**The Atacama Desert as an Analogue environment to Rocky Exoplanets**

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The study of exoplanetary atmospheres, via transmission spectroscopy, is a revolutionary development, which allows us to examine and understand: chemical compositions, temperature profiles, clouds/hazes, atmospheric dynamics, atmospheric escape, biosignatures (e.g. O2, CO, CH4, H2O), which can be used to evaluate the habitability of exoplanets (Madhusudhan 2019). The CO molecule has great importance in astronomy and biology because it is found in stars, protoplanetary discs, forming planets, and planetary atmospheres, while it also exists in important metabolic pathways. Furthermore, The principal source of carbon in the primitive Earth came from the CO/CO2 molecules which implies the existence of ancestral metabolism such as Wood-Ljungdahl pathway (WL). Still, it is possible to find acetogenic microorganisms with the WL (King 2015) in extreme environments. The extreme environment such as the Atacama Desert could provide important information about limits of life such as temperature, pressure, pH, salinity, and radiation. On Earth, there are environments with extreme conditions that occupy various ecological niches and that can be extrapolated to other celestial bodies (Merino et al., 2019). The Atacama Desert is considered the driest place in the world, and it is also analogous to the primitive Earth (Farías 2020).

Assuming that several of the discovered rocky exoplanets should be similar to the primitive Earth (e.g. CO2-H2O-CH4-H2) and that some of them have an atmosphere similar to Earth’s primitive atmosphere then considering that some microorganisms from the Atacama Desert use CO as an energy source operating ancestral metabolic pathways such as the WL pathway. It should be possible to quantify the CO biosignal of the Atacama Desert bacteria, for the use of design parameters of a theoretical model atmosphere, and evaluate, by comparison, of the spectral lines of CO of biological and non-biological origin. Including the development and comparison of exoplanetary synthetic transmission spectra of abiotic and biotic generated CO. Based on this premise and using the radiative transfer model, petitRadTrans (Mollière 2019), it is possible to generate theoretical model atmospheres to understand how they might influence the observed transmission spectra and if so, will these perturbations be detected with the next generation of telescopes such as the JWST and ELT.

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