Neoarchean island arc magmatism and gold mineralization: Examples from eastern Dharwar craton, India

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Four linear arcuate greenstone belts dominate in the eastern Dharwar craton having variable proportions of gold mineralization along which Hutti is the only working mine at present. The Sandur greenstone terrane; the Ramagiri-Penakacherla-Hungund; Hutti-Jonnagiri-Kadiri-Kolar and Naraynpet-Gadwal-Velligallu linear, composite greenstone terranes of eastern Dharwar craton are evidenced with gold mineralization in different lithounits. The plume magmatism in the western sector has resulted in concentration of iron, manganese and other base metals deposits whereas the arc magmatism in the eastern sector contributed for the concentration of gold at some places. Subduction-accretion has been recognized as a predominent process in the growth of continental crust and its mineralization in eastern Dharwar craton. Most of the greenstone belts in eastrn Dharwar craton have a complete spectrum or a few litho units that represent intraoceanic island arc process. Sandur belt has komatiite-tholeiite sequences along with calc-alkaline volcanic rocks representing plume-arc accretionary process. Komatiites, oceanic island basalts, arc basalts, Nb-enriched basalts and adakites are present along the Ramagiri-Penakacherla-Hungund belt representing the dominance of island arc process where Penakacherla belt has abundant gold mineralization. Arc-back-arc baslats with adakites were reported at Hutti; high-Mg baslats along with arc basalts are preserved at Jonnagiri; arc basalts along with Nb-enriched baslats, adakites, Mg-andesites, dacites and rhyolites occur in Kadiri belt and Kolar has ultramafic rocks that reflect on mantle plume magmatism. In Narayanpet-Gadwal and Veligallu belts boninites are present at Veligallu and Gadwal which are associated with Nb-enriched basalts, arc basalts, Mg-andesites and adakites. The identification of the rocks deposited at Neoarchean convergent margins provide significant constraints on the island arc magmatism, plume-arc accretionary process and concentration of gold in few greenstone belts of eastern Dharwar craton.

Evolution of basaltic melt during mantle refertilisation at shallow depths of spreading ridges, through experimental studies of liquid compositions in equilibrium with plagioclase + spinel lherzolite at low pressures (0.75 and 0.5 GPa)

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The presence of plag+sp lherzolites among ocean floor samples and in some ophiolite complexes invites speculation on their origin and relationships to processes of magmatism and mantle refertilisation beneath mid-ocean ridges. We have determined experimentally, in the (Cr+Na+Fe+Ca+Mg+Al+Si) system, the compositions of liquids and 5 co-existing minerals in the six phase assemblage [Liq+Ol+Opx+Cpx+Plag+Sp] at 0.5 and 0.75 GPa [1,2]. As compositions of mineral phases are pressure dependent, our results may be used to quantify the P-T and compositional evolutionary paths of both liquids and residues during mantle refertilisation at shallow depths. The major variations in liquid compositions are related to plagioclase composition. Liquid compositions, silica-oversaturated for An_{Plag} ≥40 but critically silica-undersaturated for An_{Plag} ≤25, are unlike natural MORB glasses, providing no support for MORB genesis by extraction of near-solidus melts from plag-lherzolite at low pressure. Comparisons with natural mineral compositions of plag+sp-refertilised lherzolites from the literature infer that the refertilisation process by reactive porous flow of magma within the oceanic lithospheric mantle took place at depths of up to 30 km (0.75 GPa≤P≤1 GPa) beneath the sea floor.

[1]Chalot-Prat, Falloon, Green, Hibberson (2010), *Journal of Petrology* **51**, 2349-2376; [2]Chalot-Prat, Falloon, Green, Hibberson (accepted) *Lithos*

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