

# ABSTRACT

In the present thesis, an integrated study of electrical resistivity tomography (ERT) with other geophysical data sets is presented for the delineation of auriferous and uranium mineralization amalgamated in hydrothermally altered zones along South Purulia Shear Zone (SPSZ). The SPSZ is a part of Tamar-Porapahar lineament, trending from E-W to ESE-WNW in direction and it lies between Singhbhum Shear Zone (SSZ) and Chotanagpur Granite Gneiss Complex (CGGC). SPSZ embraces mineralization such as uranium, copper, gold, REE, magnetite etc. which are essential for the industrial and economic growth. The findings of the study demonstrate the application of ERT for the delineation of anomalous zones associated with hydrothermally altered uranium and gold mineralization when incorporated self-potential, very low frequency-electromagnetic, induced polarization, gravity and radiometry methods. To study the efficiency of the ERT, various theoretical models were synthesized and data from various electrode configurations were interpreted to contemplate standard anomaly shapes with different complex geological conditions in the study area. Considering the forward model analysis, the ERT technique was employed using appropriate electrode configurations at various locations. Subsequently, a joint analysis of ERT with other geophysical data was used to demarcate gold deposits near Lawa village where results show near surface steeply dipping multiple conducting structures. Next, ERT data were correlated with IP data for the delineation of disseminated copper sulfides in that area. ERT data were from Kutni (part of Beldih-Kutni Shear Zone) to investigate uranium deposits. ERT results around Kutni were correlated with gravity data acquired in the area that suggested the presence of massive deep-seated low density conducting anomalous structures associated with hydrothermally-altered uranium zones. Finally, ERT data from the Beldih region were employed to find extensions of uranium mineralization. ERT data were analyzed with VLF and radiometric studies in that region to delineate anomalous structures. Results suggested that there is a possibility of mineralization extension on the eastern side of the Beldih opencast phosphate mine, suggesting an expansion of uranium mineralization in the South Purulia Shear Zone.

**Key Words:** *SPSZ, Electrical Resistivity Tomography, Self-Potential, Very Low Frequency-Electromagnetic, Induced Polarization, Gravity, Radiometry, Gold, Uranium*