Rupture history of the San Andreas Fault in the Carrizo Plain: Supplemental excavations, geochronology, and intern support

Southern California Earthquake Center Research Summary 2009

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Summary
This project supported an expansion of and improved geochronology for our paleoseismic activities in the Carrizo Plain along the San Andreas Fault at the Bidart site. We did not support an intern this year because of the late authorization of the funding and instead used it for expanded science and personnel involvement in our project.

Supplemental field activities
Thanks to this SCEC support, we were able to expand our field operations to more trenches and to focus on a detailed 3D investigation of what we ended up concluding was a deflected channel. Figures 1-3 show the big excavations we made and Figure 4 shows the detailed channel work site.

Terrestrial Laser Scanning operations for paleoseismology
In an activity partially supported by this funding, we used a terrestrial laser scanner (TLS) at the site to test the technology and document the local geometry of the offset landforms and stratigraphy. I gave a talk on this at the Fall AGU meeting (R. Arrowsmith; D. E. Haddad; S. O. Akciz; J. S. Oldow; J. Mauer; D. D. Rhodes (2009) Terrestrial Laser Scanning Applications in Paleoseismology (Invited), Eos Trans. AGU, Fall Meet. Suppl., Abstract G53E-08) and also produced a blog entry on the topic (https://arrowsmith.blog.asu.edu/2009/08/07/terrestrial-laser-scanning-for-paleoseismological-applications). The TLS was useful for the detailed documentation of the geomorphology (Figure 5) and the walls of the trenches (Figure 6), especially when compared to what we can do with standard photomosaics.

Geochronology
In order to expand our capability to date the channels that have formed at the site and thus assess the number of earthquakes that have contributed to their offset, as well as to test the method for application in this region, we worked with Tammy Rittenour of the Utah State University Luminescence Laboratory to sample silty and sandy sediments at the Bidart site for Optically Stimulated Luminescence. The sample collection was successful and they are being processed at the USU laboratory.

