Vast systems of ancient caverns on Mars may have captured enormous floodwaters

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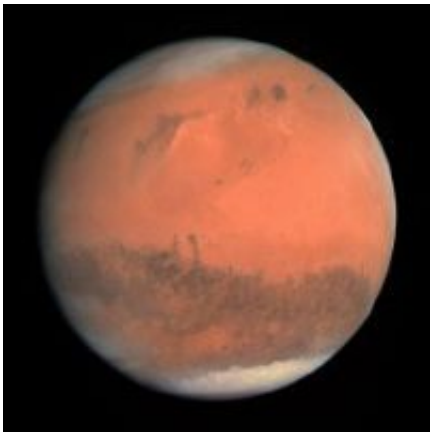

(Phys.org)—An international research team led by the Planetary Science Institute has found evidence that indicates that approximately 2 billion years ago enormous volumes of catastrophic flood discharges may have been captured by extensive systems of caverns on Mars, said PSI research scientist J. Alexis Palmero Rodriguez.

Rodriguez and the research team came to this conclusion after studying the terminal regions of the Hebrus Valles, an outflow channel that extends approximately 250 kilometers downstream from two zones of surface collapse.

The Martian outflow channels comprise some of the largest known

channels in the solar system. Although it has been proposed their discharge history may have once led to the formation of oceans, the ultimate fate and nature of the fluid discharges has remained a mystery for more than 40 years, and their excavation has been attributed to surface erosion by glaciers, debris flows, catastrophic floodwaters, and perhaps even lava flows, Rodriguez said.

The PSI-led team's work documents the geomorphology of Hebrus Valles, a Martian terrain that is unique in that it preserves pristine landforms located at the terminal reaches of a Martian outflow channel. These generally appear highly resurfaced, or buried, at other locations in the planet. Rodriguez and his co-authors propose in an article titled "Infiltration of Martian overflow channel floodwaters into lowland cavernous systems" published in Geophysical Research Letters that large volumes of catastrophic floodwaters, which participated in the excavation of Hebrus Valles, may have encountered their ultimate fate in vast cavernous systems.

They hypothesize that evacuated subsurface space during mud volcanism was an important process in cavern development. Mud volcanism can expel vast volumes of subsurface volatiles and sediments to the surface. But because evacuation of subsurface materials generally occurs within unconsolidated sediments resulting caverns are transient and mechanically highly unstable.

However, the investigated Martian caverns appear to have developed within permafrost, which at -65 degrees Celsius (-85 degrees Fahrenheit)—a typical mean annual surface temperature for the investigated latitudes—has a mechanical strength similar to that of limestone. Limestone rocks host most of the terrestrial cavern systems.

Possible caverns have been recently identified on Mars, and their existence has caught much scientific and public attention because of

their potential as exobiological habitats. However, their age and dimensions remain uncertain. The discovery of vast caverns that existed in ancient periods of Mars shows that these habitats may have in fact existed during billions of years of the planet's history, Rodriguez said.

More information:
www.agu.org/pubs/crossref/2012/2012GL053225.shtml

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