

Final Report

Project 08029

Workshop on The Structure and Formation of Fault Zones and Their Role in Earthquake Mechanics

Charles G. Sammis

The workshop was held on the Wednesday June 11 and Thursday June 12 directly following, and at the same venue as the June 9-10 SCEC leadership retreat. An organizing committee consisting of Jim Rice, Judi Chester, Terry Tullis, Yehuda Ben-Zion, and Charlie Sammis put together the appended agenda. The talks covered different approaches ranging from theoretical fracture mechanics to laboratory experiments to field observations. Key issues raised in discussion were: 1) do fault zones record information about recent earthquakes including size, rupture velocity, and rupture direction, and 2) does fault zone structure affect the dynamics of individual earthquake ruptures. There were 7 speakers and about 35 participants.



The Structure and Formation of Fault Zones and their Role in Earthquake Mechanics

June 11-12, 2008

Embassy Room 1, Embassy Suites Mandalay Beach, Oxnard, CA

Conveners: *Charlie Sammis, Jim Rice, Judi Chester, Terry Tullis, Yehuda Ben-Zion*

Wednesday, June 11th

1:00-1:30pm	Opening remarks and background on fault zone structure and mechanics	Charlie Sammis
1:30-2:00	Geologic perspective on earthquake rupture: What have we learned from the SAFOD Experiment?	Judi Chester
2:00-2:15	Discussion: Is rupture information recorded in fault zones?	
2:15-2:25	Fault Bumps: Prevalence, Causes and Consequences	Emily Brodsky
2:25-2:40	Discussion: More on rupture information in fault zones	
2:40-2:55	<i>Break</i>	
2:55-3:25	How rupture dynamics interacts with damage zone structure and properties	Jim Rice
3:25-3:55	Discussion: Rupture dynamics and fault zone structure	
3:55-4:25	Rupture directionality and supershear: Elastic mismatch or damage induced dissipation?	Ares Rosakis
4:25-5:00	Discussion: Rupture directionality and supershear	
5:30	<i>Manager's Reception</i>	<i>Surf Room</i>
7:30	Dinner	<i>Pacifica Room</i>

Thursday, June 12th

6:00-8:30am	<i>Complimentary breakfast available for hotel guests</i>	<i>Surf Room</i>
8:30-9:00	Off-fault fragmentation and secondary shear in seismic fault zones, southern California	Ory Dor
9:00-9:30	Discussion: Generation and evolution of fault zone structure	
9:30-10:00	Shear localization and particle sizes in experimental and natural fault zones	Terry Tullis
10:00-10:30	Discussion: Shear localization and particle size distributions in fault zones	
10:30-10:45	<i>Break</i>	



The Structure and Formation of Fault Zones and their Role in Earthquake Mechanics

June 11-12, 2008

Embassy Room 1, Embassy Suites Mandalay Beach, Oxnard, CA

Conveners: *Charlie Sammis, Jim Rice, Judi Chester, Terry Tullis, Yehuda Ben-Zion*

Thursday, June 12th

10:45-11:30am **Open discussion:** All issues:

- The structure of fault zones
- The mechanics of shear localization within a cataclastic layer
- The particle size distribution of cataclastic rock within a fault zone
- Mechanisms for the formation of fault zone rock
- The hydraulic properties of fault zones
- The mechanics of dynamic friction within a fault zone
- The interaction of a dynamic rupture with off-fault damage
- The interaction of a dynamic rupture with fault branches

11:30-11:59 **Open discussion:** Where do we go from here? What key issues should be addressed by:

- Field studies of exhumed fault zones
- Laboratory characterization of fault zone materials (mechanical and chemical)
- In situ studies of fault zones
- Theoretical modeling of nucleation and rupture propagation in realistic fault zones

12:00pm Adjourn