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Remote sensing approach to study morphotectonic influences on hydrogeoenvironment accross yamuna river basin,India

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Changes in groundwater as well as surface water resources have been mainly attributed as anthropogenic in origin (particularly in case of depleting groundwater levels) but focus still exists on underlying natural processes (such as tectonic activity) that play a major role in shaping the hydrogeoenvironment in a long run. Structural changes associated with tectonic activity mainly affect the subsurface features associated with any terrain, affecting the flow and accumulation of water, which ultimately affects the groundwater recharge. Such activity also affects the subsurface geochemical composition. Studying these effects is not easy as the changes associated can be very subtle, spread over a large landscape.

Present study aimed at studying the influences of active faulting episodes (that change the overall physical landscape) on the whole of geological environment pertaining to the water resource in a hard rock area that is located in vicinity of an active fault passing through Yamuna river basin.

The study area falls between 76.990 E to 78.000 E and 28.240 N to 28.450 N. The study area, however, is not selected and bound by administrative boundaries but the topography and geomorphic structural units reflective of possible tectonic activity. It is a part of river Yamuna basin (with alluvial/colluvial deposits spreading across) that intersects rocks that have undergone multiple folding.

Methodology included identification of sites suitable for other geophysical investigations (resistivity and magnetic surveys) through utilization of satellite images. Structural lineaments were identified with help of satellite data and their orientation with respect to each other was observed. Possible neotectonic activity (supported with study of microtremor spectra) and the seismogenic potentiality of lineaments identified was established. Terrain modeling was done to identify landform features and associated effects of tectonic activity. Hyperspectral Data was used for mineralogical identification in the study area by matching with the reflectance spectra of different minerals.

Sites (for geophysical surveys) suitable for further aquifer studies were successfully mapped as a result of this whole exercise. A spatial analysis of the whole database was also done to get a synoptic view for deciphering the magnitude of influence of tectonic activity on hydrogeoenvironment of the study area. This will be essential for long-term planning for exploration or management of groundwater resources.