Geodynamic significance of leucogranite intrusions in the Lohit batholith near Walong, eastern Arunachal Pradesh, India

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The Trans Himalayan Lohit batholith in the eastern part of Arunachal Pradesh exhibits a zone of intense shearing at Walong area in Anzaw district. Along the zone, intrusions of leucogranites are well documented in the area between Yasong and Walong of the Lohit valley. Sillimanite and garnet-bearing gneisses of the Yasong area represent the lithology of the host Asian crust. The 5 km wide leucogranite intrusion in the shear zone indicates tight to open asymmetric shear-related folds with boudinaged limbs and veins showing extension fractures. The pre-existing folds of the deformed Lohit batholith show transposition from the wall to the interior of the subvertical high-strain shear zone with a dominant dextral sense. The two-feldspar thermometry of the leucogranites gives a temperature range of 400 ± 50°C. This temperature of inversion from K-feldspar to microcline must have prevailed at high stress conditions at the time of emplacement of leucogranites. Melting of the metapelitic crust at higher temperatures is related to shear heating towards the end phase of development of NW–SE trending dextral shear zone in the region.

Keywords: Lohit batholith, leucogranites, shear zone, geodynamics.

IN the eastern part of the Siang antiform[1], the lithotectonic units of the Himalayan part consist of a Lesser Himalayan belt and the central crystallines represented by the Bomdila group[2]. Different aspects of geology of the antiform and its adjoining regions have been studied by various workers[1–14]. The Sela Group of rocks rests over the Main Central Thrust (MCT; Figure 1). However, the along-strike variation of MCT is significant and could be related to greater crustal shortening compared to the western Himalaya. Further, the high-grade Sela Group of rocks with Sela Thrust at its base is not exposed along the eastern part of the Siang antiform. Therefore, there are variations in lithology and metamorphic grade across the MCT in this part. The Trans-Himalayan part is divided into the Tuting–Tidding suture zone represented by the ophiolitic mélange and the Lohit Plutonic Complex (LPC). An Andean-type calc-alkaline magmatism represented by the batholith is due to the subduction of the neo-tethyan oceanic crust beneath the Eurasian plate. The suture zone rocks are thrusted over the crystallines along the Tidding thrust in the Lohit valley and consist of metavolcanics, minor acid intrusives, marble bands, garnetiferous-graphite schists, intruded by dykes and sills of serpentinite[10]. The LPC is thrusted above the suture zone rocks along the Lohit Thrust[6] (Figure 1). The LPC is about 100 km in width and 250 km in length from NW to SE and exposed along the upstream segments of Lohit, Dibang and Siang valleys. The batholith is divided into a western part of quartz diorites and granodiorites with enclaves of gabbro and an eastern part dominated by leucogranite intrusions along with pegmatites and aplite dykes into the earlier diorites and quartz diorites. The eastern part is separated from the western part by the Walong fault zone (Walong Thrust[2,14]?) The host rock lithology represented by garnet–sillimanite schist is also exposed near the contact.

Whether the leucogranite intrusion is synchronous with the formation of the Walong fault zone is an open question. On the other hand, the shear-related folds shown by the leucogranites in the Walong fault zone indicate that leucogranite intrusion and shearing took place at the same time. The leucogranites in the shear zone provide the kinematic indicators for the shearing episode of the fault zone. The two-feldspar thermometry for leucogranites of the Lohit batholith suggests a temperature range of 400 ± 50°C. But the host-rock mineralogy includes low pressure and high temperature assemblages of sillimanite and granet, which indicate amphibolite facies condition[4]. However, the sillimanite in the leucogranite layers indicates that cooling of the leucogranite dykes may be synchronous with the low-temperature metamorphism of the host rock at late stage of the Himalayan orogenesis[4]. Therefore, the temperature range shown by two-feldspar thermometry must have indicated the preceding stage of shear heating (with involvement of syndeformational fluid phase) that had provided the necessary thermal condition for inversion of K-feldspar to microcline in the leucogranites.

