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## The Muruntau singularity



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Among the gold deposits of the Urals and Tien Shan orogens, Muruntau stands out with an estimated ~ 6500 tons of gold (~ 210 million ounces), an order larger than the other world-class deposits in these belts (e.g., Berezovskoe, Kochkarskoe, Zarmitan, Jilau, Jerooy, Kumtor).

Muruntau is the westernmost known gold deposit in the southern Tien Shan. From the spatial distribution and density of known deposits one may predict that between Southern Urals and Kyzylkum there is the potential for the discovery of at least one more major mine camp under sedimentary cover.

Uncertainties concerning the evolution of Muruntau have focused on its nature as an orogenic, a lode, a sediment-hosted, a shear zone-hosted, an intrusion-related or a thermal aureole type deposit. These options need to be integrated because there are good grounds for each of them.

According to Wall et al. (2004) the geological framework of Muruntau, with five factors amenable to mineralization, resembles that of other world-class gold deposits.

However, the order of magnitude of Muruntau requires one or more additional factors given the same time window (295 Ma -280 Ma) of formation as the other world-class gold deposits in the Uralides-Altaids.

Indications of the singularity of the Muruntau district are defined by topography (Figures 2, 3, 4, 5) and magnetic field (Figures 3, 4, 5, 6).



Fig. 1 Overview of the region between the Caspian Sea and Lake Balqash in MrSid format satellite imagery. Filled triangles are iron deposits, stars are mercury-dominated deposits and circles are gold-

**VBK magnetic anomaly** 

Fig. 2 Satellite imagery (Fig. 1) and five 100 m altitude intervals (ETOPO2, 2006) in grey values. The Muruntau upland is in yellow circle. Fig. 3 Satellite imagery, topography and 0-100 and 100-200 nT intervals of the Magnetic Map of the World (Korhonen et al., 2007).

## metallogeny + morphology + trans-Eurasian strike-slip deformation





Fig. 6 Part of the Magnetic Anomaly Map of the USSR (Makarova et al., 1974) with the detail of the 'Aral Bend'. The northern part of the Muruntau enclosure is annotated by (1). The configurations of the bends suggest a shear zone (red) along the connecting limb.

Fig. 4 A magnetic anomaly (0-200 nT), emphasized in shades of pink, probably represents the Valerianovka - Beltau-Karama (VBK) arc.

The Central Ust Yurt Fault is a segment of the Scytho-Turanian Fault Zone which is the northern margin of the proposed trans-Eurasian Silk Road arc (Natal'in & Sengör, 2005). Fig. 5 The VBK magnetic anomaly is schematized in pink. The Muruntau upland is in yellow. It is enclosed by a prominent bend (1) in the VBK anomaly to the north, west and east. To the south it just overlaps the Central Ust Yurt Fault. The complexity of the principal 'Aral Bend', around black dot, is shown in Fig. 6.

The Valerianovka - Beltau-Kurama (VBK) belt serves as a marker in the regional deformation that led to the characteristic configuration of the belt. Within the apparently straightforward structural-magnetic grain of the southwestern Tien Shan and the southern Urals (Figs. 4 and 5), the' Aral Bend' and the 'Muruntau envelope' in the VBK belt are highly anomalous.

Compared to the overall elongated and dissected chains of the southern Tien Shan and the Urals, the almost equidimensional outcrop of the Muruntau upland (Figs. 2 and 5) in the otherwise flat Kyzyl Kum lowlands is similarly anomalous.

In view of the coincidence of the singular structural-magnetic, morphological and metallogenic anomalies, in view of their magnitudes, the occurrence of diamondiferous lamproites, and the proximity of the Central Ust Yurt Fault, a relation is proposed in terms of continent-scale deformation and associated plutonic, volcanic and hydrothermal processes.

The magnitude of these processes and the depth range of the magmatic-hydrothermal-metallogenic system are probably commensurate with the scale of deformation and the diameter of the Muruntau uplands.

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