Controls on SEDEX Mineralization in the Aravalli-Delhi Fold Belt: Insights from Integrated 3D Geological and Geophysical Modelling

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3D modelling provides a representation of the uncertainty when sparse or no data are available for a region. 3D geological model can provide important insights on the geometrical behavior of the rock units and also the locations of the crustal scale structures which in turn can provide the 3D (depth) and 4D (time) geodynamic evolution of the region.

The Aravalli-Delhi Fold Belt which is located in the state of Rajasthan, India covers the geological history from Archaean to Recent. It underwent two stage tectonic evolution during Proterozoic, which lead to the formation of substantial Sediment-Hosted Lead-Zinc deposits i.e. Rampura-Agucha deposit ($\sim$1800 Ma.), Rajpura-Dariba deposit ($\sim$1800 Ma), Pur-Banera deposit ($\sim$1800 Ma) and Zawar deposit ($\sim$1700 Ma). The Sediment-Hosted Lead-Zinc deposits with easy surface expressions have already been discovered based on the conventional 2D conceptual geological models approach, therefore now it is very important to discover and explore the deep-seated deposits which have no or indirect surface expressions. These deposits are formed due to the mineralization process which run in three dimensional space and time, and hence are the result of the 3D and 4D geodynamic processes operating in the region. The 3D geological modelling of the Aravalli-Delhi Fold Belt and the mineral system of the Sediment-Hosted Lead-Zinc deposit will identify the new controls of mineralization for the Lead-Zinc deposits in the fold belt..

A 3D crustal model for Aravalli-Delhi Fold Belt will be created for an area of about 275$\times$200 square kilometers of Aravalli-Delhi Fold Belt, which will convert into a 3D block of about 275$\times$200$\times$60 cubic kilometers by applying forward gravity modelling technique. The 3D geological model will be based on the detailed geological and structural mapping, and the use of the 2D forward gravity models created for the entire fold belt.

Keywords: Aravalli-Delhi Fold Belt; 3D Geological Modelling; 3D and 4D Geological Evolution; Sediment-Hosted Lead-Zinc; Mineralization Controls; Rajasthan-India.