Use of high resolution 2D Electric Resistivity Tomography for mapping of the geological structures of the north-western portion of Bénin: case of the department of the donga

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The exploration of the tectonic structures in the basement area is very complex and requires a state-of-the-art geophysical approach to complete and validate the results obtained by the use of remote sensing techniques. The aim of this study is to use high resolution electrical tomography to discriminate and characterize the geological structures of the Donga Department. The spatial-directional Sobel and gradient filtering methods applied to satellite images led to the development of the detailed linear map. The validation of these lineaments was made during several geophysical prospecting works. The results of the image processing allowed the development of the fracture map within the study area. It has 745 major fractures ranging in size from 9 to 71.5 km. The TRE applied to a portion of the Northwest segment of the Panafrican chain of the Dahoméyides in Benin has shown, up to 55 m depth, several linear structures and aquifer corridors likely to be potentially active reservoirs. These structures may be fractures, geological contacts and vein zones. Indeed, all the linear structures identified on the electrical panels are oriented NS, NE-SW, EW. The average thickness of the saprolite of these structures on all electrical panels is between 10 and 40 m. The most important layers of saprolite were recorded at the sites of Bariénou, Bodi and Diépani at 40 m, 35 m and 25 m depth, respectively. As for the thickness of the fractured horizon, it has been estimated between 5 and 35 m. In general, all the data acquired on the fracturing of the Donga department contributes to a better knowledge of the geometry of the fractured system.

Keywords: major fractures, geophysics, tectonic structures, remote sensing, basement area