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LATE-ARCHAEAN UHT METAMORPHISM: EVIDENCE FOR BREAK-UP OF THE FIRST SUPERCONTINENT? INSIGHTS FROM THE TERRE ADÉLIE CRATON.

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Onset of Archaean era is marked out by the 4.03 Ga age of the oldest continental crust. By the Late Archaean the volume of the continental crust was large enough to account for the emergence of continental blocks. This is supported by crustal growth curve (1) and by the increase in seawater radiogenic strontium (2). Between 2.6 and 2.4 Ga this continental crust, as seen in many cratons, recorded a high temperature to ultra high temperature (UHT) metamorphic event along with widespread intrusive mafic rocks.

The Terre Adélie Craton (TAC) preserves the imprint of this UHT event in the granulitic complex of the East Commonwealth Bay area (ECB) where sediments, granitoids and numerous mafic bodies recorded UHT conditions (T>900°C, P~700 MPa) between 2.53 and 2.44 Ga (3). The significance of temperature above 900ºC at crustal level and at regional scale is a problem.

We performed triaxial numerical experiments to constrain the necessary conditions for UHT metamorphism. These show that lower crustal flow, perpendicular to the direction of convergence, limits crustal thickening therefore buffering the crustal geotherm. Assuming fast convergence rate, the Moho reaches a temperature of 870ºC only if the convergence is maintained for at least 100 Myr. We conclude that crustal thickening alone is unlikely to account for UHT metamorphism. Therefore, UHT at crustal level requires an external heat source. Field investigations suggest that the intrusion of mafic material may have advected heat into the crust. Such a magmatism points toward significant partial melting of the mantle, a common process prior to continental break-up. Because of the global repartition of this long term (ca. 2.5-2.4 Ga) HT event and that of the associated magmatism, we propose that both could result from the initiation of the first continental break-up following the first Supercontinent amalgamation.

1- Taylor, S., McLennan, S., 1985. E. Oxford, Blackwell Science.

2- Veizer, J., Compston, W., 1976. GCA, v. 40, p. 905-914.

3- Ménot, R.P., Pêcher A. et al. 2005. Gondwana Res., v. 8, p. 1-9.