



Provenance analysis, detrital zircon geochronology and Hf isotopes from the Kopet Dagh basin, NE Iran: Implications for geotectonic history

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The Kopet Dagh is a thick-skinned, tectonically inverted mountain range situated along the Iran-Turkmenistan border. It comprises clastic and carbonate sedimentary rocks ranging in age from Jurassic to Neogene. We determine the provenance of Middle Jurassic deep marine turbiditic sandstones, Upper Jurassic-Lower Cretaceous deltaic-shelf sandstones and Paleocene continental conglomerate by describing sandstone modal framework, heavy minerals, detrital zircon U-Pb ages and in-situ Hf isotopic analyses. This work aims to determine the assemblages of source rocks of the investigated sediments and to reconstruct the tectonic setting of clastic sediment deposition. Modal sandstone framework compositions indicate that a magmatic arc and recycled deformed sediments were the main sources of Middle Jurassic-Lower Cretaceous sandstones and Paleogene conglomerate, respectively. Heavy mineral assemblages including ultra-stable and meta-stable minerals indicate magmatic rocks and recycled sediments as a main source of clastic rocks. Detrital zircon U-Pb ages (2478 measured ages) cluster in six main age groups: The oldest zircon grains in the Kopet Dagh belong to two populations peaking at 1833 Ma (Paleoproterozoic) and 643 Ma (Neoproterozoic). These grains suggest a continental crust provenance within the Central Iranian and Eurasian blocks. Detrital zircon grains of Silurian (437 Ma), Lower Carboniferous (340 Ma), Triassic (233 Ma) and Lower Cretaceous (132 Ma) are the major age population in the Kopet Dagh. Hafnium isotopic compositions in Zircons (175 measurements) indicate their origin: Silurian and Triassic zircons show a magmatic provenance, preferentially related to intracontinental rifting. Hafnium isotopic compositions of Lower Carboniferous and Lower Cretaceous zircons indicate a continental magmatic arc source.

Our results indicate that Middle Jurassic-Lower Cretaceous detritus have been supplied from Silurian and Triassic rifting-related magmatic rocks and Lower Carboniferous / Lower Cretaceous continental magmatic arcs. The variety of source rocks is in concordance with rifting and an extensional regime in Kopet Dagh during Middle Jurassic time. Paleocene clastic sediments result from erosion of deformed older sedimentary rocks within the basin. This indicates that the first stage of deformation in Kopet Dagh basin took place in Paleocene time.