Iron-oxidizing bacteria and stromatolites in the Ediacaran hydrothermal carbonate

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Association of drastic climate change and biological evolution during Neoproterozoic is one of the most enigmatic features of the Earth history. The If the Earth’ s surface has been hardly covered with thick ice-cover during the 58-myr-long Sturtian glaciation, the evolution of organisms was mostly reset. However, there is glowing evidence of protozoan fossils immediately after the Sturtian and Marinoan glaciations. This requires the argument that liquid environments as refugia for protozoans must have occurred in tropical zones or around volcanos.
Moroccan Anti-Atlas exposes several Proterozoic inliers surrounded with Ediacaran, Paleeozoic and Mesozoic strata. Accumulated age data of zircon U-Pb indicate that active tectonics had been sustained here during Cryogenian and Ediacaran. Paleogeographic interpretation based on paleomagnetism reconstructed a high latitude of Anti-Atlas. Neoproterozoic sedimentary sequence here is dominated by volcanics and siliciclastics, and carbonate is developed as lentic bodies on granodiorite rock.
This study focuses on two carbonate bodies near Bleida and Ouarzazate in Anti-Atlas. The Blida section exposes a 25-m-thick sequence of bedded and fine-grained dolostone of red color. This overlies 586Ma volcanic rock, and apparently underlies possible diamictite with a fault contact. Dolostone of the lower part of the section contains relics of iron-oxidizing bacteria. Carbon isotope of the dolostone is low as -6‰, but the stratigraphic position negates the correlation to the Shuram negative excursion of late Ediacaran. The low d13C value likely inherited endogenic carbon, and this interpretation is supported by low d18O indicating high water temperature (around 40-50ºC). While, the 30-m-thick carbonate sequence near Ouarzazate consists of red-colored limestone alternated with volcanoclastic sandstone and siltstone. It rests on 580Ma volcanics. The carbonate sequence exhibit stromatolites at least four stratigraphic levels. The higher d13C value (around -1.5‰) was likely reflected from CO2 degassing or gas exchange with the atmosphere. These stromatolites show regular lamination of ~1 mm interval and appears color changes reflected from a redox gradient within a biofilm.
These carbonate sequences in Anti-Atlas are not directly associated with the Snowball glaciations. However, active volcanism that had sustained latest Neoproterozoic might had provided liquid water environments, as biologic refugia during the Marinoan Snowball Earth.
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