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Neogene Basins of the West-Central Alborz Mountains: implications for the onset of collision related deformation in northern Iran and the spatial and temporal development of the Turkish-Iranian Plateau

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Neogene stratigraphy preserved in synclinal intermontane basins of the western Alborz Mountains in northern Iran records the onset of Arabia-Eurasia collision related deformation in this region. We identify two stratigraphic faciess informally named the Gand Ob facies and the Narijan facies, that represent two different basin systems that existed in the Alborz. The Gand Ob facies unconformably overlies lavas of the Eocene Karaj Formation and is composed of fossiliferous lagoonal marine rocks that grade laterally into fluvial and alluvial terrigenous clastic rocks. Interstratified with the Gand Ob facies rocks are 32.7$\pm$0.3 and 32.9$\pm$0.2 Ma basalt flows (^{40}Ar/^{39}Ar). Fossils from stratigraphically higher limestones give a Rupelian to Burdigalian age and indicate deposition in the Qom sea that covered central Iran during Oligocene to middle Miocene time. The Narijan facies unconformably overlies the Gand Ob facies and is composed of lacustrine and fluvial rocks as well as alluvial fan conglomerates exhibiting growth strata that record syncontractional deposition of the Narijan facies. We correlate the Gand Ob facies with the Oligocene-Middle Miocene Qom Formation of central and northern Iran based on the basalt and fossil ages and on lithology. We correlate the unconformably overlying Narijan facies with the Middle Miocene-Pliocene Upper Red and Hezardareh Formations of central and Northern

Iran based on its position above the Gand Ob facies, its lithologic similarity to these formations and a micro-diorite dike that intruded the basal Narijan facies at 8.74±0.15 Ma ($^{40}Ar/^{39}Ar$). The Narijan facies is exposed in the Taleghan and Alamut synclines which were formerly considered separate synformal, east-west trending, intermontane basins. Based on the Narijan facies distribution in and around the Taleghan and Alamut synclines we reinterpret the Narijan facies rocks preserved in them as remnants of a much larger ancestral Taleghan-Alamut basin that developed during Middle Miocene time. The Parachan thrust system (new name) imbricates the northeastern ancestral Taleghan-Alamut basin. 6.7±0.1 Ma to 8.74±0.15 Ma dikes ($^{40}Ar/^{39}Ar$) cut the lower Parachan thrust and the Narijan facies rocks preserved in the footwall of the thrust. Post-intrusive slip on this fault offset the dikes by as much as 20 m. These data and the geologic relationships suggest that deformation migrated into the ancestral Taleghan-Alamut basin by Late Miocene time and that deformation within the basin continued after 6.7±0.1 Ma. Undeformed, sub-horizontal alluvial and fluvial sedimentary rocks that unconformably overlie tightly folded and faulted Narijan facies rocks were overlain at 2.86±0.83 Ma by andesitic lava flows. Deformation of the ancestral Taleghan-Alamut basin was therefore complete before Late Pliocene time. Late Pliocene to recent brittle deformation in the western Alborz occurs mainly along the southern range front and possibly along the Taleghan fault zone. The data and interpretations presented here suggest that contractional deformation in the western Alborz started in Middle Miocene time. This is consistent with thermochronological results from the western Alborz that place the onset of rapid exhumation in the western Alborz at ∼12 Ma. The onset of synchronous contractional deformation in the Alborz, Turkish-Iranian Plateau, northwestern Zagros Mountains and southeastern Anatolia in late-Middle Miocene to early-Late Miocene time coupled with the cessation of Tethyan/Indian saline-water influxes into the Indian Ocean from the Neotethys Ocean at ∼ 14 Ma suggests that the Neotethys closed and the Arabia-Eurasia collisional process began by late-Middle Miocene to early-Late Miocene time (∼12 Ma).