The NW–SE trending Lohit batholith is deformed and the most dominant phase is the regional ductile shear fabric S_2 trending NW–SE and dipping towards NE[14]. This is evident from the fact that the foliation, especially in the southwestern part is parallel to the S_2 foliation of the footwall of the Lohit thrust consisting of the Himalayan metamorphic belt and rocks of the Tidding suture zone. From Hayuliang to Samdul several zones of intense shearing indicate shear folded asymmetric quartz veins indicating top to SW shear sense. In these zones, the stretching lineations (L_{2a}) plunge moderately (8–15°) towards NE to ENE direction (Figure 2 *c*). The stretching lineation (L_{2a}) is very prominent in the Lohit thrust zone both in the Lohit and Dibang valleys. Away from the fault zones and from the zones of intense shearing, the S_2 axial plane schistosity of the F_2 folds trends NW–SE and

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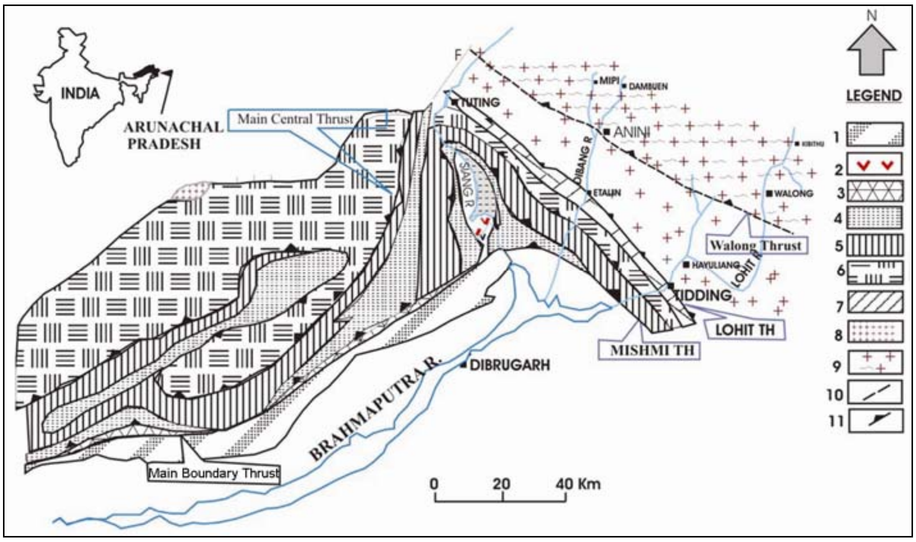

Figure 1. Geological map of Arunachal Pradesh, modified from Singh and Chowdhury[26]. 1, Siwalik Belt; 2, Abor volcanics; 3, Gondwana Belt; 4, Dedga Menga Belt; 5, Bomdila Belt; 6, Sela Belt; 7, Tuting–Tidding Belt; 8, Tourmaline-bearing leucogranite; 9, Mishmi Belt; 10, Fault and 11, Thrust.

dips moderately to NE direction. The L_2 fold axis lineation plunges at about 10–25° to NW or SE direction (Figure 2 *d*). Near the Walong fault zone, stretching lineations (L_{2b}) plunge (10–15°) towards NE, where the general trend of the batholith is NW–SE and dips steeply towards NE direction (Figure 2 *e*). However, within the fault zone, a subhorizontal stretching lineation plunging 6–12° to NW or SE (L_{2b1}) is developed indicating a SE-directed dextral shear sense. Therefore, within the fault zone, NE plunging stretching lineation (L_{2b}) is completely overprinted by the SE or NW plunging L_{2b1} lineation (Figure 2 *f*). The change in the direction of the plunge of the stretching lineation indicates that the Walong fault zone may be reactivated to a major shear zone with dextral shear sense. The dominant trend of S_2 shear fabric is NW–SE or WNW–ESE and dips at 25–35° towards NE; however, near Walong fault zone the dip increases to 60–80° towards NE (Figure 2 *g* and *h*).

