

**2019 SCEC Work Plan
SCEC Award #19023**

Building the Community Rheology Model (CRM): geologic investigation of ductile shear zone rheology

Researcher: Sinan Akciz, CSUF

Amount awarded: \$8,000

Work Plan

(a) Structural Map of the Borrego Springs Shear Zone (BSSZ):

Internal structure of the BSSZ is not adequately documented. PI Akciz and his undergraduate student, Jeremy Torres, will produce a detailed geological transect across the BSSZ along the Montezuma Hwy and document the width and spacing of mylonitic gneisses as seen along the roadcut exposures. Field mapping will be done on satellite photographs printed at 1:1000. Distribution of undeformed, lineated, foliated and lineated-and-foliated gneissic rocks will be mapped and their orientations will be recorded.

Status: Only limited field work was completed due to the late availability of the funds. Preliminary field work was completed and sections of the BSSZ with different structural elements were identified but no detailed field work was completed. Initial plans of doing the work in the summer of 2020 is on hold for the time being as CSUF is not allowing any research activity or trips.

(b) Microstructural and electron backscatter diffraction (EBSD) analysis and Zr-in-titanite thermometry:

Upon completion of the field work and characterization of shearing along the BSSZ, a selection of representative samples from high, medium and low strain zones of the BSSZ will be cut and made into doubly-polished thin sections in preparation for EBSD analyses. Jeremy Torres will be conducting these analyses at CSUN with the supervision of Dr. Miranda (co-PI of the project). Appropriate samples will be given to Dr. Schwartz at CSUN (co-PI of the project) to conduct the Zr-in-titanite analyses.

Status: One sample from this initial field reconnaissance work has been processed and results shared at the annual SCEC meeting (Miranda et al., 2019). Another samples, collected by a student of Prof. Schwartz (CSUN) during the same reconnaissance field work was also processed and results presented at the annual meeting. Our field reconnaissance also identified foliation cross-cutting leucogranitic dikes. Zircons from one of these dikes were dated to constrain the duration of shearing along the BSSZ

(Brackman et al., 2019). My student, Jeremy Torres participated in the PLASMA workshop at CSUN and dated the zircons from the leucogranitic dike.

Project Management and Research tasks

This current submission is complemented by a related research project that also involves detailed field investigation of shear zone mylonites. PI Akçiz has been a long-time member of the SCEC community through his paleoseismology research, but he has also worked along long (>1000 km), exhumed (>10 km depth) transpressional mylonitic strike-slip shear zones in China as part of his Ph.D. He will supervise Jeremy Torres in field mapping, structural data collecting, oriented sample collection, and microstructural fabric descriptions under the microscope.

Status: A new student will be recruited by the PI to complete the rest of the field investigation as soon as field work is allowed. In the case where fieldwork for the PI is allowed without the presence of students, PI will conduct the field work.

Timeline

Feb 1 – May 30, 2019: Reconnaissance weekend field work for undergraduate student training.

June 20 – July 30. Field work along BSSZ and oriented sample cutting. Field data compilation.

August 1- 30. Microstructure documentation and participation in the NSF-funded 'PLASMA' summer institute at CSUN.

Sep. Presentation of preliminary results at SCEC annual meeting.

Sep – Dec. Continued data collection and analysis.

Jan, 2010. Submit final SCEC report.

Status: If field work is allowed during the summer of 2020:

July - August 2020 – field data collection

August 2020 – submission of samples to CSUN for EBSD analysis

September – compilation and drafting of field data results.

January 2021 – completion of the project.

References:

Brackman, A., Torres, J. A., Schwartz, J., Miranda, E. A., & Akciz, S. O. (2019, 08). Dating the duration of deformation along a major shear zone within the Eastern Peninsular Ranges Batholith. Poster Presentation at 2019 SCEC Annual Meeting (poster #100)

Miranda, E. A., Zamora-Tamayo, M., Schwartz, J., Bautista, J., & Akciz, S. O. (2019, 08). Rheology of the Borrego Springs Shear Zone segment of the Eastern Peninsular

Ranges Mylonite Zone: implications for the development of the Community Rheology Model. Poster Presentation at 2019 SCEC Annual Meeting (poster #154)