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Study of terrestrial fossils in phyllosilicate-rich soil: a possible analogue for the search for biosignatures on Mars

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Searching for traces of extinct and/or extant life on the surface of Mars is one of the major objectives for remote-sensing and in-situ exploration of the planet. In a recent paper we have studied the infrared (IR) spectral modifications induced by thermal processing on differently preserved carbonate fossils, in order to discriminate them from their abiotic counterparts.
The main conclusion of the study has been that terrestrial fossils after a billion years are so altered that it becomes impossible to trace their biotic origin. Since it is reasonable to assume that the putative Martian fossils should be at least 3.5 billions years old, this would imply that our spectroscopic method could not be able to detect them, if their degradation rate were the same as that we have found in usual conditions for the terrestrial fossils. However, due to the different climate evolution of the two planets, there is the possibility of having two different degradation rates, much lower for Mars than for Earth.
In this work we show that our method is quite effective for fossils collected in protective layers of clays and that the IR spectroscopy, coupled with thermal processing, can be a useful tool for discriminating between abiotic and biotic (fossil) carbonate samples collected on the Martian surface especially in phyllosilicate-rich regions such as Mawrth Vallis (Loizeau et al. 2007).