariner-10.