Dynamics and evolution of the primitive Martian crust: a pluridisciplinary approach

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Résumé

In situ observations of possible remnants of continental crust by MSL Curiosity (Sautter et al. 2015), recent finding of differentiated crustal clasts in the NWA7533 Martian meteorite (Hewins et al. 2017), and recent crustal reconstruction study revealing an ancient block under Terra Cimmeria-Sirenum (Bouley et al. 2020) shed new lights on the crustal growth/formation in the early periods of Mars. The goal of this PhD work is to provide insights into the formation and evolution of the primitive Martian crust through a multidisciplinary approach.

On one hand, the geomorphological and tectonic characterization of a peculiar region of the Noachian crust, Terra Cimmeria –Sirenum, can provide information through dynamic processes in the Noachian crust. This region, correlated with the strongest surface magnetic anomalies, display a concentration of wide basins which associated with a series of thick stratified layers, older than Hesperian lacustrine deposits. Understanding the formation and evolution of these structure can improve our understanding of the regional primitive crust.

And on the other hand, the mineralogical study of a unique Martian breccia (NWA 7533) can highlight the composition and history of the ancient mineralogy. Focusing on key secondary minerals, like zircon, we provide elements suggesting different evolution population and a succession of complex degradation processes. These mechanisms likely happened in the pre-Noachian era, as the zircons are dated up to 4.4 Ga (Humayun et al. 2013).

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