The extent of Early Permian mafic and felsic igneous rocks, which were emplaced in the Tarim block and its surrounding mobile belts, exceeds 200000 km$^2$, making it comparable in scale to large igneous provinces. Given the little evidence for lithospheric stretching during the late Paleozoic and relatively thick lithosphere (>150 km) beneath the Tarim Basin, a large thermal anomaly within the mantle (i.e., mantle plume) is advocated. Radiometric ages suggest that the different rock units in the Tarim LIP formed between 291 and 274 Ma, with two prominent magmatic pulses, clustering at 290 Ma and 280 Ma, respectively. The inferred low eruption rate is in accordance with the intercalation of volcanic rocks with sediments as observed in outcrops and in drilled holes, although the relationship between volume of magmatic emplacement and timing is unclear. This contrasts with the high eruption rate in the Deccan Traps and Emeishan LIP, but is similar to the Paraná-Etendeka LIP. The two magmatic pulses possess distinct geochemistry, with ~290 Ma magmas having weak depletion of Nb and Ta and enriched Sr-Nd isotopic ratios, whereas ~280 Ma magmas having OIB-like trace element composition and depleted Sr-Nd isotopic composition. The early magmatic phase is suggested to be derived from the sub-continental lithospheric mantle, whereas the late phase was sourced from the convective mantle. The temporal shift in magmatic source is accompanied by migration of Permian magmatic centers from the craton’s interior to its periphery. This temporal-spatial-compositional evolution pattern in the Tarim LIP is inferred to reflect different style of the plume-lithosphere interaction. The thick lithosphere underneath Tarim may act as a lid, hindering the melting of rising plume material. Under this circumstance, only enriched components in the SCLM melt in response of upward heat transfer from the plume, producing the ~290 Ma magmas. While heating the overlying SCLM, the plume head started to flatten, and in particular flowed towards the lithospheric weak zones, such as the Bachu uplift area and surrounding orogenic belts. The thin lithosphere in these areas allows the decompression melting of the rising plume, generating the ~280 Ma magmatic phase. If this model holds, location of plume-derived magmas along the lithospheric thin spots/zones is also the site in future prospecting of mineral resources. Whether the Tarim plume affected the CAOB requires future studies.

**Key words:** Early Permian, Tarim large igneous province, geochronology, geochemistry, plume-lithosphere interaction, NW China