

## Tectonophysics

### **Neoproterozoic tectonic history of the Witwatersrand Basin and Ventersdorp Supergroup: New constraints from high-resolution 3D seismic reflection data**

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First-order scale structures in the West Wits Line and West Rand goldfields of the Witwatersrand Basin (South Africa) were mapped using the high-resolution 3D reflection seismic method. Structural models constrain the magnitude of displacement of thrusts and faults, the gross structural architecture and Neoproterozoic tectonic evolution of the West Rand and Bank fault zones, which offset the gold-bearing reefs of the basin. The merging of several 3D seismic surveys made clear the gross strato-structural architecture of the goldfields; a macroscopic fold-thrust belt is crosscut by a macroscopic extensional fault array. These are dissected, eroded and overlain by the Transvaal Supergroup above an angular unconformity. The seismic sections confirm that the West Rand Group (ca. 2985–2902 Ma) is unconformably overlain by the Central Rand Group (ca. 2902–2849 Ma), with tilting of the West Rand Group syn- to post-erosion at ca. 2.9 Ga. The seismic sections also confirm that an unconformable relationship exists between the Central Rand Group and the auriferous Ventersdorp Contact Reef (VCR), with an easterly-verging fold-thrust belt being initiated concomitant to deposition of the VCR at approximately 2.72 Ga. Fold-thrust formation included development of the (1) newly identified first-order scale Libanon Anticline, (2) Tandeka and Jabulani thrusts which displace the West Rand Group, and (3) parasite folds. The fold-thrust belt is crosscut by a macroscopic extensional fault array (or rift-like system of faults) which inceptioned towards the end of extrusion of the Ventersdorp lavas, and certainly during deposition of the Platberg Group (2709–2643 Ma) when a mantle plume may have heated the lithosphere. The West Rand and Bank fault zones formed at this time and include (1) the West Rand and Bank faults which are scissor faults; (2) second and third-order scale normal faults in the immediate footwall and hanging wall of the faults; (3) drag synclines, and (4) rollover anticlines.