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Recent Subsidence Rates in the Mekong Delta derived from Sentinel-1 SAR-Interferometry

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Coastal subsidence increases the vulnerability to flooding risk, salinization of water resources and permanent inundation. For the Mekong Delta, whose mean elevation is less than 2 m above sea level, subsidence rates of up to several centimeters per year have been reported recently. This leads to a growing risk for the resident population, infrastructure and economy, increased by the accelerating sea level rise. Land subsidence in Mekong Delta has different causes, most prominently natural compaction of young deltaic sediments, but also overexploitation of groundwater aquifers with accompanying head decline. Precise monitoring of the subsidence rate is necessary for analyses of cause and hazard as well as planning and assessment of countermeasures. Here, we present and discuss recent land subsidence rates in the Mekong Delta derived from satellite-based SAR-Interferometry.

We use Sentinel-1 scenes acquired between 2015 and 2019 to analyze recent land subsidence in the lower Mekong Delta. The Persistent Scatterer Interferometry technique (PS-InSAR) is applied, which allows for the estimation of displacement rates of coherent backscatter targets with mm-accuracy. Separate analyses of time series from ascending and descending observations and comparison with other studies based on data of the same sensor give insight into the accuracy of the parameter estimation and the error budget.

The observed subsidence rates of up to 6 cm/yr feature mainly three different spatial characteristics: (i) interconnected areas of little to no subsidence, (ii) isolated urban hot-spots with high subsidence rates and (iii) larger regions with increased subsidence rates covering urban as well as rural areas. Points on deeply founded infrastructure frequently exhibit lower subsidence rates than adjacent ground surface points. We study this phenomenon at different buildings since subsidence rates with respect to different foundation depths can be used as a proxy to constrain the effective depths of sediment compaction. Further, the correlation of observed subsidence rates and spatial distribution of lithostratigraphic units from quaternary sedimentary depositions is investigated. Finally, we show changes and commons in the spatial distribution of the subsidence rates compared to a previously published study on subsidence in the Mekong Delta

covering data from 2006 to 2010.

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