PLANETARY SCIENCE

Icy red planet

Our planetary neighbour Mars has many features in common with Earth, including seasons and polar ice caps. As on Earth, Martian ice caps influence the climate, but the Martian atmosphere is much less dense than Earth's atmosphere and is primarily composed of carbon dioxide. Mars also has dust storms similar to those experienced on Earth, but they are on a planet-wide

scale and cause planetary warming. Three publications in *Geophysical Research Letters* describe details of the Martian climate and how it differs from climate on Earth.

Agustín Sánchez-Lavega and colleagues tracked the expansion and wind dynamics of the 2018 Mars Global Dust Storm (GDS) using ground-based images. This dust storm encircled the planet, an occurrence that is uncommon but not unprecedented. This storm, however, was the first documented GDS that began in the Martian northern hemisphere, and was early in the Martian year compared with other storms. While it was not immediately apparent why this storm initiated differently from many before, Sánchez-Lavega et al. suggested that connections between atmospheric thermal tides played a role.

Water on Mars is found in frozen form, and the north pole layered deposits hold the second largest Martian water reservoir. These deposits are almost pure ice, but underneath the ice layers is a lesser-studied ice formation called the basal unit (BU), which has a substantially

different composition from the north pole layered deposits.

Lujendra Ojha and colleagues calculated the density of the BU from gravity and topology measurements of the Martian north pole. The BU was estimated to be more than 50% ice, suggesting the BU was once an ice cap that trapped wind-blown dust. Stefano Nerozzi and Jack Holt studied the composition of a particular part of the BU, named the cavi unit, using data from the Mars Reconnaissance Orbiter Shallow Radar (SHARAD). The cavi unit is composed of alternating layers of ice and sand. It is possible the cavi unit provides a record of the polar cap's cycles of advancement and retreat in its layers, recording changes in Martian climate.

These three studies illustrate a few of the many aspects of Mars's past and present climate that remain to be discovered, and can guide research in the future Mars2020 and ExoMars missions and beyond.

Laura Zinke

Nature Reviews Earth & Environment

ORIGINAL ARTICLES Sánchez-Lavega, A. et al. The onset and growth of the 2018 Martian Global Dust Storm. *Geophys. Res. Lett.* <https://doi.org/10.1029/2019GL083207> (2019) | Ojha, L. et al. Compositional constraints on the north polar cap of Mars from gravity and topography. *Geophys. Res. Lett.* <https://doi.org/10.1029/2019GL082294> (2019) | Nerozzi, S. et al. Buried ice and sand caps at the north pole of Mars: revealing a record of climate change in the cavi unit with SHARAD. *Geophys. Res. Lett.* <https://doi.org/10.1029/2019GL082114> (2019)

Credit: Getty images/Stocktrek images