THE EXO-UV PROJECT: CHARACTERIZATION OF UV RADIATION ENVIRONMENTS AND HABITABILITY OF EXTRASOLAR PLANETS

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Introduction: The study of the conditions involved in planetary habitability is one of the main goals in the Astrobiology field. Among the factors to be considered, stellar radiation has an essential role in habitability and their effects can rely at multiple levels, since the radiation received from the parent star can influence planetary evolution, atmosphere, and can determine the origin, evolution and existence of life in a planetary body. The effects of radiation can be beneficial or detrimental depending mainly on the wavelength and flux of radiation, or in the case of life, this will also depend on the mechanisms of life forms to cope with these levels of radiation. In particular, radiation emissions related to UV wavelengths can be a constraint for life but it has also been postulated as a driving force for biological evolution. Moreover, UV radiation can play a role in photochemical reactions that are produced at atmospheric level and could act as an energy source for polymerization/destruction of prebiotic molecules. Several works have analyzed the influence UV radiation fluxes in F, G, K, and M stars in order to determine their suitability for life (e.g: [1], [2]). However, most of the works are theoretical and it would be necessary to perform laboratory simulation experiments to test the theoretical predictions that have been made. Additionally, there is a lack of data about radiation emission fluxes in different stellar astrophysical contexts considering particular planetary and atmospheric conditions. The main objective of this project is to study and characterize radiation environments of F, G, K and M stars in the context of exoplanets (Earth-like planets) and to determine if these environments would support life, since radiation can act as a limiting factor for the development and evolution of life. In particular this project has several goals: 1) The development of software that allows to obtain corrected UV flux values from data belonging to different main sequence stars (F,G,K,M), using as data source measurements made by the International Ultraviolet Explorer (IUE) and the Hubble Space Telescope (HST), served by the MAST archive. The aforementioned data sources provide spectral data that, once corrected for several parameters, allows a good estimation of the UV flux a planet would receive. This will include fluxes on the quiescent state of the star but it could also be expanded to the analysis of flares in some of these stars. 2) The modelling of the atmospheres considering the atmospheric features of the planets to obtain the UV fluxes over the surface of the exoplanets. 3) The simulation of these radiation environments under laboratory conditions (ground based simulation experiments) to conduct biological experiments with microorganisms (UV, 200-400nm range), in particular radiation resistant microorganisms [3,4]. This project seeks to expand previous work, considering significant amount of data and laboratory simulations of these extraterrestrial environments. Therefore, the aim of this project is to provide some important insights about planetary habitability, increasing the knowledge about the effects of radiation in the context of exoplanets and its influence on life, considering habitable stars of different spectral types.

References: [1] Cockell C.S. (1999). *Icarus* 141, 399-407. [2] Cuntz M. et al. (2009) Proc. *IAU* 264, 419-426. [3] Abrevaya X.C. et al. (2011) *Proc. IAU* 286, 405-409. [4] Abrevaya X.C. et al (2011) *Astrobiology* 11, 1034-1040.