

Non-thermophilic archaea (Thaumarchaeota) in open oceans: new players in global carbon and nitrogen cycles and Implications for marine GDGT proxies

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Archaea were originally divided into two kingdoms: Crenarchaeota and Euryarchaeota, which were mostly studied in extreme environments such as terrestrial hot springs. Culture-independent molecular studies in the past 20 years have demonstrated the ubiquity of archaea in nature, particularly in marine settings. Currently, new phyla of archaea include Korarchaeota, Nanoarchaeota, and Thaumarchaeota. The latter was previously called non-thermophilic crenarchaeota. Among these new phyla, Thaumarchaeota have received the most attention, particularly in oceanic research. Studies so far demonstrate the wide distribution and vast abundance of Thaumarchaeota in water column and sediments and show spatial and temporal variations in global oceans. Advances in genomic research provide further insight into the physiology and biochemistry of Thaumarchaeota, which are known to play important roles in global nitrogen and carbon cycles. In parallel, advances in LC-MS technologies have allowed us to develop novel proxies based on archaeal lipids for environmental and paleoclimate studies. The integration of molecular DNA and lipid biomarkers is becoming a new trend in archaeal research and driving a new wave of discoveries in marine ecology and biogeochemistry.