The leucogranite dykes in the Walong fault zone are oriented NW–SE and cut the poorly deformed diorites and quartz diorites. The synkinematic leucogranite dykes are emplaced in the NW–SE shear zone at and beyond Yasong in the Lohit valley. The initial intrusions of the leucogranite dykes along the fractures are found to be sheared in the core of the fault zone (Figure 3). The S–C structure and rotation of the porphyroclast indicate a SE-directed dextral strike–slip component. Within the shear zone peraluminous leucogranite dykes show high dip towards SW direction. The S–C structure defines a top to SE sense of shear. From Yasong up to Yapok bridge, the Walong fault zone is a 5 km wide zone of intense shearing. The NW–SE shear zone is a part of the Walong fault zone. The NE plunging stretching lineations of the SW and NE walls of the shear zone are rotated parallel to subhorizontal fold axis lineations plunging gently to SE or NW direction (Figure 2). The F_2 folds at the interior of the shear zone are completely transposed and sigmoidal structures exhibit dominantly clockwise asymmetries.

Quantitative chemical analysis of selected feldspars was done using the Electron Probe Micro Analyser (Model: CAMECA S × 100) at CPL, GSI, Kolkata, with an accelerated voltage of 15 kV and a sample current 12 nA, where the beam diameter is 1 μm. All natural standards were used, except Mn and Ti for which synthetic standards were used.

The elements analysed were Na, K, Ca, Al, Si, Mg, Fe, Mn, Ti and Cr. Altogether 128 points were analysed and 7 images taken (Table 1). The two-feldspar thermometry for leucogranites[15,16] of the Lohit batholith suggests a temperature range of 400 ± 50°C (Table 2), which is the inversion temperature of orthoclase to microcline due to deformation[15,16]. This suggests that the structural state of transformation of alkali feldspar in the leucogranites took place during a post-crystallization thermal event. Subsequent to the crystallization of the Walong leucogranites, a low-temperature thermal event conducive to phase transformation of alkali feldspar took place. The thick sillimanite-grade Asian crust is intruded by the water-saturated peraluminous leucogranites with high present-day Sr value[2]. It indicates a stage of intense veining due to the anatectic melting of the likely metapelitic source. The leucogranites ascended as dykes along the shear zone as the intrusions are highly oblique to the trend of the deformed SW wall rocks of the shear zone (Figures 2 *e*, *f* and 4). For constraining the heat source needed for partial melting of the upper crust, the intrusion or underplating of the mafic magma may not be sufficient.

