Two-stage collision between Indian and Afghan plates: Evidences from geochemical signatures

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Trace elements and REEs concentration in the mafic ultramafic rocks of the dismembered units of the Waziristan ophiolites (Pakistan) were determined by ICPMS for petrogenetic implications. The lower NB/La ratio (<0.85), negative Nb and Ti anomalies, flat pattern of HFS-elements (Zr, Y) in the NMORB normalized spider diagram, enrichment of LIL-elements (Rb, Ba, Th, Sr) and depletion in Nb (<0.8 ppm) suggest addition of subduction component to the depleted mantle source for gabbroic and basaltic magmas. Tectonic discrimination diagrams i.e. Th/Y–Ta/Y diagram, Ti/Yb–Nb/Yb diagram, Ti/100–Zr–3*Y and Ti/100–Zr–Sr/2 diagrams show transitional character of gabbroic and basaltic rocks between Island Arc Tholeiite (IAT) and depleted mantle Island Arc basalt (NMORB) which is possible in low–pressure extensional environment directly above a subduction or a supra subduction zone. The ophiolite package structurally lying above the syn orogenic and forearc basin (trench–accretionary system) imply that emplacement initiation predates thrusting of the Late Cretaceous accretionary deposits on Indian Plate in Paleocene. These data show that the India–Afghan suturing completed in two tectonic events; i: Late Cretaceous ophiolite obduction and ii: Paleocene final closure (collision). The dataset further indicates that the mixed ophiolite and accretionary system originated in a subduction–accretion setting during two stage collision of the Indian-Afghan plates.