Using rocks found in Minnesota to help explain how Mars could have developed an atmosphere

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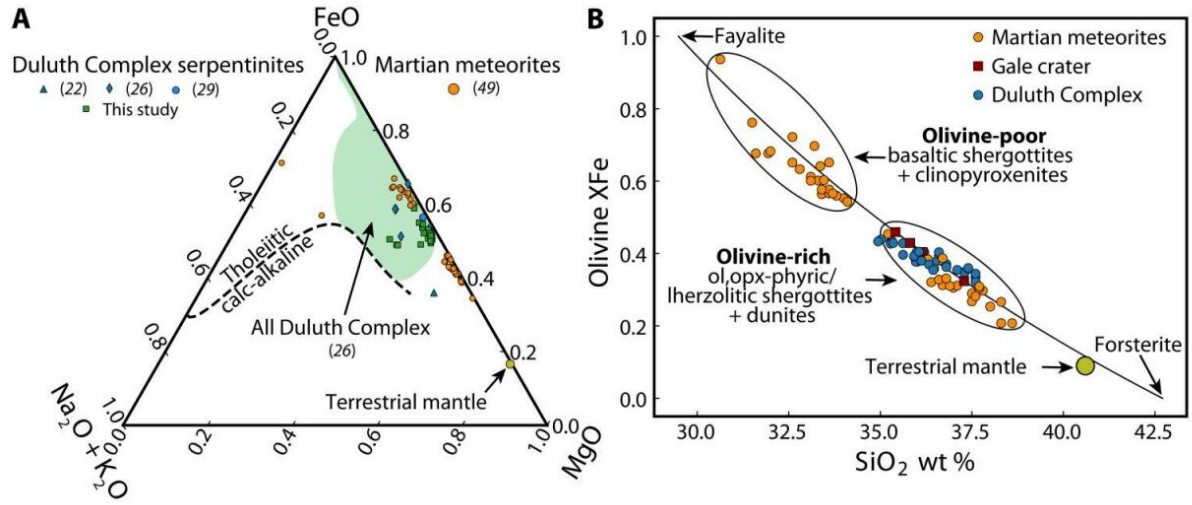

Comparison between (proto-)serpentinites of the Duluth Complex and available samples from Mars. Credit: *Science Advances* (2023). DOI: 10.1126/sciadv.add8472

A pair of Earth scientists, one with the University of Calgary, in Canada, the other from the University of Cambridge in the U.K., has found that studying rocks found in Duluth, Minnesota, might help us understand how Mars may have developed its ancient atmosphere.

In their paper published in the journal *Science Advances*, Benjamin Tutolo and Nicholas Tosca noted that some of the iron-rich rocks found in the Duluth area were similar in composition to some of those found on Mars, suggesting they might be used as a stand-in for studying Mars.

Space scientists have yet to retrieve rocks or any other material from Mars due to the huge effort involved in sending a craft to the planet, collecting samples and returning them. So scientists working to understand the history of Mars sometimes study the history of the Earth, or parts of it, that are believed to be similar to Mars.

In this new work, the researchers studied iron-rich rocks they found in Minnesota to learn more about their history. They found that the rocks had undergone a process known as serpentinization, a process by which rocks are pushed from the Earth's mantle upward, eventually coming into contact with water, resulting in the creation of hydrogen. When such rocks are eventually pushed to the surface, the hydrogen is released into the atmosphere, where, along with other gases, it serves to create a greenhouse effect, which warms the planet.

Tutolo and Tosca also note that serpentinization can also lead to the production of minerals, and in some cases, organic compounds—some with the potential of fueling an ecosystem conducive to creating the building blocks for life. They suggest that because many of the rocks found on the surface of Mars are similar in nature to those found in Duluth, it seems possible that they, too, could have been produced via serpentinization. This suggests they may have played a role in creating an atmosphere capable of holding enough heat for ice to melt into water, which would account for the evidence of flowing water on the surface of Mars billions of years ago.

More information: Benjamin M. Tutolo et al, Observational constraints on the process and products of Martian serpentinization,

Science Advances (2023). DOI: 10.1126/sciadv.add8472