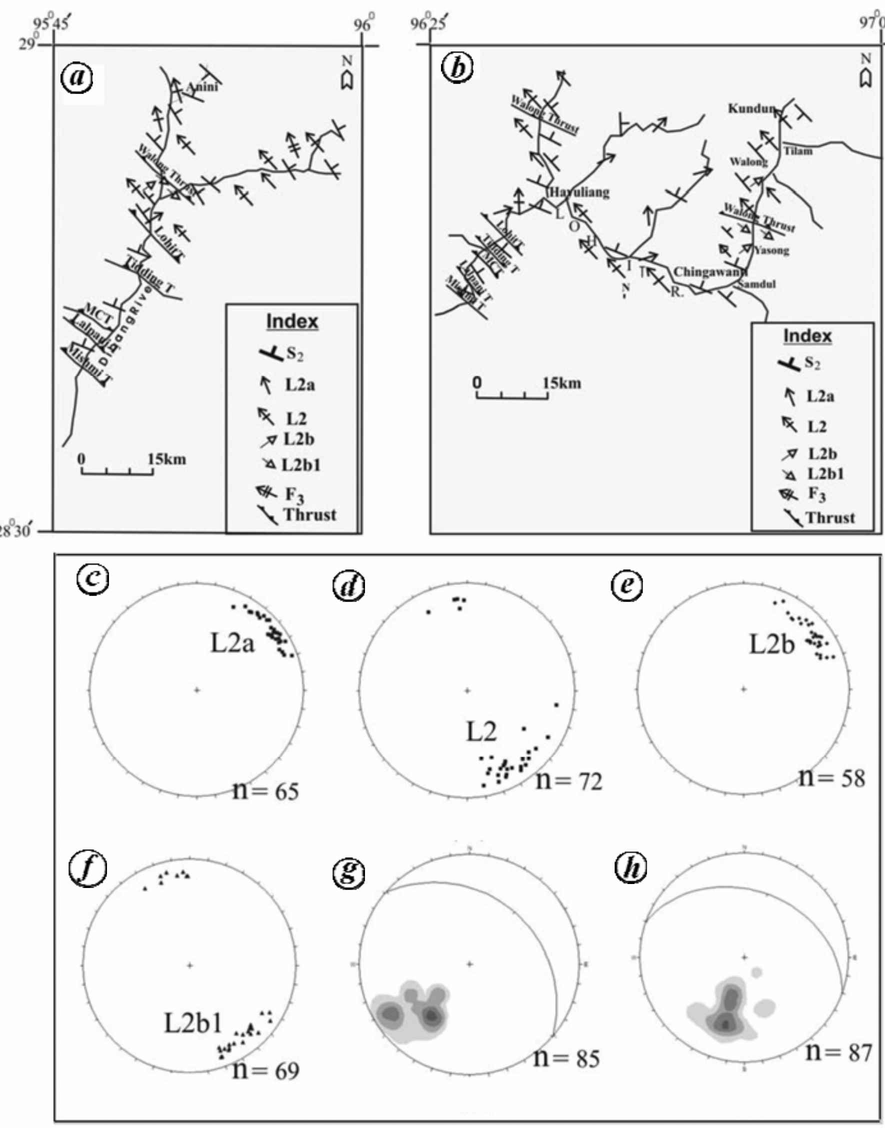

Figure 2. Structural elements in the Lohit batholith in (***a***) Dibang and (***b***) Lohit valley. (***c***) L_{2a}: Stretching lineation plunging to NE near Lohit Thrust. (***d***) L_2: F_2 fold axis lineation plunging to NW or SE between Lohit Thrust and Walong fault zone. ***e***, L_{2b}: Stretching lineation plunging to NE near Walong Thrust. ***f***, L_{2b1}: F_2 fold axis lineation plunging to NW or SE in Walong fault zone. ***g***, ***h***, S_2: Average S_2 foliation trend in the Lohit batholith (Lohit and Dibang valleys). The contour intervals are 3, 6, 20, 23 and > 30%. F_3: Broad warp-type of fold plunging at low angle to NNW.

The mineralogy of the host rock (garnet–sillimanite) does not support the low-temperature decompression melting either. The lack of high-pressure mineralogy indicates that the shear heating of the metapelites may provide the heat source for the melt to be generated[17].

Shear heating of the metapelitic crust contributing to leucogranite generation is discussed in the literature[18–21]. The main contention is that the source rock at the point of anatexis cannot sustain shear heating. Moreover, leucogranite generation at the higher Himalayan slab cannot be equated with the leucogranite generation in the continental arc batholiths. In the present study a number of 4–5 m wide shear zones are observed in the batholith between Hayuliang to Walong. In the Walong fault zone the metapelites should be a part of the Mogok metamorphic belt or metapelitic crust might have thrusted over the basement during continental collision[17]. It is generally believed that granite crust in the ductile regime has very low strength to sustain high shear stress. However, the temperature dependence of mica schist rheology is found to be much smaller than dry granite[17]. The occurrence of muscovite–sillimanite schist in the Walong fault zone can therefore well account for representing the composition of the metapelitic crust, which has contributed to leucogranite generation. The leucogranites may also represent a phase of intrusion under dry conditions of the

Table 1. Chemical composition and cations for K-feldspar (Kfs) and plagioclase feldspar (Plag) from leucogranites of Walong, Arunachal Himalaya

