NEOPROTEROZOIC CLIMATE CHANGES: THE PERSPECTIVE FROM SOUTHERN AFRICA

FRIMMEL, H. E. and FÖLLING, P. G. Department of Geological Sciences, University of Cape Town, South Africa

Worldwide most Neoproterozoic sequences are characterised by an intimate association of glaciogenic diamictite with evidently warm water, shallow marine carbonate deposits. We studied such sequences in the Pan-African Gariep and Saldania Belts in southern Namibia and South Africa. Within a rift to passive continental margin sequence, two glaciogenic diamictite horizons occur, both of which are capped by carbonate rocks. New U-Pb single zircon and Pb-Pb carbonate ages, together with a series of detailed chemostratigraphic (d13C, 87Sr/86Sr) profiles, permit a correlation with the global Sturtian (c. 750 Ma) and Varangian (c. 600 Ma) glacial epochs.

Ice-rafted detritus of metre-size was also discovered in the allochthonous oceanic part of the Gariep Belt, where diamictite within a mafic to ultramafic sequence of oceanic within-plate geochemistry is locally underlain by meta-evaporites and stromatolitic dolomite. Cap carbonates above the, in places, diamictitic volcanic sequence are geochemically and isotopically comparable to the post-Varangian cap carbonates. Based on geochemical data, fluid inclusion composition and d11B of stratiform tourmalinites, a marine origin is indicated for the meta-evaporites with the centre of an atoll as likely depositional environment.

The association of relatively low-latitude marine deposits with ice-rafted detritus away from any continental margin points to low-latitude sea ice cover. Our findings provide strong support for the hypothesis of a snow-ball Earth around 600 Ma.