

Late Cretaceous A-type magmatism in northwestern Iran reveals an episode of extensional tectonics

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A-type granitoids are commonly found in extensional and/or within-plate settings and a thus potential paleotectonic indicator. Along orogenic belts, however, their existence has been poorly documented but could mark important episodes of extensional tectonics during orogeny. This study documents a pulse of A-type magmatism from the Urumieh plutonic complex in the northwestern part of the Sanandaj-Sirjan zone, a Cimmerian continental mass sandwiched between the colliding Arabia and Eurasia continents. The sample set includes granitic rocks and related gabbro-diorite enclaves from the complex. Zircon U-Pb dating of representative samples yields a coherent crystallization age of ~96 Ma. A subset of granitic rocks exhibits ferroan, peralkaline compositions, high Ga/Al (>5) and incompatible trace element abundances, and marked negative anomalies of Ba, Sr, P, Eu and Ti in trace element patterns, conforming to most geochemical criteria for A-type granitoids. While also ferroan, another subset shows weakly peraluminous compositions, and lower Ga/Al (<2.5) and incompatible trace element abundances than the first subset, features that are probably related to late-stage fractionation of accessory minerals. Gabbro-diorite enclaves are transitional to alkaline, showing ocean island basalt-like trace element patterns without any significant anomalies. Collectively, we suggest that the A-type magmas from the Urumieh plutonic complex formed by extensive crystal fractionation of a transitional to mildly alkalic basaltic parent. The Late Cretaceous age obtained in this study coincides with a magmatic lull over the Arabia-Eurasia collision zone, but overlaps with a key period of Neotethyan ophiolite formation. We suggest that magmatism was related to extension after accretion of the Sanandaj-Sirjan zone to the southern margin of Eurasia. This extensional event might have also led to opening of a marginal basin preserved as the inner Zagros ophiolitic belt.