## Determination of tectonic and non-tectonic structures and their influence on groundwater resources of Mekelle area, Tigray

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Mekelle is located in the northern part of Ethiopia, and is mainly covered by Mesozoic sedimentary succession and late coming magmatic rocks (dolerite) found in the form of swarms of sills and dykes. The area is characterized with the presence of different kinds of fractures, and needs detail structural geological investigation. The main objective of this study was to determine tectonic and non-tectonic structures and the link with the structure of the groundwater reservoir. The methods that were employed aim at measurement of the entire geological structures. From satellite images and ground measurements, the general orientation is computed to be N55°W/75°SW. Mekelle area has two aquifers, upper (first) aquifer and lower (second) aquifer; those aquifers are separated by a dolerite sill (aquitard). The fractures and faults have become the main source of recharge area to the lower aquifer. The upper aquifer is composed of shale with limestone intercalation and mostly recharged by rainfall. Regionally, Mekelle main fault results from tectonic impact. And hence, measurements, having nearly the same orientation are supposed to be genetically linked with it. Mekelle area comprises genetically distinct structural features. Some are developed immediately after the solidification of the rocks (non-tectonic structures) and others are developed much later than the rocks (tectonic structures). A series of measurements have been collected from the entire study area and are categorized into five trends. These are: N89°E, S60°E, N55°E, N16°E, and N12°W. The minor faults and dykes have an orientation of S60°E or N60°W, which coincides with the geometry of the Mekelle fault. The E-W or N89°E aligned fractures have a kind of riddle shear appearance with the Mekelle fault. Moreover, these fractures are found in all types of rocks indicating that they are formed much later than the dolerite. For this reason, these two structures are interpreted as tectonic origin fractures. On the other hand, all other joints do not have any link with the regional or local geological structures, and they are also mainly confined with the carbonate rocks and are absent in the dolerites. From these basic two reasons, they are non-tectonic in nature. Hence, it can be concluded that both tectonic and non-tectonic structures serve as a conduit for groundwater recharge. The features could also lead to challenges in terms of quality, mostly when the surface water includes pollutants.