Novel technique quickly maps young ice deposits and formations on Mars

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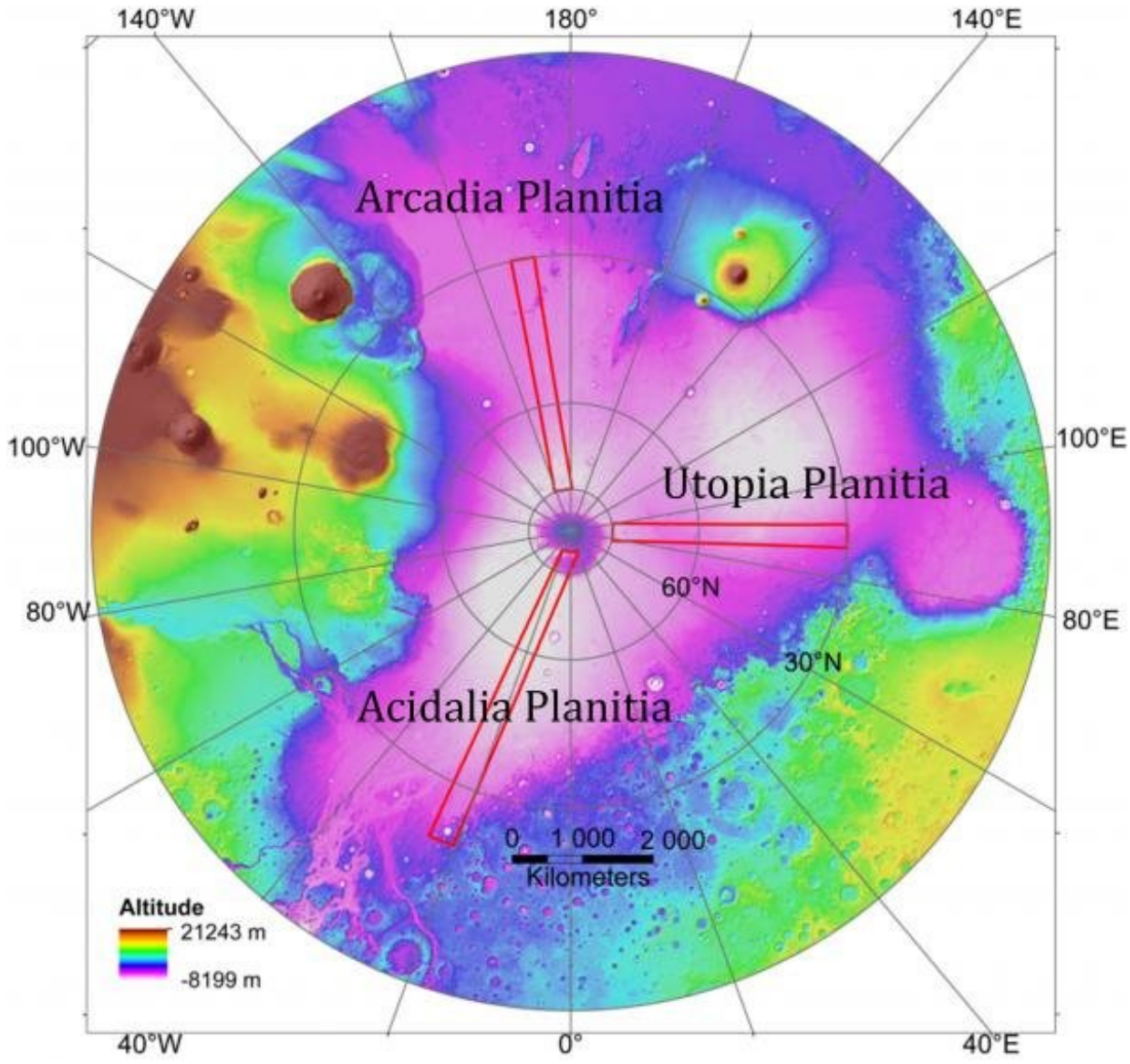

Localization of the studied regions in the northern plains of Mars. Credit:

A new investigative technique has shown the latitudinal distribution of ice-rich landforms on Mars. This large-scale study enables future, more detailed investigations to study several young deposits of ice and sediment in the north polar basin.

"The young ice deposits are extremely important for several reasons. First, they represent a different epoch in Mars' climate history when ice was stable at the mid-latitudes. We can probe them for more information and gather details about Mars climate," said Isaac B. Smith, Research Scientist at the Planetary Science Institute and co-author of three new papers on the topic. "Second, if humans are to explore Mars, they will want to go to mid-latitude locations where the Sun is up all year. Identifying where the ice is supports that. Finally, astrobiologists are very interested in locations where ice and rock interact because it may offer clues about habitability."

The northern plains of Mars comprise several basins filled by sediments. The region has been proposed to have hosted an ancient ocean and currently contains ice in the ground even at latitudes where the ice is not stable. It is not known, however, what is the origin of the ice, whether it is related to the ancient ocean or recent glaciations. The ages of different surfaces and landforms are also not well known. Improving the geological context of the northern plains will help constrain outstanding questions about evolution of the climate and geology on Mars.

"We used this type of investigation to speed up the process of seeking ground ice. The team broke up very long sections into 20 kilometer by 20 kilometer squares. In their mapping, if they identified a type of feature, then the grid cell was checked," Smith said. "This sped up the

process of interpreting huge areas by orders of magnitude. The benefit is that we can now trace the latitudinal placement of various features in a spatial context, useful for making conclusions about ground ice on Mars. This is also a powerful reference map for more detailed investigations."

Smith supported the research by providing information on what is found beneath the Martian surface using his analysis of data from NASA's Mars SHAllow RADar sounder (SHARAD) instrument on the Mars Reconnaissance Orbiter spacecraft.

"The team mapped surface morphology but had no subsurface information before I joined, so for each project I analyzed hundreds of SHARAD observations seeking subsurface reflectors that could spatially correlate to the surface morphology they were mapping," Smith said. "This increased confidence in their detections and provided thickness measurements for the ice that they found."

More information: Csilla Orgel et al. Gridmapping the Northern Plains of Mars: A New Overview of Recent Water- and Ice-Related Landforms in Acidalia Planitia., *Journal of Geophysical Research: Planets* (2018). DOI: 10.1029/2018JE005664

Jason D. Ramsdale et al. Gridmapping the northern plains of Mars: Geomorphological, Radar and Water-Equivalent Hydrogen results from Arcadia Plantia., *Journal of Geophysical Research: Planets* (2018). DOI: 10.1029/2018JE005663

Antoine Séjourné et al. Grid-mapping the northern plains of Mars: using morphotype and distribution of ice-related landforms to understand multiple ice-rich deposits in Utopia Planitia, *Journal of Geophysical Research: Planets* (2018). DOI: 10.1029/2018JE005665

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