Statewide California Earthquake Center
Final Technical Report
Project 22117

Digital post earthquake response and earthquake geology for SCEC with StraboSpot

Researchers
Ramon Arrowsmith, Professor (Principal Investigator)
Malinda Zuckerman
School of Earth and Space Exploration, ASU

Abstract
We have developed StraboSpot (https://www.strabospot.org/) for post-earthquake response and earthquake geology workflows in SCEC. It is a capable alternative which operates on iOS and Android platforms, is NSF-supported, is configurable, is cloud enabled, and is free. We have refined StraboSpot use cases including surface rupture mapping and documenting and analyzing Fragile Geologic Features, and coordinated with California Geological post earthquake response team and worked to use a common schema.

Intellectual Merit
Post-earthquake rapid response and earthquake geology are essential activities of the SCEC community. They entail the collection and preservation of perishable earthquake data. These data range from notes and ideas from the field to annotated photographs, measurements, and samples. They should be well geolocated and need coherent data management strategies to enhance their use and re-use for addressing fundamental science questions as well as hazard applications. SCEC research strategies and priorities for earthquake geology include documentation of paleo earthquake ages and displacements, characterization of fault zones to assess rupture hazard, and the analysis of Fragile Geologic Features including precariously balanced rocks (PBRs). In addition, there is a challenge to develop community guidelines for post-earthquake field reconnaissance activities.

Broader Impacts
This project adapts freely available tools developed with NSF support for the specific needs of the earthquake geology community.

Technical Report Narrative

Overview

Post-earthquake rapid response and earthquake geology are essential activities of the SCEC community. They entail the collection and preservation of perishable earthquake data. These data range from notes and ideas from the field to annotated photographs, measurements, and samples. They should be well geolocated and need coherent data management strategies to enhance their use and re-use for addressing fundamental science questions as well as hazard applications. SCEC research strategies and priorities for earthquake geology include documentation of paleo earthquake ages and displacements, characterization of fault zones to assess rupture hazard, and the analysis of Fragile Geologic Features including precariously balanced rocks (PBRs). In addition, there is a challenge to develop community guidelines for post-earthquake field reconnaissance activities.

Here we have worked to develop StraboSpot (https://www.strabospot.org/) for post-earthquake response and earthquake geology workflows in SCEC. It is a capable alternative which operates on iOS and Android platforms, is NSF-supported, is configurable, is cloud enabled, and is free. We have refined StraboSpot use cases including surface rupture mapping (Figures 1 and 2) and documenting and analyzing Fragile Geologic Features (Figures 3 and 4), and coordinated with California Geological post earthquake response team and worked to use a common schema (Figure 5).
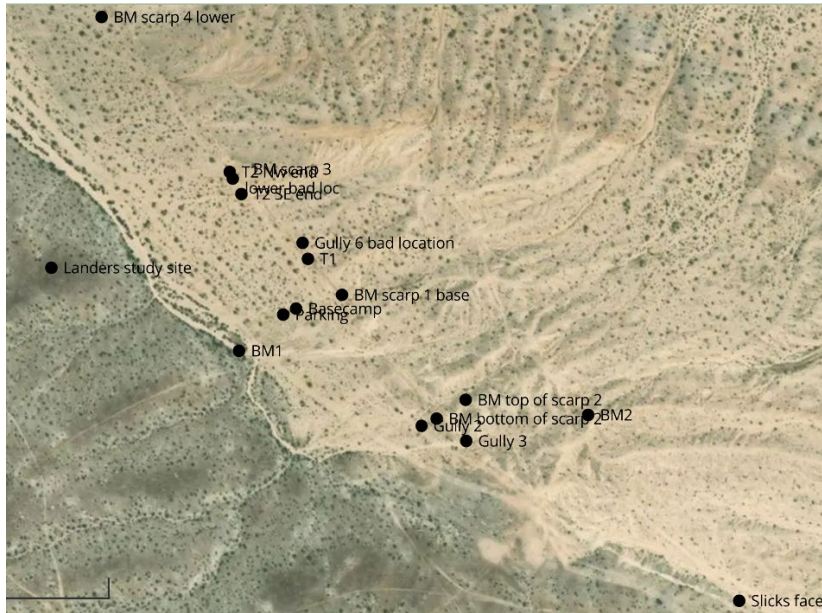
Figure 1. Landers 1992 earthquake scarp with Spots documented using StraboSpot. These were downloaded directly from StraboSpot online. Figure 2 is a picture of the T1 trench site.

Figure 2. Trench T1 photograph at the Landers earthquake Emerson Fault T1 Spot as accessed from within StraboSpot. See Figure 1 for location.

Figure 3. Courtwright and Wishon Reservoir area in the Southern Sierra Nevada. View from StraboSpot online shows fragile geologic feature mapping. See analysis of these precariously balanced rocks in Figure 4.
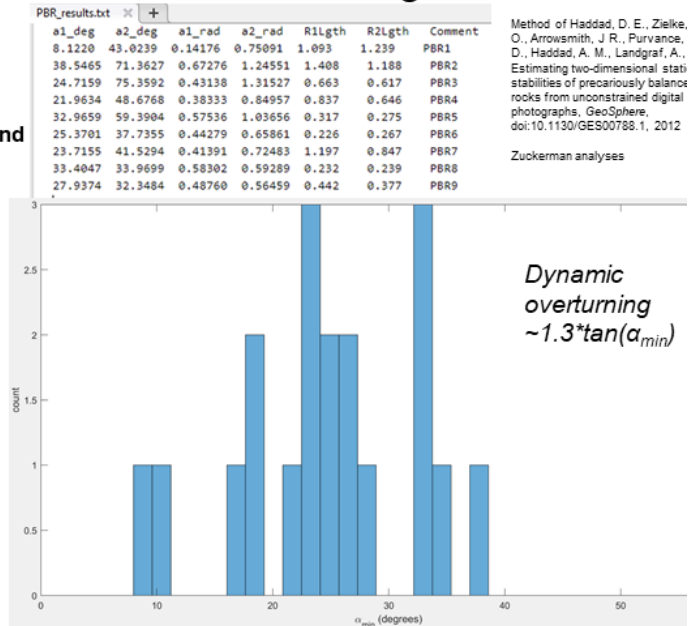

Figure 4. Analysis of precariously balanced rock (PBR) fragility following field documentation with StraboSpot. See Figure 3 for location.

Fault Slip Measurements

Fault Slip Measurement

Vector measurement (directly taking trend/plunge and measuring slip), Slip components (horizontal and vertical components of separation)

- ☐ Vector Measurement
- ☐ Slip Components

Heave Preferred (cm)

Heave Min (cm)

Rupture Expression

What does the rupture look like at this location? (e.g. mole track, crack, en echelon fractures, etc.)

Rupture Width Preferred (m)

Figure 5. Mock up of data collection schema for StraboSpot in kobotoolbox (https://kf.kobotoolbox.org/). This approach mimics the schema of the California Geological Survey.