



An integrated approach of field evidence and high resolution MSS imagery for hydrothermal alteration zone mapping in part of South Purulia Shear Zone, India: Implication for mineral exploration

Pankajini Mahanta and Sabyasachi Maiti

Indian Institute of Technology, Kharagpur, Geology and Geophysics, India (positivepankajini@gmail.com)

South Purulia Shear Zone present in Eastern Indian craton is recognized by 120 km long and 4-5 km width corridor of highly sheared and deformed rock masses. It demarcates the boundary between Proterozoic Chottanagpur Granite Gneissic Complex (CGGC) in north and Paleo-proterozoic North Singhbhum Mobile belt (NSMB) in south. Low concentration of prospective minerals such as U, Th, REE, Clay, Fe & Mn along with some Au and other polymetallic (Cu, Sn, Zn, Pb, Mn and Ag etc.) deposits has been previously reported from discrete locations, however SPSZ is relatively unexplored in comparison to adjacent Singhbhum Shear Zone (SSZ). Remote sensing can be primary exploration techniques for preliminary mapping of such an unexplored area. But, the problems of remote sensing in vegetated terrain is alteration proxies are hindered due to coarse spatial resolution and thick vegetation cover. However, newly launched (2014) Worldview-3 satellite provides high resolution multispectral imagery consists of 8 VNIR bands and 8 SWIR bands give the opportunity to separate vegetation signature from the alteration proxies. In the present study, the alteration zone mapping was targeted using WV-3 data with SAM classification techniques, where the choices of reference spectra are guided by field observation. The alteration products identified includes kaolinite, montmorillonite, nontronite, smectite, pyrophyllite, white mica, sericite, goethite, lemonite, hematite, quartz and desert varnish were further supported by field spectra, XRD and microscopic study. The hydrothermal alteration such as chloritization, sericitization, ferruginization and silicification are also evident from thin section study of host rocks viz., schist, quartzite and phyllite. As remote sensing only provides the surface information refinement of the result has implemented considering geological facts like correlation with regional structure, eliminate the misclassified household and low land area as alteration zone. XRF analysis of selected samples identified the presence of Cu (0.06 ± 0.03), Ti (1.7 ± 1), and V (0.03 ± 0.02) anomaly pointing towards possible mineralization and to consider the area for detail analysis of mineralization. WV-3 along with field guidance identified and mapped alteration minerals with better resolution and accuracy (78%). So, WV-3 integrated with field data can demarcate hydrothermal alteration zone with better accuracy even in vegetated unexplored vicinity, and coupling with laboratory study can help to locate the potential area of mineralization.

Keywords: Alteration, Worldview-3, SPSZ, Mineral exploration