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Martian supergene enrichment in Shalbatana Valley: Implications for Mars Early atmosphere

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The present work focuses on the detailed description of the first ever-identified supergene enrichment zone on Mars. The mineral paragenesis present at the site sets constraints on the characteristics of early Martian atmosphere. A chrysocolla/malachite bearing unit in the largest of Shalbatana Valley paleolacustrine sediment accumulation constitutes the proof for this process. The water permanence at the formation time is the main implication of this finding. Furthermore, the potential biogenic involvement at the mineralization stage adds scientific importance to the site. The latter implication could set the site as a high priority choice for future Martian in-situ robotic roving/sample-return missions.

The relative age of the area (~3.7 Ba) adds weight to this finding for purposes of planetary atmosphere evolution comparison. No Earth supergene deposit has survived that long, making this site extremely important to address the problem of the oxidative conditions of the primordial Earth and Mars atmospheres.