

DISCUSSION

BASEMENT-COVER RELATIONSHIP IN THE KHETRI COPPER BELT AND THE EMPLACEMENT MECHANISM OF THE GRANITE MASSIFS, RAJASTHAN, INDIA by Pratap Gupta, D.B. Guha and B. Chattopadhyay, Jour. Geol. Soc. India, v.52(4), 1998, pp.417-432

K.R. Raghu Nandan, Deputy Director General, GSI (Retd.), Venkatadri, 787, 7th Cross, M.C. Layout, Vijayanagar, Bangalore - 560 040 comments:

Any new work on the Khetri Copper Belt (KCB) is welcome. But, the paper by Gupta et al. appears to create confusion regarding certain aspects of stratigraphy and basement-cover relationship in the KCB. Having carried out exploration for copper for a decade (1964-1974) in the northern part of the belt and been acquainted with the geology, I confine my comments/observations to the North Khetri Belt (NKB).

According to the authors, their paper incorporates the results of recent mapping in the Khetri sub-basin, inclusive of new geochronological data and a general assessment of earlier works. I think, distinguishing an older basement complex of *probable* Archaean age (p.418 and 420) is questionable. I agree that the scheme of stratigraphic sub-division as established in Alwar and Bayana sub-basins is not tenable in the KCB. The Khetri basin (especially in NKB) consists of mainly repeated sequence of argillaceous and arenaceous sediments with calcareous and iron-rich types dominating in the basal part. I consider that many units of the *Basement Sequence* in the NKB as shown in Fig.2, are part of the Delhi Supergroup/Delhi Group as mapped earlier (Das Gupta, 1968). My apprehension is that some of the metasediments of the Delhi Supergroup have been included in the so-called basement sequence. The basement is not well exposed in the NKB, except for limited exposures of sillimanite-bearing paragneiss. The basis for considering all the units viz., 1-6 in Fig.2 as of *probable* Archaean age is not convincing. Do I take that the author's themselves are in doubt?

I draw the attention of the authors again to the lithological map of NKB (Fig.2), where same symbols are given for (basal) quartzite (8) and orthoquartzite (13) in the upper sequence. This could have been avoided.

The authors mention that the Proterozoic cover sequence are dominated by sedimentary and volcanosedimentary lithologies (p.418) but without clearly identifying any specific lithounit as being derived from a volcanic source. In the absence of typical volcanic rocks and any characteristics of exhalites in the mineralised zone, I wonder how they could state that the Khetri basin is *filled with Proterozoic volcanosedimentary rocks* (p.430) without offering any clear supporting evidence.

The authors make a bland statement on copper mineralisation in NKB - "the massive sulphide (copper)-hosted metasediments of the Proterozoic cover sequence" (p.420). I would like to clarify that the stratiform copper mineralisation in the NKB is generally of disseminated type (Raghu Nandan et al. 1981); with rather restricted occurrence of semi-massive (rarely massive) type of mineralisation e.g. Banwas, Kolihan, and Akwali resulting mainly from ore remobilisation.

Earlier work (Das Gupta, 1968) had recorded granite intrusives at Gotro Jaspapur, Rajota and near Babai. While carrying out exploration for copper in Kolihan area near Khetri town, I mapped (on 1:1200) a number of thin leucocratic dykes, sills and veins which were termed 'felspathic intrusives' in the Kolihan central and north blocks, over a strike length of about 1.5 km. Based on

