Effect of obliquity, atmospheric dust and UV-organic interaction on the survivability of organics on Mars

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On Mars, exogenous organics are delivered to the surface annually, yet their fate is largely unknown. One of the remaining obstacles to assessing Martian habitability is the absence of significant detection of those, and any other organics on the surface, with only trace methane (Webster et al. 2015) and chlorobenzene (Freissinet et al. 2015) tentatively identified to date. Likewise, the survivability of putative organic biomarkers directly implicates current Mars surface exploration ambitions. Among these, amino acids are valuable target molecules due to their abiogenic and biological origins.

We present the fundamental but not previously considered factors that effect the fate of amino acids embedded in Mars mineral analogues. Using existing experimental datasets (e.g. dos Santos et al. 2016) we show that the extinction coefficient at 200 nm is a powerful parameter to quantify the real effects of mineralogy on amino acid survivability. We also show that high total iron content helps the preservation process. Furthermore, using graphite and lignite as elementary carbon-based analogues for carbonaceous material, we calculate that between 45 an 65% of total photon energy is deposited between 225 and 300 nm alone.

Finally, we combine Martian climatic parameters (surface temperature and atmospheric opacity) to show that the relative UV environment varies significantly as a function of latitude, and can potentially neutralize each other, affecting the preservaton of organics over long periods of time.

Webster C.R. et al (2015) Mars methane detection and variability at Gale crater. Science **347**, 415–417. Freissinet, C. et al (2015) Organic molecules in the sheepbed mudstone, gale crater, mars. Geophys. Res-Planets. **120**(3), 495–514. dos Santos, R. et al (2016) Influence of mineralogy on the preservation of amino acids under simulated Mars conditions. Icarus., **277**, 342–353.