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Geochemical characteristics of adakites from different greenstone belts of Eastern Dharwar Craton, India – implications on subducted slab-mantle wedge interaction

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The continental crust in the Dharwar Craton of Peninsular India has evolved through terrain accretion and amalgamation of oceanic plateaus and island arcs. The adakites identified from Sandur, Gadwal and Kushtagi greenstone belts exhibit geochemical variation reflecting on their petrogenesis. Adakites of Gadwal belt have SiO_2 = 56 – 72 wt.%, Al_2O_3 = 11 – 17 wt.%, high MgO (0.67 – 3.9 wt.%), Na_2O (2.2 – 4.9 wt.%), K_2O (0.57 – 1.9 wt.%), low Mg# (35 – 55), Ni (0.7 – 11 ppm), Cr (1.8 – 27 ppm), Sr (142 – 420 ppm), Y (10.3 – 19 ppm), Yb (0.79 – 1.5 ppm) whilst Sandur adakites have comparatively high SiO_2 (75 – 78 wt%), low Al_2O_3 (12 – 13 wt%), MgO (0.15 – 0.24 wt%), high Mg# (58 – 85), Na_2O (4.7 – 7.2 wt%), K_2O (1.01 – 2.05 wt%), Ni (1.3 – 41 ppm), Cr (9.6 – 292 ppm), low Sr (175 – 237 ppm), Y (4.5 – 6.9 ppm), Yb (9 0.3 – 0.5 ppm). The Rare Earth Element (REE) patterns of Sandur adakites are highly fractionated compared to Gadwal (La/Yb = 43 – 71 and 9 – 29, respectively). Sr/Y ratio in Gadwal adakites is depleted (12 – 27) compared to Sandur adakites (26 – 46) whereas the Zr/Sm ratio of Gadwal adakites is 32 – 58, slightly higher than Sandur adakites. Phanerozoic adakites studied from different parts of the world along with Archaean adakites (from Abitibi) have been interpreted as melts derived from the subducted slab. The geochemical characteristics of slab melts is modified by their interaction with mantle wedge during its ascent and thereof the magmas derived from the partial melting of metasomatized wedge will reflect the composition of slab derived fluids/melts. The overall geochemical characteristics of these adakites and their occurrence with arc basalts, boninites, NEB and high Mg-andesites signify a transition from slab dehydration-wedge melting to slab melting-wedge hybridization and these new observations of adakite geochemistry in different greenstone belts endorse the emergence of complex arc magmatism in Neoarchaean terranes.