Sample no.	L61 (R)		L62 (C)		L68 (C)		L73 (C)		L74 (C)	
	Kfs	Plag	Kfs	Plag	Kfs	Plag	Kfs	Plag	Kfs	Plag
SiO_2	63.53	59.61	65.04	65.36	65.17	69.5	64.78	64.17	64.59	61.59
Al_2O_3	18.57	25.13	18.39	22.01	18.53	19.26	18.45	22.35	18.50	24.18
TiO_2	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00
FeO	0.03	0.02	0.05	0.01	0.01	0.04	0.00	0.07	0.00	0.05
MnO	0.00	0.00	0.00	0.01	0.05	0.00	0.00	0.00	0.05	0.01
MgO	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
CaO	0.00	6.50	0.00	2.98	0.00	2.39	0.00	3.81	0.00	5.65
Na_2O	1.03	8.18	0.65	10.48	0.72	9.32	0.86	9.87	0.73	8.47
K_2O	14.88	0.10	16.30	0.16	16.12	0.10	15.66	0.15	16.11	0.10
Cr_2O_3	0.03	0.11	0.00	0.03	0.06	0.04	0.01	0.61	0.00	0.00
Total	98.07	99.66	100.43	101.04	100.69	100.7	99.75	101.03	99.98	100.05
Formulae normalized cations										
Si	2.982	2.668	2.996	2.855	2.992	3.008	2.996	2.815	2.988	2.733
Al	1.027	1.326	0.998	1.133	1.003	0.982	1.005	1.155	1.009	1.265
Ti	0.00	0.00	0.00	0.00	0.00	0.001	0.00	0.00	0.00	0.00
Fe	0.001	0.001	0.002	0.001	0.00	0.002	0.00	0.003	0.00	0.002
Mn	0.00	0.00	0.00	0.00	0.002	0.00	0.00	0.00	0.002	0.001
Mg	0.00	0.00	0.00	0.00	0.002	0.00	0.00	0.00	0.00	0.00
Ca	0.00	0.312	0.00	0.139	0.00	0.111	0.00	0.179	0.00	0.268
Na	0.093	0.71	0.058	0.888	0.064	0.782	0.077	0.839	0.066	0.729
K	0.891	0.006	0.958	0.009	0.944	0.006	0.924	0.008	0.951	0.006
Cr	0.001	0.004	0	0.001	0.002	0.001	0.00	0.021	0.00	0.00
Total	4.996	5.025	5.013	5.026	5.009	4.893	5.002	5.021	5.016	5.002

C, Core and R, Rim.

Table 2. Temperatures calculated using two-feldspar thermometry for the Walong leucogranites, Arunachal Himalaya

Sp. no.	Temperature (°C)				
L61 (R)	404	357	311	322	349
L62 (C)	430	383	384	353	388
L68 (C)	440	393	394	365	398
L73 (C)	473	426	427	406	433
L74 (C)	467	426	422	401	429

duteric reactions below 500°C, which may lead to replacement of alkali feldspar by microcline[22]. On the other hand, retrograde crystallization or growth of feldspar[23] can occur in the temperature range 460–500°C. It is important to note that due to the strike–slip displacement in a lithospheric fault zone, partial melting of the upper mantle can take place even in the presence of small amount of fluid. The ascent of the resulting melt can induce considerable amount of crustal melting[24].

NE-plunging stretching lineations in the SW wall of Walong fault zone and reorientation of the lineations in the direction oblique to the earlier direction, indicate a late SE-directed dextral slip component in the fault zone. The timing of deformation in the Walong fault zone is not constrained so far. The Walong fault can be considered as the NE continuation of the dextral Saggaing fault or its splay in the NE part. However, whether the Walong fault zone is reactivated as a strike–slip fault from an initial thrust fault[14] is difficult to constrain. If this is true, the initial pure shear component might have changed through time due to reorientation of the compression direction. A model diagram is proposed for illustrating only the shear component associated with compression (Figure 4). The copious volume of the leucogranite intrusion is another phenomenon which is considered as synkinematic with the reactivation of the fault zone. Two-feldspar thermometry gives a temperature range of 400 ± 50°C, which is the inversion temperature for orthoclase to microcline under high-stress condition. The temperature calculated from the five samples (shown in Table 2) indicates a greenschist facies condition of metamorphism. This temperature is low and indicates that after inversion from orthoclase, microcline is stable at low temperature exhibiting a very highly ordered low-temperature phase[16]. This inversion possibly resulting from a retrograde phase as chloitization of hornblende is also common place in the rocks of the fault zone. The sillimanite-grade metapelites of the basement may be affected by the Tertiary Himalayan thermal event, which may be associated with the reactivation of the fault zone. It helped the structural state transformation of the microclines to a highly ordered reequilibrated state at low temperature rather than the phase transformation during crystallization from a cooling melt[25] which takes place at 500°C.