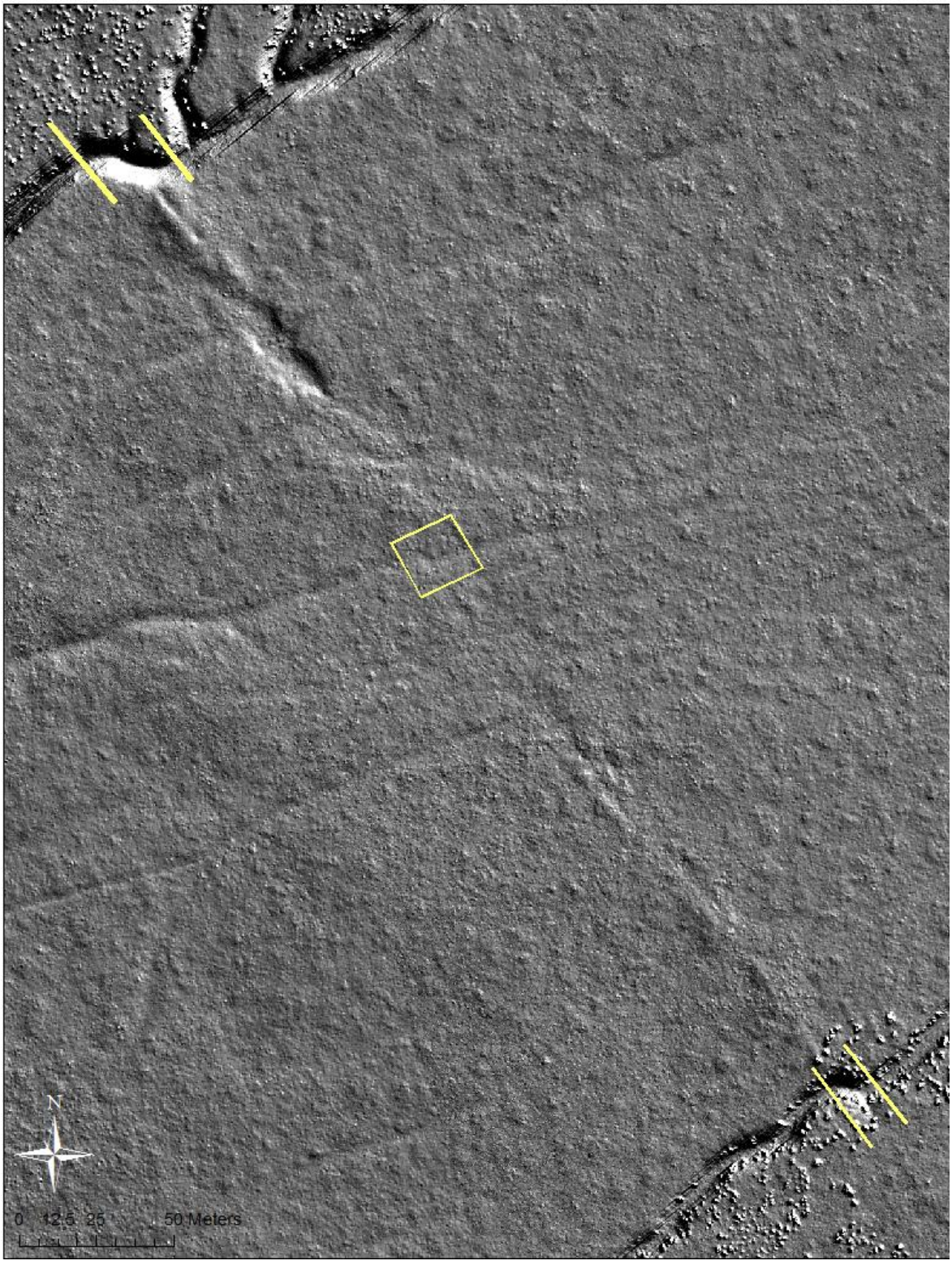

Figure 1. Bidart 2009 excavations enhanced with SCEC support. Fault parallel trenches spanning offset channels are designed to gain understanding of the ages of the offsets and the stratigraphic and geomorphic record of repeated earthquake offsets and climate-modulated incision events. Central square area was target of detailed hand trenching.

Figure 2. Aerial photograph from remotely triggered camera in balloon of NW channel excavations at Bidart site in 2009. See figure 1 for location.

Figure 3. Aerial photograph from remotely triggered camera in balloon of SE channel excavations at Bidart site in 2009. See figure 1 for location.

Figure 4. Aerial photograph from remotely triggered camera in balloon of detailed excavations at Bidart site in 2009. See figure 1 for location.