a preliminary study, the felspathic intrusives were described as quartz-poor or quartz-free type, syenitic in composition but exhibiting at places aplite/granite modifications with increase in quartz content (Chandra Chowdary et al. 1977). These intrusives were not recorded during earlier regional mapping of the belt (Das Gupta 1968). In my subsequent work on Kolihan gossans (Raghu Nandan 1979), it was mentioned that the felspathic intrusives are high in K_2O and Al_2O_3 with SiO_2 around 55%. The lithogeochemical exploration carried out in Kolihan (Raghu Nandan and Nandi 1982) revealed high copper content (0.80-1.25% Cu) in some of the gossanous exposures of felspathic intrusives in the Central block. Further, uranium mineralisation is recorded in these rocks and Atomic Mineral Division carried out exploration during 1961-1964. Although I did carry out further studies on these intrusives – petrology, major and minor element geochemistry etc., the data remain unpublished. However, I may mention briefly that these leucocratic intrusives which have low mafic mineral content, display an ultra-potassic affinity (up to 14% K_2O) and could represent an end phase of granitic activity, invading the mineralised zone at depths and incorporating chunks of sulphide ore material as revealed by the oxidised outcrops on the surface.

It is natural to expect the authors to have taken cognizance of the earlier work and carried out further studies, especially when they state their present study is aimed at establishing the new stratigraphic and structural framework of the Khetri basin (Khetri Fold Belt) and also in making an attempt to reinterpret the emplacement of granitic pluton (p.418). They have not even referred to the earlier work. Well, if they had done so, they might have interpreted the emplacement of the felspathic intrusives as representing forceful ballooning or due to forceful permitted type processes!

References

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P. Gupta, D.B. Guha and B. Chattopadhyay, Geological Survey of India, Jhalana Doongri, Jaipur 302 004 reply:

The authors thank K.R. Raghu Nandan for showing keen interest in our paper. The replies to his queries are given below.

1. The authors stick to their observations, as spelt out in the paper, about the basement status of paragneisses, schists and calcareous rocks lying below the unconformity plane observed in the NKB. It is also corroborated by detailed study establishing a structural-cum-metamorphic hiatus, as dealt with in the paper.
2. The apparent confusion in symbols of units 8 and 13 (Fig.2) is due to a reduction of the original figure submitted by the authors. The unit 8 (near Rajota, R) is marked with

alternating filled and unfilled circles whereas unit 13 (near Kalota, KA) is marked by filled circles. The inconvenience is regretted.

3. While dealing with the NKB, authors have only built-up a sedimentary sequence devoid of any volcanic assemblage (see p.418, under heading NKB). Incidentally, the volcanosedimentary assemblage is identified only in SKB and not NKB (see p.422). Therefore, the question of the occurrence of exhalites in the mineralised zone does not arise.
4. 'Massive' is a geometrical term containing certain percentage of ore minerals in a certain width of the ore body. The term massive sulphide is used in that sense only. However, 'semi-massive' and 'disseminated' sulphides are also present.
5. The authors have consulted all the previous work concerning stratigraphy, structure and petrological aspects of the Khetri copper belt and have referred to only relevant publications in their paper dealing solely with the stratigraphic status and granite emplacement mechanism. The papers quoted by the commentator, except for Das Gupta (1968) are not relevant in the present context.
6. The authors welcome the observations on the chemistry of dykes, sills and veins by the commentator. Similar leucocratic granite intrusives found as veins and dykes are referred to in the case of Chapoli, Udaipurwadi and Seoli granites (*see the text*). All these intrusives are obviously forcefully emplaced along certain weak or shear planes.
7. The comments given by Sri Raghu Nandan, "I agree that the scheme of stratigraphic subdivision as established in Alwar and Bayana sub-basins is not tenable in KCB", is a significant departure from the observations made by all the earlier workers including himself. Sri Raghu Nandan has yet to reconcile himself with the idea of recognising the entire metamorphites below the unconformity as belonging to the basement sequence.

ERRATA

In the paper on "Wall rock alteration in Cu-Zn-Au bearing volcanogenic massive sulphide deposit at Danva, District Sirohi, Rajasthan, by I.R. Kirmani and Fareeduddin, which has appeared in Vol.52, pp.391-402, index to the symbols in caption of Fig.5 (d) should read as follows: cross = unaltered rocks, filled circles = altered rocks.