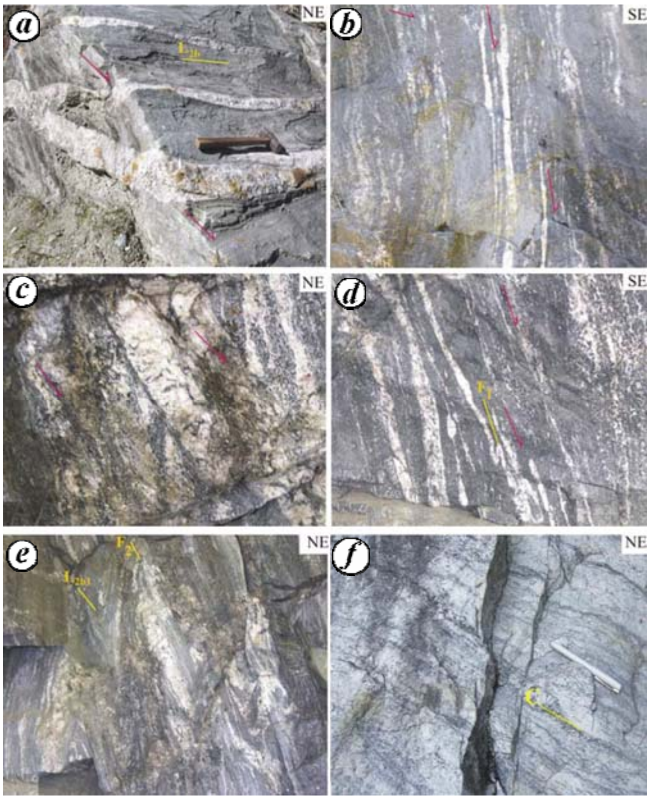

Figure 3. ***a***, Leucogranite vein parallel the axial planes of metapelites near Walong fault zone. L_{2b} stretching lineations plunging to NE. ***b***, ***c***, Dextrally sheared leucogranite shows top to SE movement. ***d***, The upright F_1 fold axis lineation plunges to SW direction. The leucogranite veins are boudinged. ***e***, Rotation of the stretching lineations in the fault zone. The axis of the asymmetric fold in the lower right (L_{2b1}) plunges to SE direction. ***f***, Leucogranite in the core of the fault zone. The earlier fabric asymmetries are almost overprinted and the S and C angle is considerably reduced (pen is parallel to the C-plane).

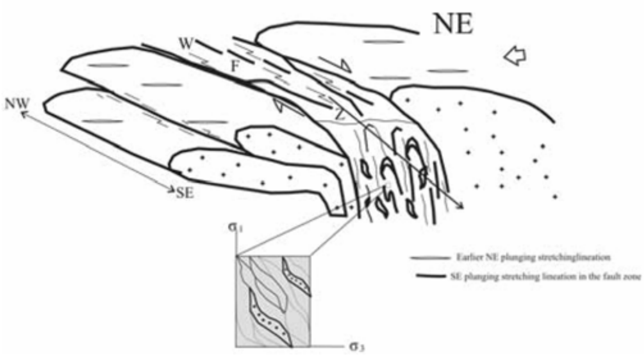

Figure 4. Possible model for deformation of the leucogranite intrusions in the Walong fault zone. Dextral shear associated with compression from east (arrow) is shown. The sub-horizontal stretching lineations plunging to SE are shown by a long arrow. The SW wall of the fault zone consists of number of a small-scale (2–3 m wide) shear zones. (Inset) Sigmoidal leucogranite veins in the $\sigma_1 - \sigma_3$ plane. WFZ, Walong fault zone.

One of the possible explanations for leucogranite generation under such condition is the shear heating of the metapelitic crust as mica schist can sustain high shear stress (higher than granite) even at the point of anatexis.

