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Investigation of urban faults in Shenzhen using wavelet multi-scale analysis and modeling of gravity observations

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Urban faults in Shenzhen are potential threat to the city security and sustainable development. To improve the knowledge of the Shenzhen fault zone, interpretation and inversion of gravity data were carried out. Bouguer gravity covering the whole Shenzhen city was calculated with a resolution of 1kmx1km. Wavelet multi-scale analysis (MSA) was applied to the Bouguer gravity data to obtain the multilayer residual anomalies corresponding to different depths. In addition, 2D gravity models were constructed along three profiles. The Bouguer gravity anomaly shows a NE-striking high-low-high pattern from northwest to southeast, strongly related to the main faults. According to the result of MSA, the correlation between gravity anomaly and faults is particularly significant from 4 to 12 km depth. The residual gravity with small amplitude in each layer indicates weak tectonic activity in the crust. In the upper layers, positive anomalies along most of faults reveal the upwelling of high-density materials during the past tectonic movements. The multilayer residual anomalies also implicate important information about the faults, such as the vertical extension and the dip direction. The maximum depth of the faults is about 20km. In general, NE-striking faults extend deeper than NW-striking Faults and have a larger dip angle.

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