BIODIVERSITY AND REDOX CONDITIONS THROUGH THE PROTEROZOIC TAOUDENI BASIN OF MAURITANIA

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Prokaryotes and microscopic eukaryotes are known to have appeared well before the Cambrian's adaptative radiation, when the macroscopic world flourished. What do we know about the trigger events which stimulated eukaryotic diversification during the Proterozoic? Biological innovations or environmental changes, and indeed probably both, played a fundamental role controlling this important step of life's evolution on Earth. A diversification pattern of early eukaryotes divided into three steps and focusing on different taxonomic levels of the domain Eukarya, from stem group to within crown group, remains to be tested. Supercontinent formation and break-up, widespread glaciations, meteor impacts, atmosphere and ocean oxygenation and chemistry are the main environmental changes which have probably led to eukaryotic diversification. A stratified ocean, during the so-called 'boring billion' (~ 1.8-0.8 Ga), with anoxic ferruginous deep water, euxinic mid-depths, and oxygenated shallow-waters, is thought to have delayed eukaryotic diversification after the Great Oxidation Event (~ 2.4 Ga) by restricting eukaryote evolution and limiting nutrient availability. Here we present new, exquisitely preserved and morphologically diverse assemblages of organic-walled microfossils from three drill cores of the ~ 1.1 Ga Atar/El Mreïti Groups (Taoudeni Basin, Mauritania, Northwestern Africa). These assemblages include beautifully preserved microbial mats comprising pyritized filaments, prokaryotic filamentous sheaths and filaments, microfossils of uncertain biological affinity including smooth isolated and colonial sphaeromorphs (eukaryotes and/or prokaryotes), diverse protists (ornamented and process-bearing acritarchs), as well as purported green algae and multicellular microfossils interpreted in the literature as possible xanthophyte algae. Several taxa are reported for the first time in Africa, but are known worldwide. Palynofacies and Raman microspectroscopy analyzes were performed to investigate thermal maturity and the preservation state of organic matter; iron speciation was also conducted to reconstruct the ocean palaeoredox conditions. This study improves the microfossil diversity previously reported and demonstrates the presence of unambiguous eukaryotes. These new microfossil assemblages, in combination with global data sets, provide evidence of early and worldwide diversification of eukaryotes around 1 billion years ago. To

better understand the palaeobiology (stem or crown group, aerobic or anaerobic metabolism) and palaeoecology (habitat diversity) of these early eukaryotes, we are combining morphological, microchemical, ultrastructural and quantitative analyzes of microfossils with a high-resolution characterization of eukaryotic biomarkers and palaeoenvironmental and palaeoredox proxies.