

TETH – Towards Extra-Terrestrial Habitats

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Abstract

The discovery and characterisation of new extra-solar planets (exoplanets) is ongoing, but to date only a handful of low-mass planets have been found orbiting in the habitable zone of sun-like stars. The next generation of major facilities (e.g. TESS and PLATO) aimed at the systematic search for Earth-like planets orbiting solar-like stars will be operational in the coming years, and some of the planets they will find may orbit stars close enough for atmospheric characterisation, including the possible detection of bio-signature gases. Studies on the formation and evolution of the Earth reveal that an Earth-like habitat is characterised by a N-dominated atmosphere and could be detected by measuring the relative atmospheric abundances of N, O, C, and H (NOCH). However, N, which is the main fingerprint of an Earth-like habitat, is extremely difficult to detect and may be possible only in the ultraviolet, a wavelength range that has not been studied for low-mass exoplanets. Before starting the search for bio-signatures with future facilities (e.g. ELTs, LUVOIR), we need to explore our capabilities to detect Earth-like habitats. Here, we present several synthetic transmission spectra for the Earth's atmosphere, for the wavelength range 915 to 11000 Å, at a spectral resolution of $R = 100,000$. We focus on both atomic and molecular features, and discuss the detectability of N.