# Architecture of the Onverwacht Suite, Barberton Mountain Land, South Africa: new stratigraphic nomenclature and revised models

**Maarten de Wit**

Africa Earth Observatory Network, AEON, University of Cape Town: maarten.dewit@uct.ac.za

## ABSTRACT

Synthesis of new and existing data identifies at least seven major shear zones and a major unconformity that separate the rocks of the southern Barberton greenstone belt into seven complexes with different complex geologic histories. The stratigraphic nomenclature presently applied to these sequences (e.g. formations) cannot incorporate these complexities. This requires changing the status of the traditional 'Formations' of the Onverwacht Group of the Barberton greenstone belt into 'complexes'. The complexes are referred to collectively as the Onverwacht Suite. The total age range and thickness of the suite is about 120 million years and 15 km, respectively, but the precise age ranges of each complex and their original thicknesses remain unknown. All the complexes include significant volumes of intrusions into their volcanic and volcanoclastic host rocks. The ages of the intrusions of the different complexes are different. In some complexes the intrusions and volcanic rocks have similar if not identical geochemistry, and are co-magmatic. Others provide 'stiching' ages between complexes. Six of the complexes have ophiolite-like affinities that suggest the complexes formed predominantly in oceanic spreading- and intraoceanic arc- environments with water depths of 2-4km. The complexes are tectonically stacked and the original spatial relationships between them can only be inferred in most cases.

At least one complex was uplifted by 2-4 km between about 3470 and 3460 Ma, giving a minimum uplift rate of some 2-4 mm/yr, similar to that in modern subduction zones and during emplacement of Phanerozoic oceanic crust as ophiolite complexes. Overlying coarse clastic sediments overlap in age with about 15 myrs of felsic-intermediate igneous activity dated between 3460 to 3445 Ma, that, in turn, relate in age to the intrusion of the tonalite-trondjemite plutons to the south of the greenstone belt. These sediments may therefore represent a sequence deposited in a tectonic basin associated with subduction and obduction processes. The emergence of the deep water complex above sealevel and the onset of subaerial clastic sedimentation (> 3455 Ma) probably best represents the start of obduction of the lowermost Onverwacht complexes across the older complexes (>3.5 Ga) that are now only preserved as remnants in the surrounding granitoid terranes.

Timing of a second major episode of subduction/accretion, dominated by folding, thrusting and exhumation of the Barberton greenstone belt, occurred between 3.230 -3.140 Ma. Early minimum cooling rates during more than 18 km unroofing were in the order of 1.5-5 mm/yr, similar to those recorded in modern orogenic belts. Oblique convergence ended in collision and strike-slip displacements around 3.1 Ga. The deposition of the Moodies Group sandstones and conglomerates has been linked to this period of deformation, again at rates comparable to those measured in modern orogenic belts and transcurrent plate boundaries. Thus within all crustal regimes for which reasonably robust rates of tectonic processes can be determined, these rates are similar to within an order of magnitude as those encountered today. By 3.0 Ga the region was part of a rigid peneplained continent.