Distinguishing Source Areas of Upper-Permian Fluvial-Lacustrine Deltaic Sediment Fills of a Half Graben Through Petrographic Study, Southern Bogda Mountains, the Greater Turpan-Junggar Basin, NW China

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The location, lithology, and unroofing history of provenance affect the type, amount, and texture of sediments filling half grabens. Both distant Northern Tianshan arc to the north and local horsts are possible sources of Upper-Permian Wutonggou Formation in Tarlong-Taodonggou half graben, southern Bogda Mountains, NW China. The half graben is in the greater Turpan-Junggar intermontane rift basin, similar to the Basin-and-Range Province in western U.S. Petrographic and stratigraphic data were used to identify the main source and to reconstruct its unroofing history. Stratigraphic data suggest Wutonggou Formation was deposited in fluvial and lacustrine deltaic environments. 1500 grains in 5 arenites of Wutonggou Formation were counted. Two petrofacies, A and B, have compositions of $Q_5F_7L_{88}$ and $Q_{32}F_8L_{60}$, respectively. Facies A occurs in the lower 335 m; Facies B in the upper 50 m. The lithic grains are mainly volcanic, indicating the Tianshan arc was the main source. The abundance of volcanic grain and rarity of quartz in Facies A suggest an undissected Tianshan arc during initial arc unroofing; the significantly increased quartz in Facies B suggests a transitional arc where intrusive rocks were partially unroofed. The interpretation is supported by clast counting results of 4 conglomerates (2060 point-counts) in the lower 190 m of Wutonggou Formation. Abundant (96%) andesitic and dioritic clasts suggests North Tianshan arc as the main source; upward increase of phaneritic clasts from 3 to 14% suggests increased exposure of intrusive rocks. In addition, upsection sandstones become finer and conglomerates less abundant and finer, suggesting lowered provenance relief and increased catchment size. Provenance and catchment evolution had significantly improved the compositional and textural maturity of sandstones filling the Tarlong-Taodonggou half graben. Similar trends are probably present in other grabens of the greater Turpan-Junggar basin.