Geochemical implications of iodine distribution in Indian soils

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Iodine plays a pivotal role in many of the geological, chemical and biological processes because of its litho-, bio-, atmo-, hydro- and chalco-philic nature. Speciation of iodine as inorganic iodine (iodides and iodates), molecular iodine and organically bound iodine provides its chemical signature in diverse forms in the earth crust. Contrasting distributions of iodine are observed in the Indian soils; wherein iodine lows below the permissible limits of WHO are observed in several parts of India, especially in the northern region [1], and on the other side, elevated iodine concentrations in hydrocarbon prospective/petroliferous sedimentary basins of India have been documented [2].

Soil iodine studies have been carried out in Saurashtra and Deccan Syneclise basins, which are potentially prospective hydrocarbon realms in the western and west central India, respectively. Results show the concentration (in mg/kg) of iodine to be in the range of 1.5-68.5 and 1.1-19.3 in the surficial soils of Saurashtra and Deccan Syneclise, respectively. The values are quite high compared to average distribution of iodine in soils (0.01-6mg/kg) [3]. The iodine highs in these regions appear to be associated with the hydrocarbon prone organic matter of the sedimentary basins.

The geological and geophysical variations occurring in different regions and sedimentary basins of India corroborate the concentration distribution pattern of iodine in the soils and the related geochemical anomalies.

[1] Ghose, *et al.* (2003) *Journal of Geol. Soc. of India* **62**, 91–98. [2] Mani *et al.* (2011) *Natural Resources Research* **20**, **1**, 75–88. [3] Kebata-Pendias & Pendias, (1984) *Trace elements in soils & plants*, CRC Press.

HIMU-EMI type OIBs from the Neoarchean Penakacherla greenstone belt, Dharwar craton, India: Implications on Recycling of Mesoarchean crust

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Alkaline basalts, having relict aegirine, leucite and nepheline mineralogy, are associated with high-Mg and island arc basalts in the Neoarchean Penakacherla greenstone belt, eastern Dharwar craton, India. These are compositionally uniform, where SiO_2 = 43 to 46 wt%, Mg# = 0.70 to 0.58, and Ni = 183-85 ppm, enriched in alkalies (K_2O+Na_2O ~7 wt.%), TiO_2 (2.3-2.1 wt.%), and exhibit fractionated REE patterns with $(La/Yb)_N$ ranging from 23 to 29. On the Ni-Zr diagram, alkaline basalts plot with counterparts from the ocean island of Tubuai, Cook-Austral volcanic chain. On paired REE and primitive mantle normalized multi-element diagrams these basalts are characterized by coherent patterns: (1) smoothly fractionated REE [(La/Sm)N 4.08-5.00, (Gd/Yb)N 3.09-4.27]; (2) uniform Th/U ratios (4.1-5.4); (3) no Ce or Eu anomalies; (4) depletions of Th relative to Nb and La, yielding small negative anomalies of Nb relative to La (Nb/La = 0.78-1.01 vs.1.04 the primitive mantle ratio, in common with compositional characteristics of Phanerozoic alkaline ocean island basalts (OIB). These basalts plot with Recent counterparts from Aitutaki and Heard OIB on SiO_2 vs Nb/Y plot. High-μ, EM1 and EM2 OIB have distinct to overlapping trace element characteristics, of which HIMU OIB alone are characterized by positive Nb-anomalies. Comparison of PT-alkaline basalts with average trace elements ratios of OIB end members of Greenough *et al.* (2005) exhibit resemblance with some features of HIMU and EM1. Ratios of Zr/Nb (2.7-3.61), and La/Yb (32 - 41) compared to respective values in HIMU (3.4, 30), EM1 (5.4, 36), and EM2 (6.3, 21). Ti/Y (559) and Y/Yb (14) compare to respective values in HIMU (598, 13), EM1 (680, 15) and EM2 (638, 16). Consequently, PT alkaline basalts have trace element ratios intermediate between HIMU and EM endmembers. This occurrence of alkaline basalts indicates subduction, recycling, and incubation of Mesoarchaean oceanic and continental crust in the mantle, and generation of a mantle plume at 2.7 Ga.