

Stratigraphic Investigation of Neoproterozoic Incised Valleys, Johnnie Formation, California, USA: Evidence for Glacioeustatic or Tectonic Influence

The goal of this research was to investigate whether major incised valleys filled by coarse carbonate breccias in the Ediacaran Johnnie Formation (ca. 580 Ma) were formed through glacioeustatic drawdown, possibly related to a “snowball Earth” style glaciation, or extensional tectonism during rifting of the Neoproterozoic supercontinent Rodinia. Funding from the IAS Postgraduate Grant Scheme supported two field trips in eastern California during January 2004 and April 2004, where 12 detailed stratigraphic sections were measured and the contacts of the coarse carbonate breccia, Johnnie Oolite, and overlying Stirling Quartzite were mapped. The composition and size of clasts in the valley-fill breccia were also qualitatively assessed at each measured section locality.

The measured sections indicate that the coarse breccia drapes a valley that was at as much as 120 m deep, incising into the carbonates of the Rainstorm Member and below the Johnnie Oolite at its deepest point. Detailed mapping revealed the presence of synsedimentary normal faults that were active just prior to deposition of the breccia or were contemporaneous with earliest stages of valley formation. Clast size in the breccia is at a maximum near the buried normal faults and large olistoliths (reaching sizes of nearly 15 m) occur at the fault scarps. All clasts were derived from underlying formations in the Death Valley region, predominantly from lower units of the Johnnie Formation itself. No exotic or striated clasts were observed. Although it is not possible to definitively rule out contemporaneous glacioeustatic drawdown, these results, especially the striking correlation between valley incision, clast size and the location of

syndepositional normal faulting, strongly support a primary tectonic origin for valley formation.

These results will be published in a manuscript entitled “Tectonically driven deep valley formation in the Terminal Neoproterozoic (Ediacaran) Johnnie Formation, eastern California, USA,” currently in final stages of preparation. I thank IAS for supporting this project.

Sincerely,

Matthew Clapham

Final Budget

Transportation: 2 field trips to Shoshone, CA (961 miles) at 39 cents/mile - \$375

Lodging: 2 nights in Shoshone Motel during January field trip - \$90

Food: \$60

Total: \$525 (approx. 400 Euros)