



Surface deformation induced by ground water pumping in Taipei Basin: A case study in urban underground construction of Taipei metro station

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Since 1955, the rapid development of population has requested for large amount of water usage in Taipei city. Thus, the overuse of ground water leads to the land subsidence rate up to ~ 5 cm/yr. In 1989, the government stated to put restrictions on water pumping. Consequently, ground water recovered and resulted in the widespread uplift in Taipei basin. Due to the underground transportation and wiring, ground water were massively pumped for the safety of construction sites. In this study, persistent scatterer interferometry technique is used for processing 37 high resolution X-band radar images to characterize deformation map in the period from May 2011 to April 2015. From the ground table records of 30 wells in Taipei basin, the results indicated that the main factor to the surface deformation of Taipei basin is the elevation change of water table. In the case of Wuku groundwater well, the elevation change of the ground water table is about 15 m during September 2011 to April 2015. In the same period of the time, the change of surface deformation within 100 m of Wuku groundwater well is consistent to the elevation change of ground water table, and is more than 5 cm along line of sight. The storability is roughly constant across most of the aquifer with values between 0.8×10^{-4} and 1.3×10^{-3} . Moreover, in the case of Taipei metro construction, according to the analytical results of radar image and the 380 vertical control points of Taipei, the high water pumping before the underground construction project will inflict surface deformation. It is noticeable that, the Jingmei Formation and the Wuku Formation are composed of the sediments with high porosity. Thus, the actual land subsidence caused by water pumping would be five times than the underground construction areas.