Feasibility Study for Detecting Atomic Oxygen Exospheres of Trappist-1 d, e, f, and Proxima b Using World Space Observatory –Ultraviolet (WSO-UV) Telescope

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We present simulation results for the detectability of atomic oxygen exospheres on TRAPPIST-1d, e, f and Proxima b with WSO-UV telescope, assuming Earth-like atmospheres composed of nitrogen and oxygen. These atmospheres are exposed to Stellar extreme ultraviolet (EUV) radiation, 10 –117 nm, several dozen times stronger than exposure to the present Earth because of star proximity (Bourrier et al., 2017, Ribas et al., 2017). It has been hypothesized that a thermosphere expands under extreme solar EUV radiation (Kulikov et al., 2007), which plays an important role in the ionization, dissociative ionization, dissociation, and heating of the planetary upper atmospheres. Furthermore, these responses depend on wavelength. However, stellar radiations between 40 and 91.2 nm cannot be measured because of the absorption of neutral hydrogen in an interstellar medium. We estimate the EUV spectrum at TRAPPIST-1d, e, f and Proxima b using empirically derived relationships between total hydrogen Lyman alpha intensity, at 122 nm, and the EUV spectrum presented by Linsky et al. (2014). We simulate the oxygen column density on these planets using the 1-Dimensional General Circulation Model (1DGCM) and estimate the necessary transit times to detect these planets using WSO-UV telescope. Moreover, we introduce the ultraviolet spectrometer which we propose onboard WSO-UV.

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