Contrasting sterane signatures in Neoproterozoic marine sediments of the Centralian Superbasin before and after the Acraman bolide impact

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Major evolutionary changes have been discovered across the Late Neoproterozoic ejecta horizon of the Acraman bolide impact (ca 580 Ma) in central Australia. Microbial and leiospheroid palynoflora that survived the Marinoan "Snowball Earth" glaciation were superseded by large acanthomorph acritarchs following the Acraman event. The latter coincided with another glacial episode that affected the near-equatorial Rodinian Ocean, as indicated by till pellets in the Dey Dey Mudstone (Officer Basin) and dropstones in the Bunyeroo Formation (Adelaide Fold/Thrust Belt). The combined effect of these two events on the biomarker record has been investigated in the Amadeus Basin (Pertatataka Formation, Wallara-1) and the Officer Basin (Dey Dey Mudstone and overlying Karlaya Limestone, Munta-1). These basins were part of the Neoproterozoic Centralian Superbasin. Bacterial biomarkers remained ubiquitous in these suboxic to anoxic sediments. Anaerobic non-photosynthetic bacteria dominated the Dey Dey and Pertatataka basin-floors, while planktonic photoautotrophic microbial consortia dominated the slope sediments of the upper Dey Dey Mudstone and the micritic carbonates of the Karlaya Limestone. Only eukaryotic biomarkers provided evidence of the evolutionary havoc wrought by the Acraman event, with the C_{29}/C_{27} sterane ratio transiently increasing six-fold above the ejecta horizon. This corresponds to a drop in sterane/hopane ratio and a negative shift of 5‰ in $\delta^{13}C_{org}$, signalling a sharp decline in marine algal productivity. If the markedly ethylcholestane-dominant signatures of certain Neoproterozoic crude oils from Oman and Siberia are artefacts of the Acraman event, this constrains the age of their source rocks to 570–580 Ma.