Geophysical Research Abstracts
Vol. 12, EGU2010-5267, 2010
EGU General Assembly 2010

A basin on an unstable ground: Correlation of the Middle Archaean Moodies Basin, Barberton Greenstone Belt, South Africa

Frank Ohnemueller, Christoph Heubeck, Jens Kirstein, and Antonia Gamper
Department of Geological Sciences, Freie Universitaet Berlin, Berlin, Germany

The 3.22 Ga-old Moodies Group, representing the uppermost part of the Barberton Supergroup of the Barberton Greenstone Belt (BGB), is the oldest well-exposed, relatively unmetamorphosed, quartz-rich sedimentary unit on Earth. Moodies facies (north of the Inyoka Fault) were thought to be largely of alluvial, fluvial, deltaic or shallow-marine origin (Anhaeusser, 1976; Eriksson, 1980; Heubeck and Lowe, 1994) and in its upper part syndeformational. However, units can only locally be correlated, and the understanding of the interplay between Moodies sedimentation and deformation is thus limited.

We mapped and measured Moodies units in the northern BGB. They partly consist of extensive turbiditic deep-water deposits, including graded bedding, flame structures, and slumped beds, interbedded with jaspilites. These contrast with shallow-water environments, south-facing progressive unconformities and overlying alluvial-fan conglomerates along the northern margin of the Saddleback Syncline further south. The palaeogeographic setting in which late BGB deformation was initiated therefore appears complex and cannot be readily explained by a simple southward-directed shortening event.

In order to constrain Moodies basin setting before and during late-Moodies basin collapse, we correlated $\sim$15 measured sections in the northern and central BGB. Most units below the Moodies Lava (MdL, ca. 3230.6+-6 Ma) can be correlated throughout although facies variations are apparent. Above the Moodies Lava, coarse-grained units can only be correlated through the Eureka Syncline and the Moodies Hills Block but not with the Saddleback Syncline. Fine-grained and jaspilitic units can be correlated throughout the northern BGB. Moodies below-wavebase deposition occurred largely north of the Saddleback Fault.

The observations are consistent with a pronounced basin compartmentalization event following the eruption of the MdL which appeared to have blanketed most of the Moodies basin(s) in middle Moodies time and immediately predates the initiation of basin shortening. Basin compartmentalization was likely due to the movement along a group of major faults (Sheba, Haki, Barbrook, Saddleback Faults) between the present Saddleback and Eureka Synclines, creating at least two subbasins in late Moodies time. Even though sediment provenance thus became localized, intensive Archaean weathering likely contributed to generate petrographically similar quartz-rich sandstones in fault-bounded minibasins. The late-Moodies minibasins may have become connected occasionally, allowing concurrent deposition of thin BIFs. A similar phase of movement along the major transcurrent Inyoka Fault may be responsible for the distinct petrographic character of Moodies sandstones south of that fault.