GLOBAL FORUM ON URBAN & REGIONAL RESILIENCE

Fall 2017 Seminar Series

Thursday, November 16th | 3:30 PM

**** RECEPTION TO FOLLOW ****

Looking for Off-Fault Deformation & Measuring Strain Accumulation During the Past ~70 years on a Portion of the Locked San Andreas Fault

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Even at high tectonic rates, detection of possible off-fault plastic/aseismic deformation and variability in far-field strain accumulation requires high spatial resolution data and likely decades of measurements. Due to the influence that variability in interseismic deformation could have on the timing, size, and location of future earthquakes and the calculation of modern geodetic estimates of strain, we attempt to use historical aerial photographs to constrain deformation through time across a locked fault. Modern photo-based 3D reconstruction techniques facilitate the creation of dense point clouds from historical aerial photograph collections. We use these tools to generate a time series of high-resolution point clouds that span 10-20 km across the Carrizo Plain segment of the San Andreas fault. We chose this location due to the high tectonic rates along the San Andreas fault and lack of vegetation, which may obscure tectonic signals. We use ground control points collected with differential GPS to establish scale and georeference the aerial photograph-derived point clouds. With a locked fault assumption, point clouds can be co-registered (to one another and/or the ~1.7 km wide B4 airborne lidar dataset) along the fault trace to calculate relative displacements away from the fault. We use CloudCompare to compute 3D surface displacements, which reflect the interseismic strain accumulation that occurred in the time interval between photo collections. As expected, we do not observe clear surface displacements along the primary fault trace in our comparisons of the B4 lidar data against the aerial photograph-derived point clouds. However, there may be small scale variations within the lidar swath area that represent near-fault plastic deformation. With large-scale historical photographs available for the Carrizo Plain extending back to at least the 1940s, we can potentially sample nearly half the interseismic period since the last major earthquake on this portion of this fault (1857). Where sufficient aerial photograph coverage is available, this approach has the potential to illuminate complex fault zone processes for this and other major strike-slip faults.

LOCATION: Global Forum Conference Room, Suite 312, Kent Square

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