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MEASUREMENT OF SUBSIDENCE AND LEVEE INTEGRITY IN THE SACRAMENTO-SAN JOAQUIN DELTA IN CALIFORNIA

Abstract

Nearly a quarter of California's fresh water supply flows through the Sacramento-San Joaquin Delta, an area comprised of tidal marshland and reclaimed land in the form of 60 islands surrounded by 1700 km of levees. Maintaining the integrity of the Delta levee system is critical to protecting the state's primary water supply and the overall economic and environmental health of the region.

Land subsidence within the Delta poses a serious challenge to maintaining the delicate ecosystem and integrity of the water supply. Land subsidence behind the levees increases the stress from the water in the channels and can lead to levee failure or cause water seepage.

Here we report on an ongoing study to determine the cumulative subsidence and subsidence rates across the Sacramento-San Joaquin Delta in the period since July 2009. We use data from NASA's Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR), collected at 40-day average interval from July 2009 through the current day for a project led by the Jet Propulsion Laboratory and funded by the NASA Applied Science Program, the Department of Homeland Security's Science and Technology Directorate, and the California Department of Water Resources. UAVSAR is an L-band SAR designed for differential interferometry (InSAR) and has sufficient resolution (7 m product ground resolution) to resolve the levees from the surrounding area. Our determination of subsidence rates in the primarily agricultural area is enabled by both the longer wavelength of the L-band SAR, which allows the radar data to maintain some coherence over the average 6-week repeat interval, and through special processing techniques developed at JPL to accommodate the low coherence data usually obtained in that region. This information is of value to both risk management associated with maintaining the levees in the area and to long-term plans for providing a more reliable water supply for California.