ET-HOME: Evolution and Tracers of Habitability on Mars and the Earth

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Abstract:
Seven Belgian research teams are collaborating to improve our understanding of habitability of early Earth and of past and present Mars. Habitability is commonly understood as "the potential of an environment (past or present) to support life of any kind". Having liquid water at the surface of a planet is probably the minimum condition for habitability. However, several other parameters control the environmental conditions necessary for a planet to harbor life. Therefore, a multidisciplinary approach, uniting expertises from geochemistry and paleobiology to numerical modeling is proposed to investigate the habitability of Early Earth and Mars. Mars originally displayed many similarities to Earth but then evolved along a very different path. First, we study the effect of planetary differentiation (core formation, large impacts, plate tectonics) on conditioning habitability. Second, we develop new geochemical biosignatures (Se and Ga) tracers, test them and then combine them with existing ones (e.g. Zn and Cu) to detect and characterize early terrestrial life, and its responses to major geological events (impact cratering, huge magmatic event). To do so, case studies have been selected: A Proterozoic impact structure in Australia (Acraman) and a major Archean magmatism in Canada (Abitibi). Finally, data collected by ongoing and future space missions to Mars are used to document the past and present habitability of the red planet in comparison to Earth. As this 4-year project just started, we will present the state-of-the-art at the beginning of our initiative and discuss the methodology we chose to apply, and preliminary results.

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