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Monitoring ground subsidence induced by salt mining activity: the Tuzla (Bosnia & Herzegovina) case

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Ground subsidence induced by salt mine overexploitation is well known problem in the city of Tuzla (Bosnia & Herzegovina, BiH) and surroundings since the year 1950, when borehole activities began. The paper discusses results obtained from the analysis of the huge (and never processed before) amount of data collected from the first topographical survey, in the year 1956, to the interruption due Balkan War in 1992. This analysis highlighted a sinking rate up to 10 meters within that period. Several damages, with regards to buildings and infrastructures, were produced, leading to the final demolition of the most compromised part of the city. The dramatic sinking rate (up to 40 cm/yr) in the most developed area drove a joint project between the University of Bologna and Municipality of Tuzla in the year 2002 with the aim to recognize the areas affected by collapsing phenomena and map the hazards. New surveys were therefore carried out by modern space geodesy methodologies, such as static relative GPS (Global Positioning System) and effects related to urban aspects monitored by high resolution satellite imageries. Monitoring by GPS surveys from 2004 to 2006 confirms the decreasing of sinking rate to 20 cm/yr following to the great effort towards the reducing in salt exploitation activities. The paper emphasized also the strong correlation between the average sinking rate and the annual amount of salt exploited.