

## **Widespread magmatism and metamorphism at 3.2 Ga in the eastern Kaapvaal craton, southern Africa**

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There is no consensus on when plate tectonics started on the Earth. Studies on metamorphism in the southern Barberton granitoid-greenstone terrane (BGGT), South Africa suggested mid-Archean subduction at ca. 3.2 Ga, which received much attention from the geologists around the world. The magmatic rocks in the northwestern BGGT and southern Swaziland were interpreted as magmatic arcs at 3.2 Ga to support such a proposition. To focus the 3.2 Ga magmatic and metamorphic events in the eastern Kaapvaal craton, we provide a comprehensive zircon/monazite U-Pb geochronological investigation coupled with Ti-in-zircon thermometry and Y-in-monazite thermometry for the magmatic and metamorphic rocks from the BGGT, South Africa and Ancient Gneiss Complex in Swaziland. The results show that the 3.2 Ga metamorphism and magmatism are widespread in eastern Kaapvaal craton. There is no linear distribution for the 3.2 Ga metamorphic and magmatic rocks or asymmetry in the thermal structure, which are quite different from those of the modern subduction zones. In addition, some metamorphic rocks record extremely high Y-in-monazite temperatures (>900 °C), suggesting a high geothermal gradient. In combination with previous studies, we suggest that the widespread metamorphism and magmatism in the eastern Kaapvaal craton at 3.2 Ga were the results of partial convective overturn induced by gravitational instability.