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Detection and mapping of the underground cavities by geophysical methods: ground penetrating radar, seismic waves and electrical imagery - case of Béni-Mellal city (Morocco)

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During the recent years, there has been a growing interest in recording and investigating the network of underground cavities and karsts in many countries around the world. The karstic grounds in Morocco dominate considerable areas. The city of Béni-Mellal has been built on a ground affected by an important network of underground cavities which actually causes numerous buildings collapse. In order to test the efficiency of geophysical methods to localize and map these cavities, the ground penetrating radar campaign with a 200 ,225,400 MHz antenna ,seismic mapping and 2D electrical tomography measurements have been carried out to investigate an area of the old city (Medina). Prospections with several depths in the form of sections of resistivity and isochrones maps allow to identify with precision the resistant zones and the seismic echoes resulting from the interfaces. The analysis of the whole of the results showed that these anomalic zones correspond to a broad underground cavity almost occupying all the width of the area. The methodological tests developed in this study constitute efficient tools to the managers to intervene upstream and to found the preventive means against any risk of collapse. The results clearly reveal the existence of subsurface cavities, the largest one spreads on about fifty square metres.