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Recent surface displacement in Bangkok associated with groundwater recovery

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In many cities in the world, groundwater level decrease and subsequent land subsidence has been observed associated with groundwater pumping. Bangkok, the capital city of Thailand, is also one of the cities that had been suffered from land subsidence due to groundwater extraction. Since 1960s, groundwater has been extracted for commercial and personal use. Subsequently, the cumulative subsidence of about 1 m has been reported. Recently, Thailand government has implemented several measures to regulate groundwater use, and groundwater level recovery has been reported.

In this study, we used persistent scatterer SAR interferometry (PS-InSAR) analysis, which is the method to process a series of SAR data equipped on repeat-pass satellite, to estimate ground displacement in Bangkok from November 2007 to December 2010. Since SAR data is acquired by satellite, PS-InSAR analysis has an advantage for mapping displacement pattern in wide area with high spatial density.

As a result, we estimated ground uplift with the rate of about 1 cm/year. The secular uplift has decayed over time, and can be modeled by exponential function of time. Since the groundwater recovery has been observed in areas where uplift was estimated, this uplift is likely associated with groundwater recovery. Moreover, we also estimated seasonal displacement correlated with the cycle of precipitation in eastside of Bangkok.

Keywords: groundwater recovery, surface displacement, Bangkok, persistent scatterer SAR interferometry