New theory suggests Mars was once cold and wet

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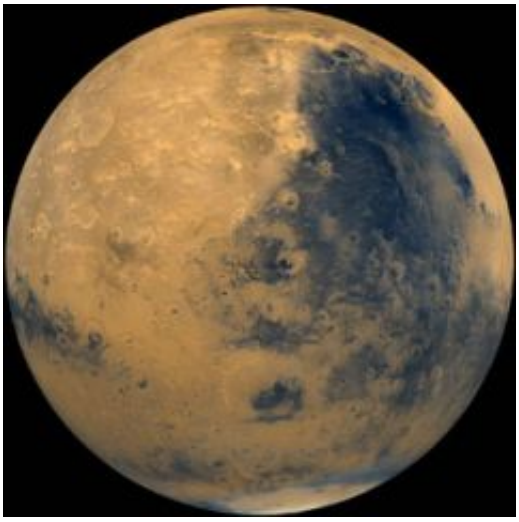

Mars. Credit: NASA

(PhysOrg.com) -- Alberto Fairyn, an astrobiologist who works for both the SETI Institute (the group using radio telescopes to listen for extraterrestrial life) and NASA's Ames research center, along with colleagues, has published a paper in the journal *Nature Geoscience*, in which they describe ancient Mars as cold and wet with a large northern hemispheric ocean whose edges were lined with glaciers.

Most recent thinking has suggested that Mars was either warm and wet or cold and dry; Fairén et al, however believe it was neither; this because of the absence of phyllosilicates (layers or sheets of parallel silicate) in

the northern areas, compared to those in the south. They say this is likely due to an environment so cold that such minerals would not be able to move from the highlands to the lowlands due to glaciers. Also, they note the presence of moraines in northern parts of the planet, the rocky residue that is created on Earth by glaciers. Taken together, the researchers believe they have found credible evidence to suggest that Mars was indeed wet, but it wasn't warm, at least in the northern parts of the planet.

If true, the ocean, in the Martian northern lowlands likely would have more resembled the North Atlantic between Norway and Greenland, than the tropics.

Some scientists have suggested that the northern part of the planet was likely not wet at all because of the absence of the phyllosilicates in the lowlands, due to the belief they would need liquid to form. If they were held back as the new research suggests, it would mean that Mars, rather than being an exotic tropical paradise in its early history, was more likely a cold inhospitable place with northern oceans at near freezing temperatures.

Fairén and his team conclude that because heat transfer from the relatively warmer areas near the equator wasn't able to occur the way it does on Earth via ocean currents, the result would be far more temperature variation between the two regions than is found on our planet. This would mean that the oceans in the two areas would not have been connected, leaving the northern parts of the planet cold virtually all of the time.

The team plans to continue their research in this area, looking for other clues that would suggest the existence of a cold northern ocean, such as coastal areas that might have been impacted by icebergs.

More information: Cold glacial oceans would have inhibited phyllosilicate sedimentation on early Mars, *Nature Geoscience* (2011) doi:10.1038/ngeo1243

Abstract

Phyllosilicate minerals are commonly found in marine sediments on Earth. Accordingly, the presence of an ocean in the northern lowlands of Mars during the Noachian period would be expected to lead to the presence of abundant phyllosilicates in crust of the same age. However, mineralogical data from orbiting spectrometers show that phyllosilicates are rare in the Noachian-aged crust that is exposed in impact craters in the northern lowlands. In contrast, phyllosilicate minerals are abundant in the equatorial and tropical highlands, raising doubts about the presence of an ocean. Here we use climatic and geochemical model calculations and palaeohydrological reconstructions to assess the factors that control phyllosilicate synthesis and sedimentation on early Mars. Our model results show that temperatures in an ocean confined to latitudes poleward of 30° N would have been near freezing, which would have hindered the formation of phyllosilicate minerals in the ocean basin. In addition, the presence of cold-based glaciers surrounding the ocean would have limited the delivery of phyllosilicates from the highlands to the ocean basin. We therefore suggest that the presence of a cold, Noachian ocean could explain the paucity of phyllosilicates in the Noachian-aged crust of the northern lowlands.