Cross-Cultural Provenance and Characterization of Turquoise Artefacts: A Multi-Analytical Non-Destructive Study of Reshui Tomb Cluster, China (744 AD) and Tepeh Zagheh, Iran (5200–4200 BCE)

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Turquoise has long held considerable cultural, economic, and symbolic significance across ancient civilizations, functioning both as a prestigious ornament and as a medium of exchange. Its distribution provides important insight into long-distance trade networks (figure 1), resource procurement strategies, and the sociopolitical structures that facilitated material mobility. This study presents a cross-cultural, comparative analysis of turquoise artefacts from two geographically distinct archaeological contexts: the Reshui Tomb Cluster (Xuewei Tomb No. 1, Qinghai Province, China, Tang Dynasty, 744 AD) (Ma *et al*., 2024) and Tepe Zagheh (Qazvin Plain, Iran, Transitional Chalcolithic period, 5200–4200 BCE) (*Vidale et al*., 2018).

A non-destructive, multi-analytical methodology was applied to characterize the mineralogical and geochemical composition of the turquoise samples. The analytical techniques included Raman spectroscopy, Fourier-transform infrared spectroscopy (FTIR), Energy-Dispersive X-ray Fluorescence (EDXRF), and Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS). Provenance determination was supported by an extensive LA-ICP-MS dataset comprising over 2,000 measurements from turquoise deposits across China (Hubei, Henan, Shaanxi, Xinjiang, Gansu, Qinghai, and Anhui) and 586 measurements from main Iranian sources (Neyshabur, Baghu, and Meiduk). Together, these complementary methods enabled the identification of diagnostic mineral phases, trace-element patterns, and rare earth element (REE) distributions critical for accurate provenance attribution (*Shirdam et al*., 2024).

For the Reshui assemblage, preliminary hypotheses positioned Delingha (Wulan region, Qinghai) as the likely source, based on the presence of sedimentary-hosted min-

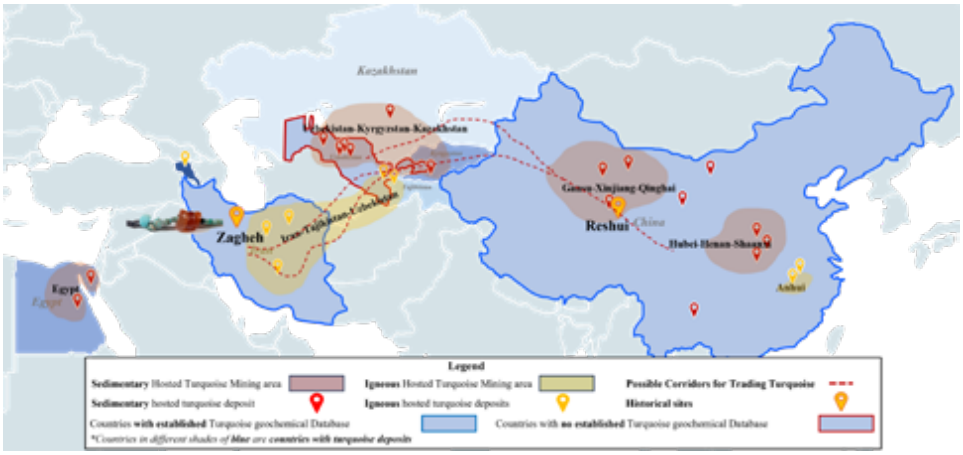

Figure 1. Major turquoise sources along the silk road and the location of studies artefacts to the trade routes

eral traits. However, detailed mineralogical and trace-element data, including rare earth element (REE) profiles and secondary mineral associations, didn't match with known Delingha specimens. Instead, geochemical consistency was found with turquoise from the Shuangying Mountain Formation in Beishan, Gansu Province. This reassignment redefines understandings of Tang Dynasty turquoise procurement, indicating that acquisition was likely integrated into formalized, state-regulated trade routes through the Hexi Corridor, a strategic segment of the Silk Road. The association of Gansu-sourced turquoise with elite tombs in Qinghai suggests centralized control over high-value resources and underlines the reach and sophistication of Tang economic networks.

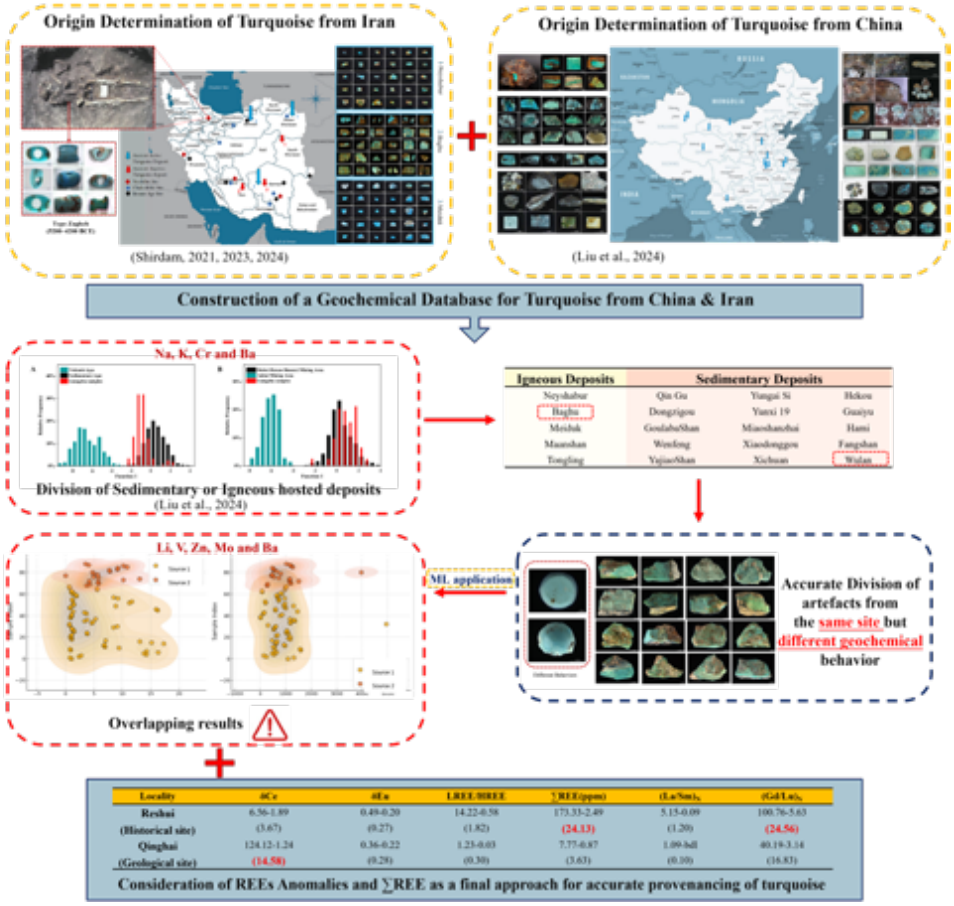

Figure 2. Technical workflow for turquoise provenancing, including an example of data processing and strategies for resolving overlapping geochemical signatures

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