Thus, the persistent NE-plunging stretching lineations in the Lohit batholith are reoriented to SE-directed sub-horizontal lineations in the Walong fault zone. The Walong fault zone is reactivated as a zone of intense shearing with a dominant dextral slip shown by the shear sense indicators. The two-feldspar thermometry of the leucogranites gives a temperature range of $400 \pm 50°C$, which is the inversion temperature for orthoclase to microcline under high stress condition. Such a condition prevailed at the time of reactivation of the fault zone, which has helped the structural state transformation of alkali feldspars to be reequilibrated at low temperature. Leucogranite dykes in the Lohit batholith in the Walong fault zone may be the products of shear heating of the metapelitic upper crust during continental collision as the metapelites can sustain high shear stress even at the point of anatexis.

1. Singh, S., Geology and tectonics of the eastern syntaxial bend, Arunachal Himalaya. *J. Himalayan Geol.*, 1993, **4**, 149–163.
2. Gururajan, N. S. and Chowdhury, B. K., Geochemistry and tectonic implications of the Trans-Himalayan Lohit Plutonic Complex, Eastern Arunachal Pradesh. *J. Geol. Soc. India*, 2007, **70**, 17–33.
3. Mishra, D. K., Litho-tectonic sequence and their regional correlation along the Lohit and Dibang Valleys, Eastern Arunachal Pradesh. *J. Geol. Soc. India*, 2009, **73**, 213–219.
4. Nandy, D. R., Geology and structural lineament of the Lohit Himalaya (Arunachal Pradesh) and adjoining area: a tectonic interpretation. In Proceedings of the Seminar on Geodynamics of the Himalayan Region. National Geophysical Research Institute, Hyderabad, 1973, pp. 167–172.
5. Nandy, D. R., Tectonic pattern in northeast India. *Indian J. Earth Sci.*, 1980, **7**, 103–107.
6. Nandy, D. R., *Geodynamics of Northeastern India and Adjoining Region*, ACB Publications, Kolkata, 2001, p. 209.
7. Karunakaran, C., Geology and mineral resources of the state of India Part – IV (Arunachal Pradesh), Assam, Manipur, Mizoram, Nagaland and Tripura. *Geol. Surv. India, Misc., Publ.*, 1974, **30**, 124.
8. Jain, A. K., Thakur, V. C. and Tandon, S. K., Stratigraphy and structure of the Siang District of Arunchal Pradesh. *Himalayan Geol.*, 1974, **4**, 28–60.
9. Thakur, V. C. and Jain, A. K., Some observations on deformation, metamorphism and tectonic significance of rocks of some parts of Mishmi hills, Lohit District (NEFA) Arunachal Pradesh. *Himalayan Geol.*, 1975, **5**, 339–364.
10. Acharyya, S. K., Cenozoic plate motions creating the Eastern Himalayan and Indo-Burmese range around the north east corner of India. In *Amphibolites and Indian Plate Margin* (eds Ghosh, M. C. and Varadarajan, S.), Patna University, Patna, 1987, pp. 143–160.
11. Kumar, G., *Geology of Arunachal Pradesh*, Geological Society of India, Bangalore, 1997, p. 217.
12. Ding, L., Dalai, Z., Win, A., Kapp, P. and Harrison, T. M., Cenozoic structural and metamorphic evolution of the eastern Himalayan syntaxis (Namche Barwa), *Earth Planet. Sci. Lett.*, 2001, **192**, 423–438.
13. Liu, Y., Berner, Z., Joachim, H. M. and Xiao, X., Geology of the eastern Himlayan syntaxis (abstract) 19th HKT Workshop, Niseko, Japan, 2004, p. 197.

