

Martian polygons and deep-sea polygons on Earth: More evidence for ancient Martian oceans?

July 27 2012

Debate over the origin of large-scale polygons (hundreds of meters to kilometers in diameter) on Mars remains active even after several decades of detailed observations. Similarity in geometric patterns on Mars and Earth has long captured the imagination. In this new article from *GSA Today*, geologists at The University of Texas at Austin examine these large-scale polygons and compare them to similar features on Earth's seafloor, which they believe may have formed via similar processes.

Understanding these processes may in turn fuel support for the idea of [ancient oceans](#) on Mars.

Through examination of THEMIS, MOLA, Viking, and Mariner data and images, planetary scientists have found that areas on the northern plains of Mars are divided into large polygon-shaped portions and that sets of these polygons span extensive areas of the [Martian surface](#). Smaller polygon-shaped bodies are found elsewhere on Mars, but these are best explained by [thermal contraction](#) processes similar to those in terrestrial permafrost environments and not likely to form larger polygons.

In the August 2012 issue of *GSA Today*, Lorena Moscardelli and her colleagues from The University of Texas at Austin present a detailed comparison of the geometric features of these large Martian polygons

and similar features found in deep-sea sediments here on Earth. Moscardelli and colleagues note striking similarities.

On Earth, polygon-shaped areas, with the edges formed by faults, are common in fine-grained deep-[sea sediments](#). Some of the best examples of these polygon-fault areas are found in the [North Sea](#) and the Norwegian Sea. These are imaged using detailed, 3-D seismic surveys conducted to search for [offshore oil](#) and gas deposits. Images reproduced in this paper show that these deep-water polygons are also 1,000 meters or greater in diameter.

While the details of deep-sea polygon formation on Earth are complex, Moscardelli and her colleagues conclude that the majority of these polygons form in a common environment: sediments made up of fine-grained clays in ocean basins that are deeper than 500 meters, and when these sediments are only shallowly buried by younger sediments. A key observation -- also made recently by Michelle Cooke at the University of Massachusetts -- is that the physical mechanism of polygon formation requires a thick, wet, and mechanically weak layer of sediment.

Moscardelli and colleagues also conclude that the slope angle of the sea floor plays an important role in both the formation and preservation of these polygons. Where the seafloor slope is very gentle (slopes less than half a degree), the polygons have very regular shapes and sizes. In many locations where polygons have formed on top of buried topographic features on the seafloor, the shapes of the polygons were altered, and in some cases were broken up and disrupted where the slopes were steepest. Both observations are consistent with deformation of the soft marine sediments as they creep or flow downslope in these areas.

In the northern plains of Mars, where the surface is basically flat, the polygons have very regular shapes and sizes -- remarkably similar to the deep-sea polygons found on Earth. In places where the topography on

Mars is more varied, and where there may be evidence for other sediment-transport features on the surface, areas of deformed and disrupted polygons can be found -- again similar to the disrupted polygons here on Earth.

On the basis of these striking similarities, the University of Texas at Austin team concludes that these features most likely share a common origin and were formed by similar mechanisms in a similar environment. The team argues that the Martian polygons were formed within a thick, wet, and weak layer of fine-grained sediments that were deposited in a deep-water setting, similar to the Earth polygons. Thus, these interesting geometric features may provide additional evidence for the existence of an ocean in the northern portion of Mars approximately three billion years ago.

More information: Deep-water polygonal fault systems as terrestrial analogs for large-scale Martian polygonal terrains Lorena Moscardelli, Tim Dooley, Dallas Dunlap, Martin Jackson, and Lesli Wood, Pages 1-9; [doi: 10.1130/GSATG147A.1](https://doi.org/10.1130/GSATG147A.1)

Provided by Geological Society of America

Citation: Martian polygons and deep-sea polygons on Earth: More evidence for ancient Martian oceans? (2012, July 27) retrieved 19 April 2024 from <https://phys.org/news/2012-07-martian-polygons-deep-sea-earth-evidence.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.