Leka Ophiolite Complex as analogy to the serpentinization-carbonation system on Mars

Benjamin Bultel\(^1\), Agata M. Krzesińska\(^1\), Damien Loizeau\(^2\), Cateline Lantz\(^2\), François Poulet\(^2\), Håkon O. Austrheim\(^3\), Elise M. Harrington\(^1\), Jean-Christophe Viennet\(^4\), Henning Dypvik\(^1\), and Stephanie C. Werner\(^1\)

\(^1\)Center for Earth Evolution and Dynamics (CEED), Beyond Earth, Oslo, Norway (benjamin.bultel@geo.uio.no)
\(^2\)Institut d’Astrophysique Spatiale, CNRS/Université Paris-Sud, Université Paris-Saclay, bâtiment 121, 91405 Orsay Cedex, France
\(^3\)Physics of Geological Processes (PGP), The Njord Centre, Department of Geosciences, University of Oslo, 0136 Oslo, Norway.
\(^4\)Muséum National d’Histoire Naturelle, Institut de Minéralogie, Physique des Matériaux et Cosmochimie, CNRS UMR 7590, Sorbonne Université, CNRS, F-75005 Paris, France.

Jezero Crater is the landing site of the Mars2020 NASA rover. The crater in its early history hosted a paleolake with at least two deltas remaining. The Jezero lake belongs to a larger system - the Nili Fossae region - which exposes a mineralogical assemblage interpreted as a serpentinization/carbonation system [1]. While the main alteration minerals in Jezero are identified, little is known about the accessory minerals. The latter could reveal critical information about the conditions of serpentinization/carbonation [2; 3]. Moreover, several aspects are yet to be solved: Are the carbonates resulting of primary alteration or reworked origin [4]? Is the mineralogical assemblage modified after deposition in the lake (weathering)? What is the nature of the protolith that could contains up to 30% of olivine [5]?

The Nili Fossae-Jezero system has its potential analogue in terrestrial serpentinized and carbonated rocks, such as the Leka Ophiolite Complex, Leka Island, Norway, (PTAL collection, https://www.ptal.eu), which records complex weathering of serpentinite formed from mafic to ultramafic rock [6].

We perform petrological and mineralogical analyses on thin sections to characterize the weathering products in Leka samples, and combine with Near Infrared Spectroscopy measurements. We study the significance of the mineralogical assemblages including solid solution composition and nature of accessory minerals. The consequence for habitability potential might be important. Indeed, the amount of H\(_2\)/CH\(_4\) production in mafic or ultramafic system vary significantly [2; 7]. This could represent crucial information that could guide future in-situ operations but could also help for a better interpretation of the remote sensing data.

References: