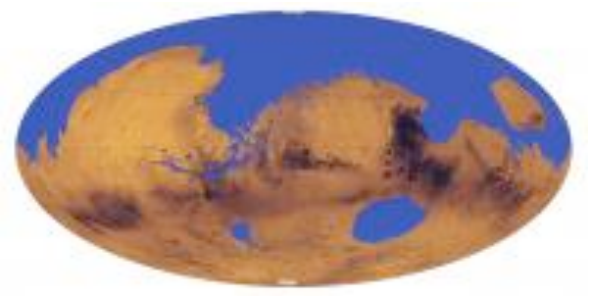
# Ocean covered a third of Mars, study concludes

June 13, 2010
Courtesy of University of Colorado at Boulder
and World Science staff

**Some 3.5 billion years ago, a vast ocean likely covered more than one-third of Mars and was part of an Earth-like water cycle that probably included rain, according to a new study.**

**Scientists analyzed geological features thought to have been formed by water, including river valleys and delta deposits, where rivers spill out and dump sediments. Of 52 delta deposits identified, more than half are at about the same elevation, indicating they marked the boundaries of an ocean, the scientists involved in the study argued.**



Map of Mars' presumed ocean some 3.5 billion years ago. (Image courtesy U. Colorado)

**The notion of a large, ancient ocean on Mars, where microbial life could have arisen, has been repeatedly proposed and challenged over the past two decades.**

**The new work supports the idea of a sustained sea on the Red Planet during the so-called Noachian era more than 3 billion years ago, said the researchers, Gaetano Di Achille and Brian Hynek, both of the University of Colorado at Boulder. Their findings are published in the June 13 issue of the journal *Nature Geoscience*.**

**River deltas on Earth quickly bury organic carbon and other molecular markers of life. Thus river deltas Mars would would be a prime target for exploration, said Di Achille: "if life ever arose on Mars, deltas may be the key to unlocking Mars' biological past."**

**Twenty-nine of the 52 deltas were connected either to the ancient Mars ocean or to the groundwater table of the ocean and to several large, adjacent lakes, he said.**

**The study is the first to integrate multiple data sets of deltas, valley networks and topography from a cadre of NASA and European Space Agency orbiting missions of Mars dating back to 2001, said Hynek. The study implies that ancient Mars probably had an Earth-like global water cycle, including precipitation, runoff, cloud formation,**

and ice and groundwater accumulation, he added.

Di Achille and Hynek used a geographic information system to map the Martian terrain and conclude the ocean likely would have covered about 36 percent of the planet and contained about 30 million cubic miles, or 124 million cubic kilometers, of water. This about a tenth as much as oceans on Earth, which is twice Mars' size, hold.

The elevation of the deltas on the edges of the proposed ocean was remarkably consistent around Mars, said Di Achille. Large, ancient lakes upslope from the ancient ocean likely formed inside impact craters and would have been filled by the transport of groundwater between the lakes and the ancient sea, according to the researchers.

A second study headed by Hynek being published in *Journal of Geophysical Research – Planets* detected about 40,000 river valleys on Mars. That's about four times the number previously been identified, said Hynek.

These valleys were the source of the sediment carried downstream and dumped into the deltas adjacent the proposed ocean, said Hynek. "The abundance of these river valleys required a significant amount of precipitation," he said. This "puts a nail in the coffin regarding the presence of past rainfall on Mars." Hynek said an ocean was likely required for the sustained precipitation.

"One of the main questions we would like to answer is where all of the water on Mars went," said Di Achille. He said future Mars missions—including NASA's $485 million Mars Atmosphere and Volatile Evolution mission, or MAVEN, slated to launch in 2013—should help to answer such questions and provide new insights into the history of Martian water.