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Subsidence of the Sacramento Delta (California, USA)

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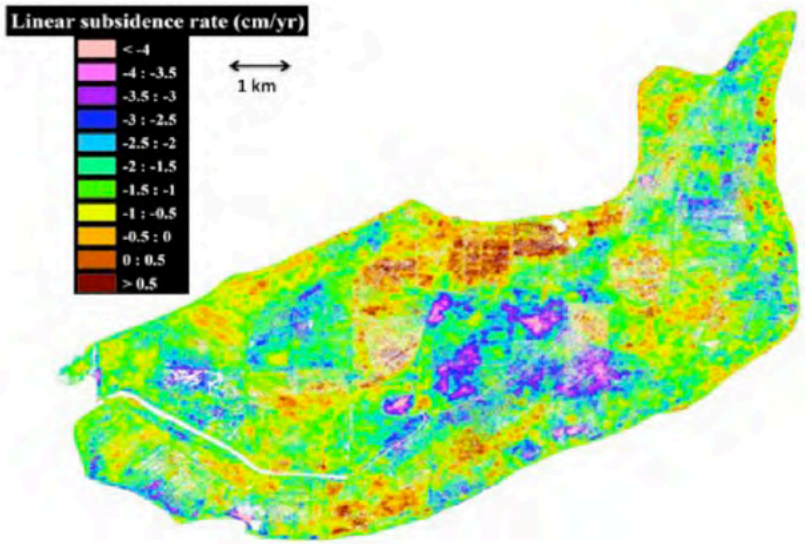
InSAR-based measurement of ground subsidence rates are notoriously challenging in agricultural areas because of rapid temporal decorrelation introduced by physical disturbance of the ground, vegetation growth, and changes in soil water content. Decorrelation noise can be mitigated by the use of longer wavelength instruments and time series techniques, but measurement remains a challenge particularly in areas where the deformation rates are low. Here we discuss techniques developed for low coherence data in a project to measure sub-island scale subsidence rates and levee movement across the Sacramento-San Joaquin Delta, based on SBAS processing of L-band Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR) data. Determination of rates in this area is particularly valuable because of the Delta's critical importance as a water resource for the State of California and as a productive estuarine ecosystem. Subsidence across the region has left most of the man-made islands below mean sea level, and the levees maintaining the island integrity are subject to a wide range of threats, including localized nearby subsidence and earthquakes on nearby faults, which include the Hayward and San Andreas fault systems. We show that a dense acquisition of L-band images, processed with InSAR time series techniques, can achieve excellent spatial coverage and rate accuracy as low as 2 mm/yr even in this challenging area. Application of the technique to monitoring the levees and aqueducts in the area is shown, and he L-band airborne sensor results are compared to results obtained with TerraSAR-X and Radarsat-2.



Subsidence rates on Sherman Island, Sacramento Delta, California (USA) during 2009-2014, derived from InSAR applied to L-band airborne SAR (UAVSAR) data