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Land Deformation Monitoring using SAR Interferometry

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In this work, the past and present ground deformations are investigated in the area of Al Wagan, which is a primarily agricultural area. However, due to the hot desert climate and the sparse precipitation events, the viability of the plantations has traditionally relied on the local aquifer resources. The exploitation of the groundwater reserves has led to significant land subsidence phenomena, which were detected with the use of differential SAR Interferometry (DInSAR). The application of DInSAR techniques for the quantification of fast and localised ground displacements was a challenging task using moderate resolution data, mainly due to the low coherent surface background. Despite the sparsity of the SAR acquisitions over the region, the available ENVISAT, ALOS and Sentinel-1A imagery was analysed with conventional DInSAR and the Small Baseline Subset (SBAS) technique in order to provide estimates about the evolution of the deformation patterns in a limited area. During the period 2003-2010 the subsidence rates were estimated to reach 18 cm/year as observed in the SBAS results of data from the ENVISAT and ALOS Satellites. However, the deformation trends appear to have decreased during the recent past (Dec/2016 – March/2018), as observed in the results from Sentinel-1A data, where a maximum localized subsidence in the order of 10 cm was estimated. The comparison of the deformation trends with the groundwater levels implied that the depletion of the local aquifer resources was the most probable cause.