14. Gururajan, N. S. and Chowdhury, B. K., Geology and tectonic history of the Lohit Valley, eastern Arunachal Pradesh, India. *J. Asian Earth Sci*., 2003, **21**, 731–741.
15. Pandey, P., Rawat, R. S. and Jowhar, T. N., Structural state transformation in alkali feldspar: evidence for post crystallization deformation from Proterozoic granite, Kumaun Himalaya (India), *J. Asian Earth Sci*., 2005, **25**, 611–620.
16. Erdine, B., Winchester, J. A., Mittewede, S. K. and Ottley, C. J., Geochemistry and tectonic implications of leucogranites and tourmalines of the Menderes massif, southwest Turkey, *Geodyn. Acta*, 2006, **19**, 363–390.
17. Nabelek, P. I. Liu, M. and Sirbescu, M. L., Thermo-rheological, shear heating model for leucogranite generation, metamorphism, and deformation during the Proterozoic Trans-Hudson orogeny, Black Hills, South Dakota. *Tectonophysics*, 2001, **342**, 371–388.
18. Le Fort, P., Himalayas, the collided orogen. Present knowledge of the continental arc. *Am. J. Sci*., 1975, **275**, 1–44.
19. Toksöz, N. and Bird, P., Modelling of temperatures in continental convergence zones. *Tectonophysics*, 1977, **41**, 181–193.
20. Zhu, Y. and Shi, Y., Shear heating and partial melting of granite: thermal structure of overthrusted terrains in the Greater Himalaya. *Chin. J. Geophys*., 1990, **33**, 341–351.
21. Harrison, T. M., Lovera, S. M. and Grove, M., New insights into the origin of two contrasting Himalayan granite belts. *Geology*, 1997, **25**, 899–902.
22. Parsons, I. and Brown, W. L., Feldspars and the thermal history of igneous rocks. In *Feldspars and Feldspathoids* (ed. Brown, W. L.), NATO Adv. Sci. Inst., Ser., The Netherlands, 1984, vol. CL37, pp. 317–371.
23. Raase, P., Feldspar thermometry: a valuable tool for deciphering the thermal history of granulite–facies rocks, as illustrated with metapelites from Sri Lanka. *Can. Mineral*., 1998, **36**, 67–86.
24. Brown, M., Orogeny, migmatites and leucogranites: a review. *Proc. Indian Acad. Sci*. (*Earth Planet. Sci*), 2001, **110**, 313–336.
25. Brown, W. L. and Persons, I., Alkali feldspars: ordering rates. Phase transformations and behavior diagrams for igneous rocks. *Mineral. Mag*., 1989, **53**, 25–42.
26. Singh, S. and Chowdhury, P. K., An outline of the geological framework of the Arunachal, Himalaya. *J. Himalayan Geol*., 1990, **1**, 189–197.

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A new sub-surface find of uranium mineralization in Devri area, Proterozoic Surguja Crystalline Belt, Surguja district, Chhattisgarh

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A new find of uranium mineralization associated with granite mylonite and cataclasite near Devri area (23°31′35″, 83°08′35″, 64M/2), Surguja district, Chhattisgarh is significant in enhancing the uranium potential known from the Proterozoic Surguja Crystalline Complex (SCC). Scanty radioactive surface outcrops extending for 30 m length with 10 m width were observed within paddy fields and soil-covered area. Shielded probe logging of the trench dug at the radioactive outcrop indicated mineralization of 0.014% $eU_3O_8 \times 5.6$ m. Initial exploratory core drilling has indicated strike and dip continuity of mineralization at depth for at least 260 and 100 m respectively, with the number of mineralized intercepts varying from 0.010% $eU_3O_8 \times 1.0$ m to 0.028% $eU_3O_8 \times 4.68$ m. Extensive shearing, cataclasis, mylonitization, calcitization, ferruginization and sericitization is associated with mineralized shear zone at depth. Data obtained so far in Devri area indicate a satellite uranium deposit in addition to the Jajawal deposit in the west and Dumhath in the east established earlier within the SCC. Gravity, magnetic and IP geophysical surveys along the main ENE–WSW structural grain may help in establishing high resistivity, low magnetic zones and deciphering the shear zones. This would help in tracing the shear zone for establishing uranium mineralization.

Keywords: Crystalline rocks, radioactive outcrops, shear zone, uranium mineralization.

THE Surguja Crystalline Belt (SCB), 80 km long and 10–30 km wide extends from Palamau district of Jharkhand in the east to Surguja district of Chhattisgarh in the west, and is a part of the Chhotanagpur Younger Mobile Belt (CYMB)[1,2]. It comprises Palaeo- to Mesoproterozoic meta-sedimentary and unclassified crystalline rocks exposed as inliers in the area covered by Gondwana sedimentary rocks. The SCB in the central and western part of Surguja district comprises meta-sedimentary rocks, granites, pegmatites and migmatites (banded and augen-type), which have been affected by intense multi-

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