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Archean deep-water depositional system: interbedded and banded iron formation and clastic turbidites in the Barberton Greenstone Belt, South Africa

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The 3.23 billion year old sediments in the Barberton greenstone belt, South Africa include some of the world's oldest known deep-water deposits. Unique to this locality are turbidites interbedded with banded iron formation (BIF) and banded ferruginous chert (BFC). This unusual association may provide clues for reconstructing Archean deep-water depositional settings. For our study we examined freshly drilled core in addition to measuring ∼500 m of outcrop exposures along road cuts. The stacking pattern follows an overall BIF to BFC to amalgamated turbidite succession, although isolated turbidites do occur throughout the sequence. The turbidites are predominately massive, and capped with thin, normally graded tops that include mud rip-ups, chert plates, and ripples. The lack of internal stratification and the amalgamated character suggests emplacement by surging high-density turbidity currents. Large scours and channels are absent and bedding is tabular: the flows were collapsing with little turbulence reaching the bed. In contrast, field evidence indicates the BIF and BFC most likely precipitated directly out of the water column. Preliminary interpretations indicate the deposits may be related to a pro-deltaic setting. (1) Deltaic systems can generate long-lived, high volume turbidity currents. (2) The contacts between the BIF, BFC, and turbidite successions are gradual and inter-fingered, possibly representing lateral facies relationships similar to modern pro-delta environments. (3) Putative fan delta facies, including amalgamated sandstone and conglomerate, exist stratigraphically updip of the basinal sediments.