THE OUT-GASSING OF A BASALT FLOW AS A SOURCE OF MARTIAN PHYLLOSILICATE. G. Berger[1] and A. Meunier[2], [1]LMTG, CNRS-Université Toulouse, 14 av. E. Belin, 31400 Toulouse, France, berger@lmtg.obs-mip.fr, [2]HYDRASA, University of Poitiers, 40 av. Recteur Pineau 86022 Poitiers, France.

Introduction: Geomorphological observations of Mars surface and mineral detection, in particular hydrated sulphates, militate for the idea that liquid water have existed on Mars surface, even if physical conditions forbid its presence today. Beside the sulphate formation which requires particular chemical conditions, clay minerals are of particular interest because they are the first by-product of aqueous alteration of silicate rocks. Martian clays have been directly observed as iddingsite in SNC Martian meteorites [1], and Fe-Mg clays were spectroscopi-cally detected on the surface of Mars by OMEGA [2].

Basically, clays are produced on the Earth by two contrasted mechanisms: bio-mediated alteration of silicate bedrocks by pedogenetic processes or hydrothermal abiotic thermoactivated alteration. The former being speculative in the Mars context, we focused on hydrothermal processes that could happen on Mars and affect volumes of rocks sufficiently important to be detected by remote sensing techniques.

Modeling: We tested the assumption of Fe-Mg clays formation during magma degassing by analysing terrestrial analogues in the Parana flood basalt province (Brazil). The petrographical and mineralogical characteristics of clay deposits in the prismatic joints of a lava flow [3] are interpreted here using quantitative chemical and thermodynamical models simulating the basalt interaction with Cl_2 rich volatiles. We reproduced an early acidic and oxidizing alteration of the lava flow by out-degassing of H_2O-Cl_2 fluids with disproportionation reactions, followed by a later more conventional alteration by neutral or alkaline evolved hydrothermal solutions. The above alteration model is supported by the mineralogical observations that clearly evidence two different reaction sequences, within the basalt columns or within the inter-columnar joints.

Conclusion: The degassing pathways, by contrast with local hydrothermal systems, can affect large areas (several tens of square kilometres) as it is the case in Mars sites described by [2].

References:

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