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Tectono-stratigraphic evolution of the Northern Iranian Plateau (N Iran)

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High orogenic plateaus are extensive, arid, generally internally drained, and low-relief morphotectonic provinces, which strongly impact atmospheric circulation and rainfall patterns and the tectonic stress field. Located in the Arabia-Eurasia collision zone between the Urumieh Dokhtar Volcanic Zone and the High Zagros mountains, the NW-SE oriented, ca. 2-km-high Iranian Plateau comprises a rigid, virtually aseismic block with a crustal thickness up to 56 km. The age of the plateau can be roughly constrained to be younger than 18-17 Ma, based on the uplift of marine deposits. The plateau constitutes a series of mountain ranges and sedimentary basins. In the northern sector of the plateau these basins have been recently excavated by the northward draining Ghezel Ozan River. These conditions together with the excellent preservation of sediments younger than 18-17 Ma make this region an ideal location to decipher the mechanisms of plateau uplift and lateral growth.

To achieve these goals we have designed a study to date deformation and exhumation processes across several mountain ranges of the northern Iranian Plateau (see abstract EGU2014-6939) and established a detailed chronostratigraphic framework. Combined, our sedimentologic, magnetostratigraphic, geochronologic (Ar-Ar, U-Pb) and provenance data from the Mianeh-Zanjan region show that widespread alkaline volcanism occurred between at least 20 and ca. 16 Ma. The volcanic and volcaniclastic deposits are interbedded with fine-grained clastic and evaporite deposits, reflecting playa-lake and lacustrine settings. Upsection, these sediments grade into channelized sandstone and fine-grained floodplain deposits of braided to meandering fluvial systems. Growth strata document widespread syndepositional contractional deformation. Sediment provenance and magnetic lineations show that detritus was sourced from the interior of the plateau, suggesting that sedimentation was associated with the development of large drainage systems. Starting from ca. 11 Ma, a major episode of progradation of conglomerates occurred. Our preliminary low-temperature thermochronology data suggest that this episode may reflect an increase in sediment supply triggered by the growth of new structures, although the role of climate and intensified surface processes cannot be excluded and must be still investigated. This episode was associated with a progressive basin compartmentalization and the development of intermontane basins. Although characterized by deposition in alluvial-fan and lacustrine settings each basin had developed a distinct stratigraphic sequence, which was incised and partially removed in more recent times. Dating of these deposits is still in progress and will complete the refinement of our new chronostratigraphic framework.

Collectively, these data suggest that sedimentation occurred in a contiguous foreland-basin system, most likely triggered by thrust stacking and topographic loading in the interior of the plateau. The outward N to NE-directed propagation of the deformation fronts excised parts of the foreland, incorporating new basin sectors into the orogenic plateau and compartmentalizing the foreland into a contractional basin and range topography.