A forest of carbonate-brucite chimneys at the Southwest Indian Ridge: the ultramafic-hosted Old City hydrothermal field

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The Old City hydrothermal field was discovered at the end of 2016 (ROVsmooth cruise of RV Pourquoi Pas?) on ultramafic seafloor midway up the axial valley wall of the ultraslow Southwest Indian ridge (SWIR) near 64°E. It is made of carbonate-brucite deposits similar to those of the Mid-Atlantic Ridge Lost City field.

Compared to Lost City, Old City deposits are larger in spatial extent and overall volume (including three massive 30-50 m-high active towers, and dozens of more slender inactive 10-20 m-high edifices). Present-day venting fluxes are notably smaller, with no visible shimmering effluents. Nonetheless, bright white brucite-carbonate deposits, completely free of iron-manganese oxide precipitates and therefore very recent, cap a significant proportion of the edifices. Fluid samples collected near these active edifices have higher pH (up to 8.2) than surrounding seawater, indicating mixing with very slowly venting, high pH effluents.

In this talk, we present an overview of the characteristics of this newly discovered vent field, focusing on: (1) its geological setting and the possible origin and pathways of hydrothermal fluids in the substratum; (2) the mineralogy, isotopic composition, shape, chronology and possible modes of construction of the carbonate-brucite deposits; and (3) the relevance of these findings for a better understanding of serpentinization-related carbonation processes at slow and ultraslow mid-ocean ridges.