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Formation of a giant honeycomb seafloor morphology on the Carnegie ridge: potential geodynamic significance.

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A honeycomb seafloor morphology is evidenced in the sedimentary blanket of the Carnegie Ridge. The seafloor depressions of the HP area are typically 0.8–2.0 km wide, separated by 100–250-m-high, dominantly linear ridges. The ridges give the depressions their polygonal and, in places, hexagonal shape and enclose subcircular depression bottoms. Most polygonal depressions lie in 2100–2800 m of water depth, together with isolated, subcircular to ovoid, larger depressions.
Based on swath bathymetry, 2D high-resolution seismic reflection profiles and ODP/DSDP data, we propose a model for the formation of this seafloor honeycomb pattern in carbonate sediments deposited on an uneven oceanic basement. Hydrothermal fluids derived from the basement aquifer fractured and dissolved carbonate sediment, creating seafloor pits above basements highs. Fluids expelled along polygonal faults may have assisted the nucleation of seafloor depressions. Fluids expelled from host sediment together with hydrothermal fluids derived from the basement aquifer, migrated along the polygonal faults, fracturing and dissolving carbonate sediment, thus contributing to the development of seafloor furrows and pockmarks. At the Plio-Pleistocene boundary, strong bottom currents scoured previously damaged sediments at specific triple junctions of adjacent polygonal fault cells generating the honeycomb pattern. This regional erosive episode is contemporaneous to the final closing of the Isthmus of Panama and the Ecuador trench clogging by the subduction of the Carnegie Ridge, so that the honeycomb pattern may be viewed as a regional marker of these geodynamic events.