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Plio-Pleistocene Stratigraphy of the Kura Basin, Azerbaijan: Implications for the Formation of the Greater Caucasus and Kura Fold-Thrust Belt

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The west-northwest trending Greater Caucasus Mountains form the northern edge of the Arabia-Eurasia collision within the Alpine-Himalayan belt. Recent thermochronologic work suggests the Greater Caucasus initiated in the west and that rock uplift has propagated eastward overtime. Since the Pliocene, the main locus of shortening has shifted south, from the Greater Caucasus to the Kura fold-thrust belt in Georgia and Azerbaijan. Eastward decreasing structural complexity and depth of exposure within the fold-thrust belt suggest diachronous initiation and eastward propagation similar to the Greater Caucasus. The south- and eastward propagation of this fold-thrust belt into the Kura foreland basin has progressively deformed and exposed sediments shed during earlier stages of Greater Caucasus uplift.

The lithology, petrography, and geochemistry of age-correlative Kura Basin sediments exposed within the central ($\sim$46.8˚E) and eastern ($\sim$47.8˚E) portions of the Kura fold-thrust belt vary significantly both along- and across-strike. Four measured sections, three within the central portion and one in the eastern section, expose compositionally immature sediments of heterogeneous siliciclastic lithologies. The three central sections measured across the fold-thrust belt (perpendicular to the strike of the fold-thrust belt and Greater Caucasus) interrogate mainly Pliestocene age sediments, with the northernmost, section extending into the Pliocene aged Productive Series. Lithologies suggests that for much of the Pliestocene an extensive braid plain extended $\sim$30 km southwestward from the modern Greater Caucasus rangefront. Just north of the modern Mingachevir reservoir, exposures of predominantly fine grained sediments are consistent with a shallow lake with occasional aerial exposure existing for much of the Pleistocene. South of the Mingachevir reservoir, the sediments record a large east-west striking meandering fluvial system, similar to the modern southeast-flowing Kura River, indicating the main axis of the Kura Basin at this longitude has remained relatively stationary since the Pleistocene. The easternmost section records a marked upwards coarsening, with fine grained muds at the base transitioning to coarse conglomerates. This section was previously mapped as mid-upper Apsheron (1.2 – 0.7 Ma), but geochemical correlation of an intercalated ash horizon near the top of the section to an ash in the central sections known to be $\sim$1.2 Ma instead suggests that the base of this section extends to between $\sim$3-4 Ma.

Whole-rock sandstone geochemistry suggests along-strike spatial and temporal variations in the source area for the Kura Basin sediments. In particular we identify three “units” based on tightly grouped populations on Th-Sc-Zr/10 and La-Th-Sc discriminatory diagrams. These populations contain rocks of similar age within measured sections in the central region, but differing age when comparing the central and eastern regions. Investigation of these populations petrographically and with additional geochemical discrimination diagrams suggest they generally correlate to both an overall decrease in the input of volcanic material over time, but also a change in source material from intermediate to progressively more felsic volcanic. These results suggest that in the central portion of the belt, during the late Pliocene and early Pleistocene, the predominant source areas were intermediate volcanic or volcaniclastic rocks, potentially of the Vandam arc, which were progressively exhumed and completely eroded in the section of the Greater Caucasus north of the central region. These source rocks are no longer exposed within this portion of the Greater Caucasus, instead only occurring to the east. Contrastingly, Plio-Pleistocene age sediments within the eastern region indicate that volcanics and volcaniclastics were never a significant source, suggesting that the modern the Vandam arc rocks directly north of these sections have been exposed only post $\sim$1 Ma. Collectively these data are consistent with thermochronologic evidence suggesting an eastward propagation of the Greater Caucasus.