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# Geodynamic reconstruction and metallogeny of the Tien Shan, Uzbekistan

Seltmann, R.[1], Dolgopolova, A.[1], Armstrong, R.[1], Belousova, E.[2], Konopelko, D.[3], Shatov, V.[4], Khalmatov, R.[5] and Koneev, R.[5]

[1] NHM, Department of Earth Sciences, CERCAMS, London SW7 5BD, UK (E-mail: rs@nhm.ac.uk)
[2] Macquarie University, CCFS/GEMOC, NSW, 2109 AUSTRALIA
[3] St. Petersburg State University, Geological Faculty, St. Petersburg 199034, RUSSIA
[4] Russian Geological Research Institute - VSEGEI, St. Petersburg, Russia
[5] NUUz, Department of Geology, Tashkent, UZBEKISTAN

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Sr-Nd-Hf-Pb isotope mapping combined with U-Pb zircon SHRIMP ages and Re-Os sulphide geochronology of granitoids from profiles across terrane boundaries in Uzbekistan reveal distinct reservoir types (cratonic vs turbiditic), corresponding to diverse nature and origin of granitic magmatism and its hosted ore-forming processes. Three main tectonic domains are recognized described from E/NE to W/SW - Middle Tien Shan, Southern Tien Shan and Karakum microcontinent:

1. Northernmost (as part of Middle Tien Shan), the **Beltau-Kurama tectonic zone** with recycled crust of continental arc (C1-P2), represented by the giant Kalmakyr Cu-Au porphyry (~315 Ma) emplaced within massive Devonian to Carboniferous sediments and volcano-plutonic units. To the W is located the **North-Bukantau tectonic zone** characterised by D1-C2 oceanic arc tholeiites with slivers of Cambrian oceanic crust and C1-C2 bimodal volcano-plutonic arc with volcanomictic carbonate-terrigenic series.

2. Following to the SW are PZ2 turbidites of the Southern Tien Shan accretionary complex, represented by **Turkestan-Alai tectonic zone** hosting the Zarmitan intrusion-related gold deposit (~285 Ma) in Nurata region, and Muruntau giant gold deposit (~290 Ma) in Kyzyl-Kum. To the W (SW), it envelopes the Sultanuvais tectonic zone (ensialic arc) that hosts ophiolites.

3. Southernmost follow the **Zarafshan-Alai** and **South Gissar tectonic zones**, O3-C2 backarc basins stitched by post-collisional granites of C3-P ages developed on pre-Cambrian cratonic crust of the Karakum microcontinent.

Sr-Nd isotopes (whole-rock) of all domains show a wide range of $\varepsilon$Ndt (-5 to +7) and ($^{87}Sr/^{86}Sr$)t predominantly between 0.704 and 0.707, indicating involvement of both mantle-derived material (e.g., subduction of oceanic crust) and older crustal sources (Mesoproterozoic model ages).

The large range of Hf-isotope compositions found in zircons of granites from Kurama, Middle Tien Shan, ($\varepsilon$Hf ~ -6 to +5) suggest recycling of older heterogeneous crustal protolith(s). In the Southern Tien Shan involvement of subducted oceanic crust is exemplified by juvenile $\varepsilon$Hf values of up to +14 (Sultan-Uvais) and +16 (Teksquduk-Kyzylkum). However, Permo-Carboniferous granitoids crossing all terrane boundaries exhibit predominantly crustal signatures indicating Neoproterozoic protoliths.

Pb isotopes (whole-rock) exhibit a present-day range of $^{206}Pb/^{204}Pb$ 18.229-20.718, $^{207}Pb/^{204}Pb$ 15.607-15.823 and $^{208}Pb/^{204}Pb$ 38.077-39.827. These are in full agreement with Sr-Nd-Hf isotopes indicating the dominance of a crustal component as well as crust-mantle mixing processes.

The granitoid samples from Middle Tien Shan, Southern Tien Shan and Karakum microcontinent show a variation of crustal to mixed signatures with a significant contribution of older components.

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