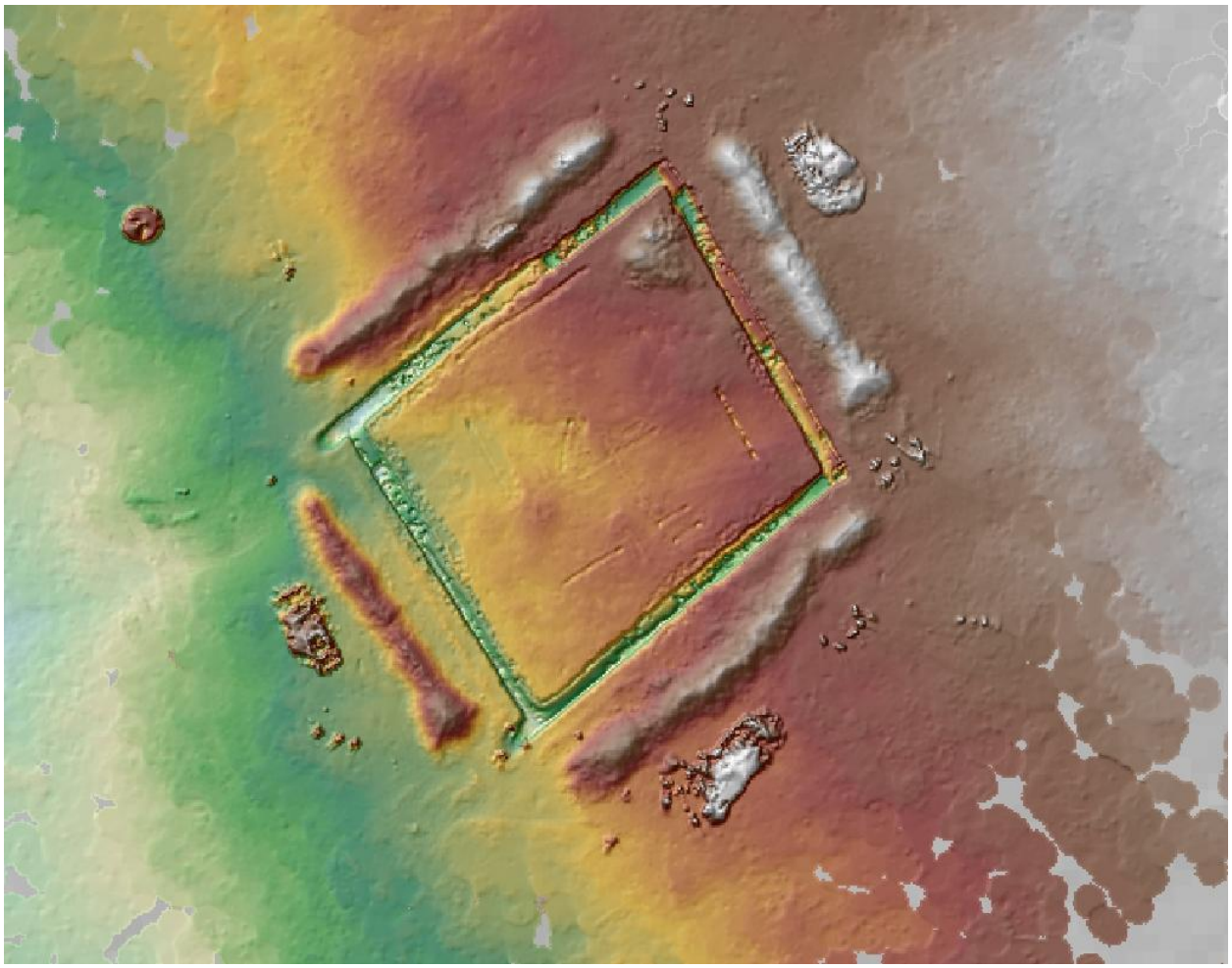

Figure 5. High resolution topography from Terrestrial Laser Scanner of the detailed investigation site at Bidart site in 2009. See figure 1 for location.

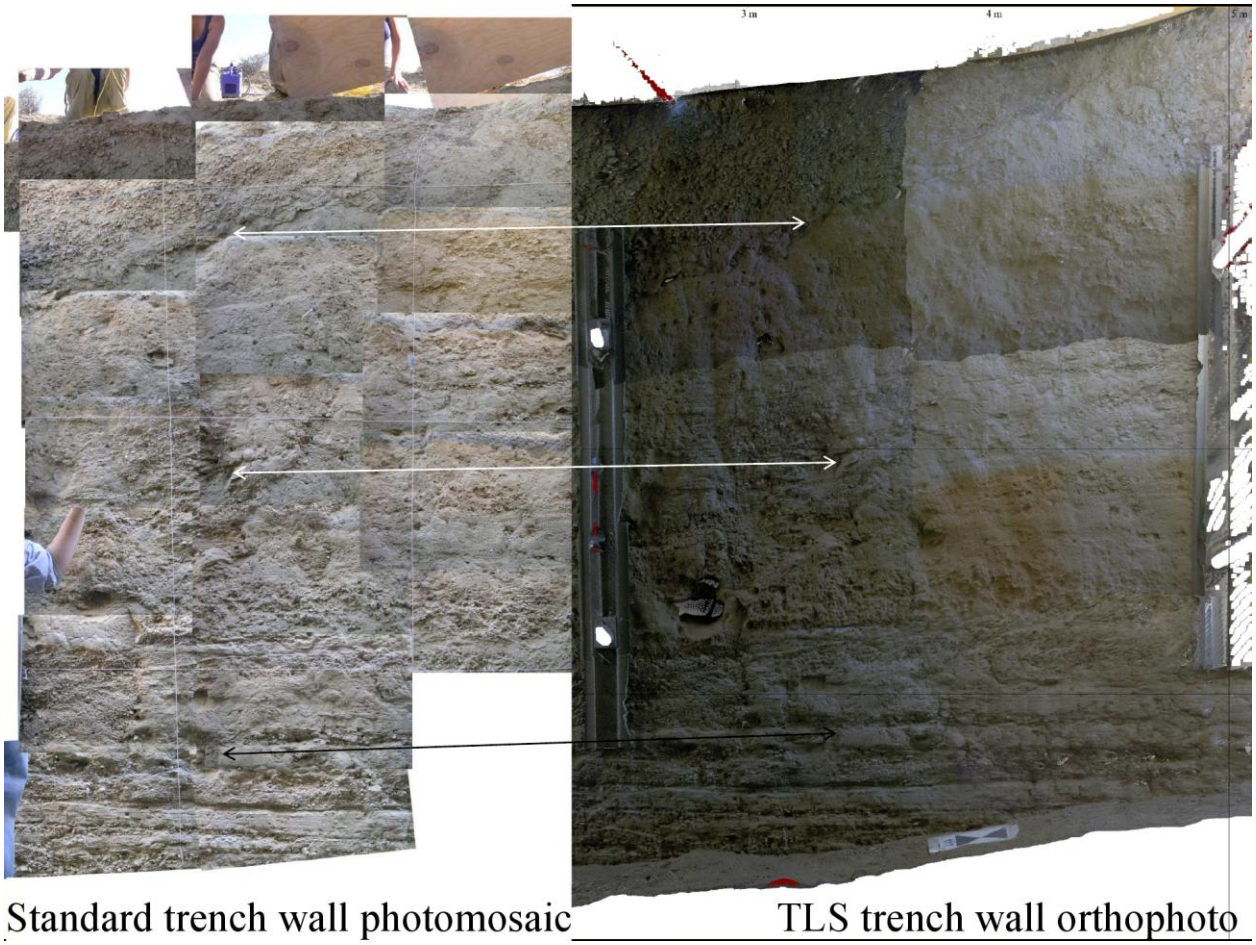

Figure 6. Terrestrial Laser Scanner derived trench wall orthophotograph (right side) compared with standard photomosaic of same exposure in trench across offset channel at the SE channel downstream trench at the Bidart site 2009. See figure 1 for location.