Jet Propulsion Laboratory

Detection of Small, Slow Ground Targets Using Synthetic Aperture Radar (SAR) Along-Track Interferometry (ATI)

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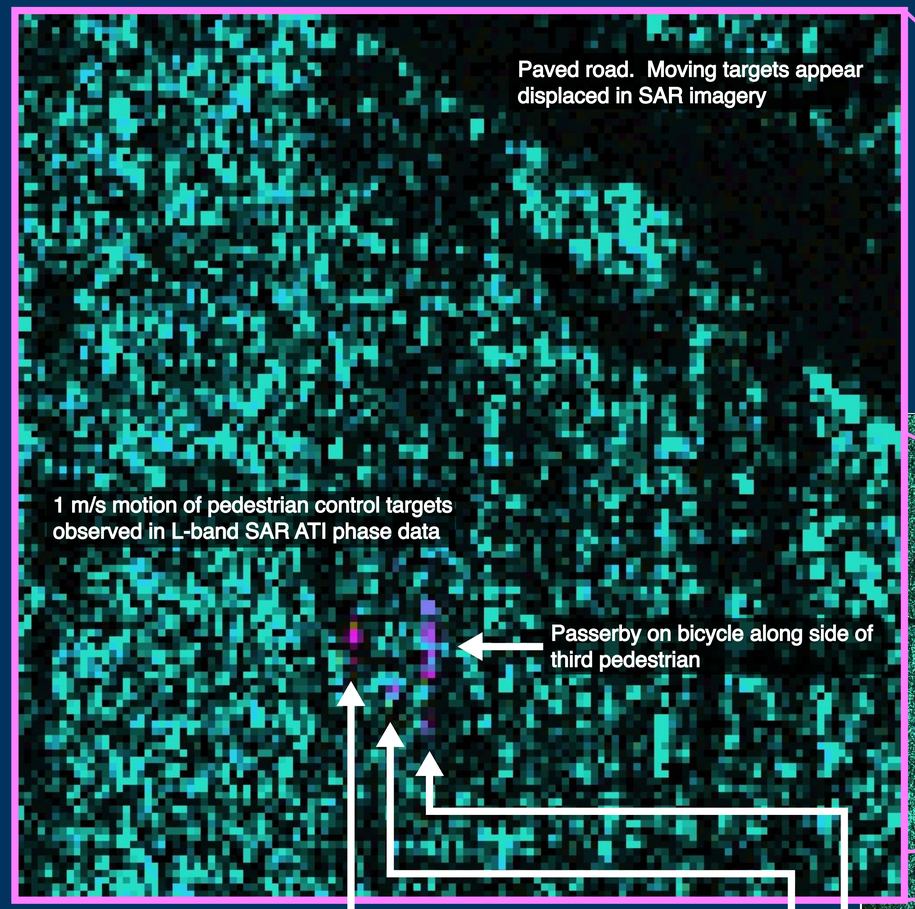
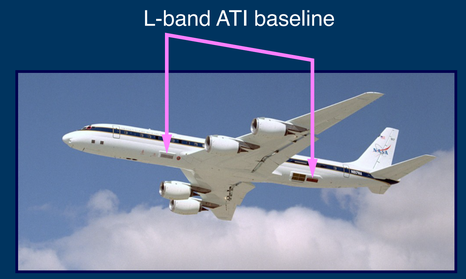
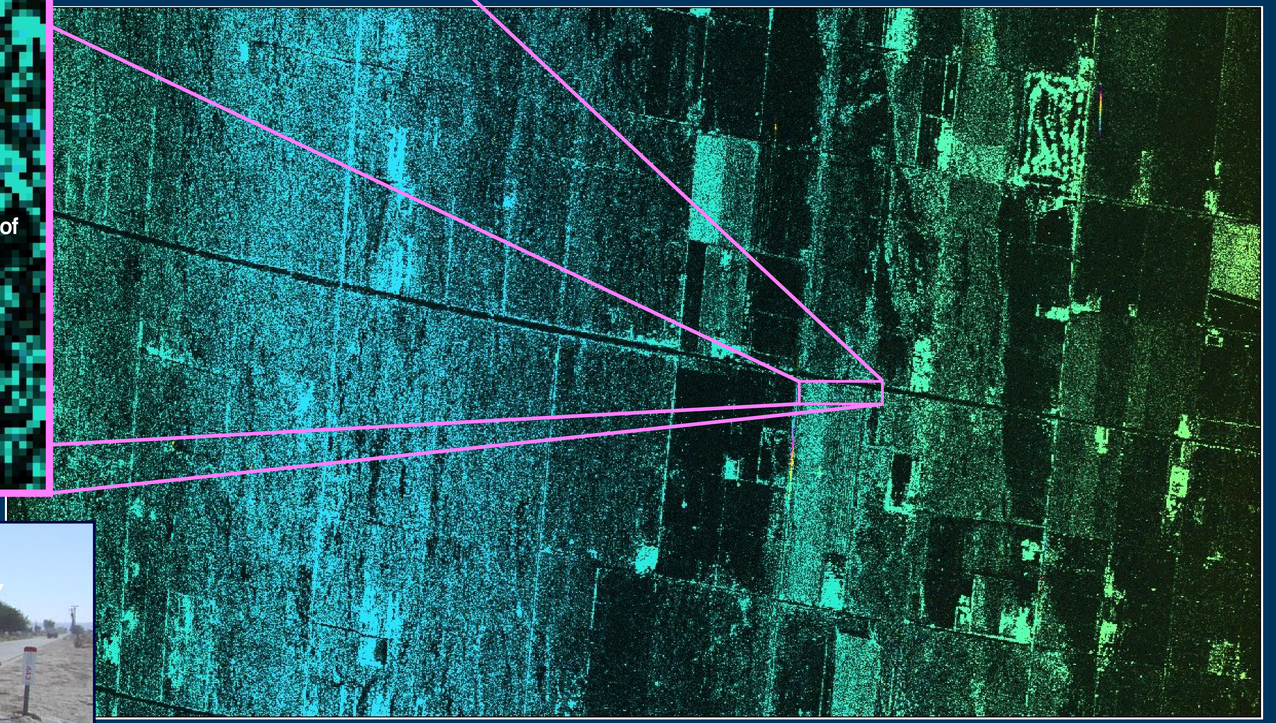


Synthetic aperture radar (SAR) along-track interferometry (ATI) is a technique for sensing Earth-surface motion. The technique involves interferometrically combining data from two radar images acquired from phase centers separated along the platform flight track. Because an interferometer with a long baseline is usually much more easily implemented than a single filled array of the same size, SAR ATI lends itself to applications in which high sensitivity to target motion is required, especially at longer wavelengths. SAR ATI also offers great sensitivity to radar-dim targets because long coherent integration times are possible. Future systems may be able to rapidly search large areas for targets as small and as slow as humans on foot. Such systems could automatically cue other sensors or modes to areas of high activity. Additional airborne experiments could demonstrate these capabilities for varieties of target and clutter phenomenologies.





L-band SAR ATI data acquired by the NASA/JPL AIRSAR airborne radar. The interferogram phase, which depicts surface motion, is shown in color, overlaid on a grayscale image of the interferogram magnitude. The enlarged area depicts the phase signatures of three pedestrian control targets from an airborne experiment. Although they are not resolved in the imagery and are no brighter than the background clutter, the targets have distinct signatures observable in the interferometric phase. A passerby on a bicycle was also imaged and appears next to the third pedestrian. The targets were moving at 1 m/s when imaged, as determined from the GPS equipment on the cart.