Longitudinal Conductance- An effective parameter for mapping Groundwater potential zones in hard rock areas

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Abstract:

Geo electrical methods, particularly, Vertical Electrical Soundings (VES), are being widely used in exploration of groundwater. The method is based on the estimation of the electrical conductivity or resistivity of the medium. The depth of investigation largely depends on the distance between the current electrodes. In order to obtain the apparent resistivity as the function of depth, the measurements for each position are performed with different current electrode separations. Interpretation of the VES data is performed in terms of different layers having different resistivity and thickness values and the depth to the geo electrical basement. In hard rock areas, generally apparent resistivity values increase continuously (A Type curves) with increasing electrode separation. The longitudinal conductance increases with current electrode separation and remains constant for the current electrode separations greater than the thickness of the formation above the geo electrical basement and the difference between the successive values becomes zero. Plotting the contours of the difference of the longitudinal conductance of successive current electrode separations of AB ($_{i}$) and AB $_{(i+1)}$ makes it easy to delineate the areas with depth to geo-electrical basement less than AB(i)/2.

VES data of 837 locations in Chandur West basin is processed using the longitudinal conductance method and delineated the shallow basement areas and the map generated is in agreement with the well density and well yields contour map.

This method of difference of longitudinal conductance will also nullify the impact the top soil resistivity. The method is useful in processing the VES data of large area which saves the time required for interpretation of huge quantity of VES data.