Site of Martian lakes might have been linked to ancient habitable environment

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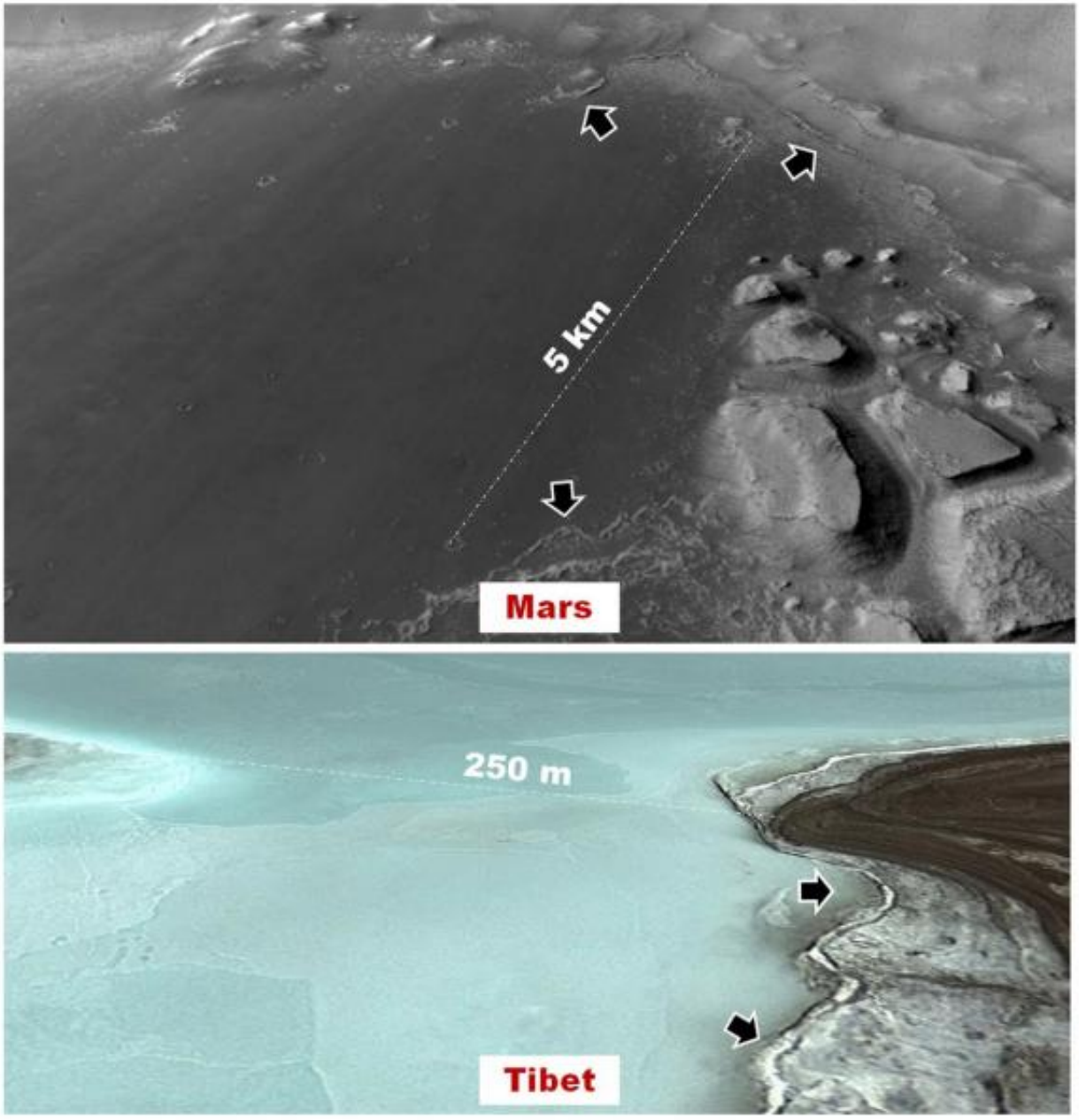

Perspective views of (top) the floor of a basin where Rodriguez and others propose in this investigation that shallow lakes could have formed within the last few tens of millions of years, and (below) the floor of a proposed Martian analog high mountain lake in the Tibetan plateau, where Rodriguez will conduct a field investigation this coming summer. The arrows in both panels identify similar ridges that surround the basin's floor. In the Tibetan lake case, the ridges are thought to form as sediments are pushed outwards by the freezing waters. These types of ridges might be diagnostic shoreline feature of lakes that formed under extremely cold and dry Martian conditions. A key objective of the planned field expedition is to investigate these bizarre shoreline features and characterize their astrobiological potential.

Groundwater circulation beneath a massive tectonic rift zone located along the flanks of some the Solar System's largest volcanic plateaus resulted in the formation more than 3 billion years ago of some the deepest basins on Mars, according to a new paper by Planetary Science Institute Senior Scientist J. Alexis Palmero Rodriguez.

These basins could have been episodically covered, perhaps during hundreds of millions of years, by lava and water lakes that were discharged from subsurface pressurized sources, Rodriguez writes in "Groundwater flow induced collapse and flooding in Noctis Labyrinthus, Mars" that appears in *Planetary and Space Science*.

This shows an area on Mars that could possibly have harbored life.

"The temperature ranges, presence of liquid water, and nutrient availability, which characterize known habitable environments on Earth, have higher chances of forming on Mars in areas of long-lived water and volcanic processes," Rodriguez said. "Existing salt deposits and sedimentary structures of possible emplacement within Martian paleo-

lakes are of particular astrobiological importance when looking for past habitable areas on Mars. This is particularly true if the discharge of early Mars groundwater, perhaps liked to hydrothermal systems that were active for billions of years, contributed to the formation of the paleo-lakes, as it is proposed in this investigation."

The detection of paleo-lake sites on Mars is particular challenging because under the planet's frigidly cold and thin atmosphere, their ponded water would have behaved differently than on Earth, he said. "In this research we propose a Tibetan region where high mountain lakes show unique sets of landforms that might explain some basin interior features in the studied region of Mars."

In collaboration with the Chinese government, Rodriquez will visit the Tibetan region this coming summer to investigate their in-situ potential as astrobiological analog sites.

More information: J. Alexis P. Rodriguez et al. Groundwater flow induced collapse and flooding in Noctis Labyrinthus, Mars, *Planetary and Space Science* (2016). DOI: 10.1016/j.pss.2015.12.009

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