



Metamorphism-deformation relationships in a mid-archean granite-greenstones terrane: Deciphering between metamorphic core complex and diapiric models

The example of the East Pilbara craton (Western Australia)

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The significance of the well-documented Archean dome-and-basin map pattern is very controversial. For some, this pattern can be interpreted in terms of modern style tectonic processes driven by plate boundary forces. For others, it is the result of the gravitational emplacement of granitoid complexes and coeval foundering of the greenstone cover, a process called partial convective overturn (see Van Kranendonk and others, 2003, for a review). The aim of this study is to test these models on the Pilbara craton, a natural laboratory for Archean processes, using a research approach combining metamorphic petrology, geochronology, and numerical modeling based on Ellipsis a particle in cell code.

In the East Pilbara craton, a high-grade shear zone has affected the southern margin of the Mount Edgar dome over a narrow rim (~4km). For some it is the detachment that allowed the exhumation of the domes in a Metamorphic Core Complex (MCC) style. For others it is the sheared margin of an asymmetric solid-state diapir. Rocks closer to the granite consist of amphibolites, quartzofeldspathic and alumino-silicate bearing schists. In the direction of the granite, one can observe the following assemblages: Kyanite over andalusite, staurolite+garnet+biotite, garnet+sillimanite+biotite.

This succession argues for a significant increase in temperature towards the pluton. To constrain Pressure-Temperature-Time paths we performed thermo-barometric investigations based on geothermobarometers, multi-equilibrium method and pseudosections calculated with THERMOCALC. Timing was constrained with geochronological dating (Rb-Sr, Sm-Nd, Lu-Hf) on garnets as well as ^{39}Ar - ^{40}Ar on micas. Finally, to decipher between MCC and diapir models, this dataset was then inverted using 2D thermo-mechanical modeling.

Van Kranendonk M., Collins W.J., Hickman A., and Pawley M.J.: Critical tests of vertical vs. horizontal tectonic models for the Archean East Pilbara Granite-Greenstone Terrane, Pilbara Craton, Western Australia, *Precambrian Research*, Volume 131, issues 3-4, p. 143-151.