

Conclusions

- Massif type **charnockite intruded the UHT metamorphosed lower crust and contains xenoliths** of aluminous granulite, calc-silicate granulite and mafic granulite.
- Subsequently, the rock has **suffered high-grade metamorphism** up to ~910°C, 9 kbar and cooling.
- Geochemical signatures indicate a **chemically diversified magmatic** character, with weakly peraluminous to metaluminous affinity and granite to granodiorite in composition.
- Trace and REE data **suggest arc type signatures of the magma in a collisional setting**. The source of such a magma is speculative, but theoretical modelling suggests melting of hydrated basaltic crust in presence of CO₂-rich fluid in a subduction-collision setting could be a possibility.
- Charnockite magmatism occurred in **two pulses** (ca.1020–1000 Ma and ca. 980–940 Ma) during and immediately after the peak UHT metamorphism, when the lower crust was still hot.
- Metamorphic **overgrowth on zircon yields spot dates** in the range ca. 950–750 Ma. This could be linked to subsequent metamorphism (M₂: approximately 950-900 Ma) and/or modifications caused by fluids (approximately 550-500 Ma).
- Charnockite magmatism in the EGP **shows similarity with the Mawson coast in Rayner Complex, East Antarctica**, which witnessed the emplacement in three successive phases. The charnockite magmatism in the **EGP matches closely with the phase 3 Mawson charnockite** (ca. 985–960 Ma).
- The combined EGP-Mawson charnockite must have emplaced in an **extensive area of the R-EG orogeny** in response to **periodic accretion and collision of arc-continent in the India-East Antarctica sector**.
- The peak temperature of mafic granulite is 890°C, 8 kbar, which is a reset value considering the UHT metamorphic history of associated aluminous granulites.
- The occurrence of **magnetite-ilmenite and pyrite-pyrrhotite in different textural modes indicates fluctuations of the fO_2 condition** during metamorphism.
- The consistently **high fO_2 condition of the mafic granulite is similar to aluminous granulite**. Infiltration of the **Ca-rich brine solution could be responsible** for elevating both the fO_2 conditions and metasomatism of the lower crust.
- Granites (hydrated magma) are broadly coeval with charnockites (dry magma) in EGP implies a **fluctuation of the fluid regime in terms of CO₂ – H₂O**.
- These rocks show peraluminous affinity, quartz monzonite to granitic in composition. Trace and REE data of granite indicate their **evolution in an arc setting**.
- Juxtaposition of EGMB along the north-western cratonic margin occurred at ca. 500 Ma.