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Geodetic infrastructure for measuring crustal deformation associated with earthquakes

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Earthquake processes and the associated deformation take place on a wide range of spatial and temporal scales. Surface deformation measurements provide insight into the mechanisms of fault and crustal behavior, stress and transfer of stress associated with faults and networks of faults, and earthquake and aftershock potential. GPS and InSAR measurements are complementary measurements for measuring and interpreting surface deformation. GPS measurements produce near continuous time series of deformation at discrete and often widely separated stations. InSAR measurements, on the other hand produce spatially smooth, but infrequent measurements of surface deformation. Each measurement can be used to extrapolate the other measurement in time or space, providing a detailed image of time varying crustal deformation. California is well-instrumented with GPS stations from the Plate Boundary Observatory. Beginning in 2009 UAVSAR flight lines will provide InSAR imagery of the San Andreas fault and Los Angeles basin. We will merge the InSAR and GPS data to study earthquake fault behavior in California. NASA's Earth Science Decadal Survey recommended the launch of DESDynI, and InSAR/Lidar satellite for measuring surface deformation among other goals. UAVSAR can be used to simulate DESDynI data to develop techniques for combining GPS and InSAR data. UAVSAR will also provide additional imagery between satellite passes, which should be particularly important following earthquakes when crustal deformation is rapidly varying with time.