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U-Pb zircon ages from the Sanandaj-Sirjan zone, Iran: Arguments for the plate tectonic relationships

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The aim of this paper is to provide new constraints and to discuss potential new models of the plate tectonic evolution and position of the Iranian terranes within a global framework, particularly its relation to the northern Gondwana margin. The new U-Pb detrital zircon geochronology of the central segment of the Sanandaj Sirjan metamorphic zone (SSMZ) in the Zagros orogenic belt is a key to acclaim a new scenario and significant challenges to existing models. The Dorud-Azna area known as a polyphase metamorphic succession, located in the central part of the SSMZ close to the Main Zagros thrust, consist of a Panafrican basement with Gondwanan affiliation of continental (e.g., the granitic Galeh-Doz orthogneiss) and oceanic/rift (e.g., various amphibolites and metagabbro) origin intruded by massive gabbro in the eastern part. The U-Pb laser ablation ICP-MS U-Pb zircon age of the metagabbro is at 314.6 ± 3.7 Ma indicating a "Variscan" event, now more often found in Central Iran. The metagabbro is characterized by Mg#= 59.06, features of near-primary magma, and strongly enriched in LREE, as well as calk-alkaline differentiation trend with pyroxene accumulation. Detrital zircons of a garnet-micaschist located in the adjacent of the metagabbro yield six distinctive groups of ages. A Panafrican age population ranges from 595.8 ± 3.9 Ma to 665.3 ± 4.12 Ma, an age population ranges from 721.3 ± 3.3 Ma to 779.9 ± 3.93 Ma (here termed Sinian A), another age population ranges from 858.9 ± 3.54 Ma to 896.2 ± 3.72 Ma (Sinian B), a Late Grenvillian population age ranges from 930.8 ± 3.4 Ma to 987.6 ± 6.4 Ma, Early Proterozoic A age population age ranges from 2072.5 ± 18.46 Ma to 2149.5 ± 17.95 Ma and an Early Proterozoic B age population from 2400.6 ± 17.73 Ma to 2501.3 ± 17.53 Ma. The 533.3 ± 2.12 Ma detrital zircon proofs a Cambrian or younger age of the garnet-micaschist. The new U-Pb age results for the protolith of garnet-micaschist define one previously unrecognized Late Grenvillian age population at ~0.93 to 0.99 Ga. This unique age group could be used to the origin of the Sanandaj-Sirjan zone. Together with biogeographic evidence, which proofs some Ordovician biogeographic relationships with the South China craton, the Grenvillian detrital age population may either relate to the (1) "Gondwana superfan" or with (2) the south China craton. The Sinian A and B age groups might argue for the second alternative.