Biosignature modification in the Oxia Planum region.

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**Description:**

ESA’s ExoMars 2020 Rosalind Franklin rover is expected to land on Mars in mid-2021, with a primary objective to search for signs of life. A landing site, Oxia Planum, has been selected that is rich in clay minerals, indicative of an environment that has been subjected to aqueous alteration in the past [1-3]. The prior presence of water may indicate that this region was once habitable, but any biosignatures (geochemical indicators for life) left behind may have been modified or even obliterated by subsequent surface processing, such as impact cratering, desiccation and diagenetic aqueous alteration [4].

This project aims to determine the effects of such processing on biosignatures within an Oxia Planum-like environment. It will combine orbital and rover data to develop an Oxia Planum simulant, which will then be used in laboratory simulation experiments to identify how biosignatures could be modified after they experience the types of processing seen at Oxia Planum.

The project will begin with the design and production of a prototype Oxia Planum simulant based on existing data obtained from orbiting spacecraft. This prototype will be characterised and tested using instruments akin to those onboard the rover, specifically the Raman Laser Spectrometer (RLS) and infrared spectrometer for ExoMars (ISEM). Once data is returned from the ISEM, RLS and MicrOMEGA (micro Observatoire pour la Minéralogie l’Eau, la Glace et l’Activite) instruments aboard the ExoMars rover, the simulant will be refined, and a final version produced.

The simulant will then be doped or loaded with biosignatures, defined from literature data from existing Mars missions [5] or returned data from ExoMars 2020 rover. It will then be subjected to secondary processing to recreate high pressure and temperature environments that result from impacts. These environments have been shown to cause the degradation of organic molecules, for example long chain hydrocarbons, that are associated with microbial life [6]. These processed samples will then be re-analysed using instruments similar to those aboard the Rover. The results from this work will help with the interpretation of data returned from the rover and future missions.

**References:**

Qualifications required: The ideal candidates will have a minimum 2:1 in geological sciences, geochemistry or a related discipline.