Geochemical characteristics of the Quaternary volcanic rocks from Hatay region, Southern Turkey: Evidence for lithospheric mantle source

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The Hamam–Reyhanli (Hatay) region located in southern part of Turkey, consists of two distinct phases of Quaternary basaltic volcanism that display different geochemical characteristics. The first phase includes alkaline basalts and the second one tholeiitic basalts with SiO_2 contents ranging from 45.55-46.4 and 48.94-50.56 respectively. The former group contain high LILE, LREE, low HREE, Y contents, low Sr and high Nd isotopic values and display negative K, positive Nb, Ta anomalies as compared with the latter group. The geochemical data indicate that all the volcanic rocks are derived from a metasomatically enriched mantle source. The crustal contamination is not an important process in the evolution of the samples. The trace elements and isotopic characteristics of both group suggest that they were derived by partial melting of different depth of a lithospheric mantle source. The higher La/Yb, Zr/Y and La/Nb (<1) ratios reveal that the first group volcanic rocks are derived from a deeper mantle source than the second group.

The relative tempo of weathering and erosion controls supergene metal accumulation

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When the balance between weathering and erosion favors the former, chemically and mineralogically stratified weathering profiles may develop. Weathering may promote the supergene enrichment of mineralized lithologies or the formation of ore deposits from unmineralized substrates. In the first case, weathering is an ore-enrichment process; in the second, weathering is an ore-forming process. Geochronological constraints indicate that under conducive climatic and tectonic conditions, supergene enrichment of some ore deposits may occur extremely fast (less than 1 Ma; e.g., Ok Tedi). Weathering geochronology, on the other hand, indicates that supergene ore bodies in stable cratonic areas may be continuously exposed to weathering for more than 70 Ma (e.g., Carajás). Protracted exposure suggests that some supergene deposits may not reflect any one specific climatic condition, but record the combined effects of changing climates through time. Variations in precipitation, evapotranspiration, vegetation cover, and biological activity ultimately control the composition of the weathering solutions and the mechanisms affecting the dissolution, transport, and redeposition of ore elements in supergene systems. Weathering geochronology and cosmogenic isotope studies provide quantitative constraints on longevity of weathering profiles, rates of physical and chemical erosion, and rates of supergene transport and redistribution of ore elements in supergene systems. Particularly significant are contributions from $^{40}Ar/^{39}Ar$ geochronology of supergene Mn-oxides and alunite-group sulfates; (U-Th)/He dating of supergene Fe-hydroxides; and ^{26}Al, ^{10}Be, and ^{3}He constraints on erosion rates. Results from these studies reveal that most supergene ore bodies preserved on the surface of the planet are younger than ca. 70 Ma (some much younger); resulted from protracted and episodic dissolution and reprecipitation of ore minerals, with effective leaching of deleterious elements; and are preserved in areas of low to very low (less than 1 $m.Myr^{-1}$) erosion rates. The application of these analytical approaches on a global scale indicates that paleoclimates in the late Cretaceous-early Paleocene, the early Eocene, and the early to mid Miocene were especially conducive to weathering-driven ore forming processes.