GEOCHEMICAL CONSTRAINTS ON THE CENOZOIC ALKALINE VOLCANIC ROCKS OF NW TURKEY: MANTLE SOURCES AND MELTING PROCESSES

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The North-West Turkey contains a number of intra-continental alkaline volcanic eruption sequences formed along the localised extensional basins developed in relation with the Late Cenozoic extensional processes. The volcanic suites comprise the extracted liquid and residual solid products of adiabatic decompression melting of the mantle that are represented respectively by: (1) small-volume intra-continental plate volcanic rocks of alkaline olivine basalts and basanites with compositions representative of mantle-derived primary (or near-primary) melts; and (2) abundant ultramafic mantle nodules that were brought up by the alkaline magmas. The volcanic rocks are characterised by OIB-type trace element patterns with significant enrichment in LILE, HFSE and L-MREE, and a slight depletion in HREE, relative to N-MORB. Trace element variations of individual basaltic eruption sequences indicate that each lava sequence show remarkably similar temporal-compositional trends that are characterised by an increase in incompatible elements and MgO, with decreasing SiO₂, as melt production proceeds. Systematic changes in melt chemistry with time does not reflect fractional crystallisation nor can it be explained by variable proportions of mixing between melts produced by different degrees of partial melting of two (or more) compositionally distinct sources in the mantle. Instead, the observed trends are consistent with a progressive decrease in degree of melting from early-formed alkali olivine basalts to later basanites and systematic mixing between increments of melt derived from the same source but probably at different depths. Quantitative trace element modelling of fractionation-corrected data indicates that mafic alkaline magmas
formed by variable degrees (~2% to 10%) of incremental partial melting of a single mantle source that is enriched in all incompatible elements (e.g. LILE, HFSE and L-MREE) relative to hypothetical Depleted MORB Mantle (DMM) and/or Primitive Mantle (PM) compositions. The peridotite xenoliths are generally refractory spinel-harzburgites and dunites with geochemical signatures representative of solid residues of varying degrees of partial melting. Trace element data for whole-rock peridotite xenoliths show LREE enrichment caused by melt metasomatism and U-shaped REE patterns with MREE depletions that probably reflect carbonate-rich fluid metasomatism.