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Mineral Prospectivity Modeling using AVIRIS-NG VNIR-SWIR data and Gravity data for Gold-Sulphide mineralization in parts of GADAG schist belt, Karnataka, India

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Gadag schist belt, India is known for sulphide-gold mineralization. In the study area mineralization is controlled structurally and lithologically. In this context, Airborne Visible-Infrared Imaging Spectrometer - Next Generation (AVIRIS-NG) Visible Near InfraRed (VNIR) - Shortwave Infrared (SWIR) bands were utilized to derive alteration zones and structures present in the study area. Lithological boundaries have also been updated using AVIRIS-NG VNIR-SWIR bands derived images enhancement products i.e. Minimum Noise Fraction (MNF) and False Colour Composite (FCC). Further, image spectra of alteration zones (Hydrous mineral etc.) derived from AVIRIS-NG calibrated VNIR-SWIR bands were compared with the standard corresponding reference library spectra (USGS, JPL spectral library). These image spectra have been utilized to demarcate the alteration zones using the Matched Filtering spectral mapping method. Structures were demarcated using high pass (HP) filtered image and FCC images. Low pass (LP) filter image and along with MNF & FCC image composite were utilized to update the lithological boundaries in the study area.

Ground gravity data has also been processed to derive the subsurface evidences relevant to the deposit in the present study area. Subsurface structures which are responsible for the transportation of mineral rich fluid in the near subsurface are delineated using the gravity data derived products. Apart from this, basement depths are also derived from the gravity data which are being utilized for the validation as well as to further precise the locations of mineral deposits. These subsurface structures (gravity data), lithology, lineament density and alteration zones are very important evidential layers which have been integrated using fuzzy logic integration techniques to identify potential zones of gold-sulphide mineralization in the present study area. The prospective zones are validated using the secondary data and basement depth derived from the gravity data.

For similar kind of gold-sulphide mineralization, AVIRIS-NG data and Gravity data can be used to derive the important evidential layers in any part of the world. There are only few studies where such integration approach has been utilized to explore new potential zones of gold sulphide mineralization.

Keywords: AVIRIS-NG, VNIR-SWIR, alteration, MNF, FCC, Gravity, Basement Depth