

2005 SCEC Annual Report

**Collection of GPS data in the San Bernardino Mountains**

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Proposal Type: A. Data Gathering and Products

E. SCEC Intern Support

Disciplinary Committee: Tectonic Geodesy

Focus Group: Fault Systems

### Collection of GPS data in the San Bernardino Mountains

The density of geodetic velocity measurements used in SCEC's Crustal Motion Model 3 (CMM3) is substantially lower in the San Bernardino Mountains than it is along most other parts of the plate boundary zone within southern California (Figure 1). We were funded by SCEC in 2005 to begin to remedy this situation. Using 2005 SCEC funding we supervised two SCEC interns, Amanda Lopez and Adam Skalenakis in their collection of data from 13 stations in the San Bernardino Mountains: A325, Cherry, Deadman, Divide 1960, JRH15, Lune, Meadow, Meeks, Mill 1952, Monarch, Pits, Onyx, and White Mtn (yellow circles in Figure 2; see also Table 1). McGill or Fryxell accompanied the interns to the more remote locations. All of our data has been sent to Duncan Agnew, to be made available at the SCEC data center and to be included in future versions of SCEC's crustal motion model.

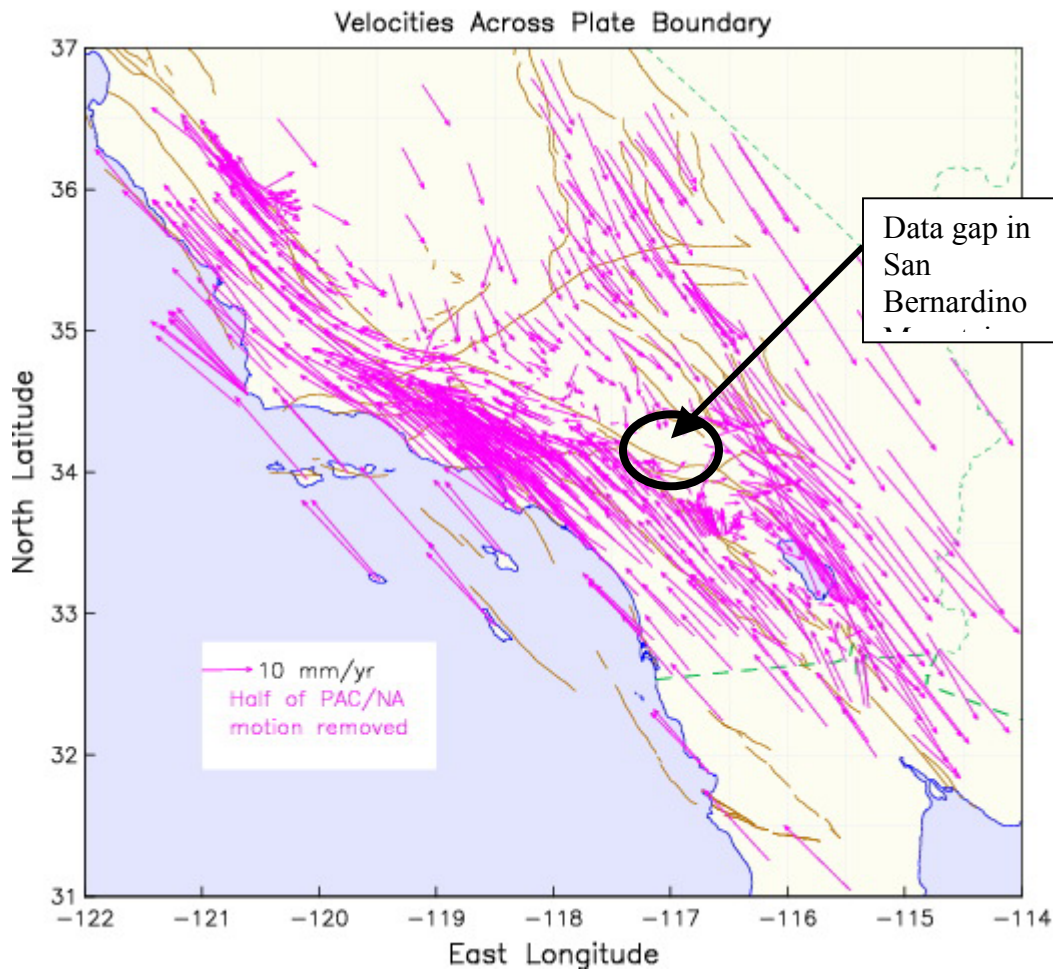


Figure 1: Map showing existing velocity vectors from SCEC's Crustal Motion Model 3 <http://epicenter.usc.edu/cmm3/>.

Of the 13 stations we visited, three were included in CMM3 (Meeks, Onyx and Cherry). The new observations we collected at these sites will allow these CMM3 velocities to be updated. Two other stations (Mill and Divide) have prior data available at the SCEC data center but were not included in CMM3. Our new observations at these sites may now

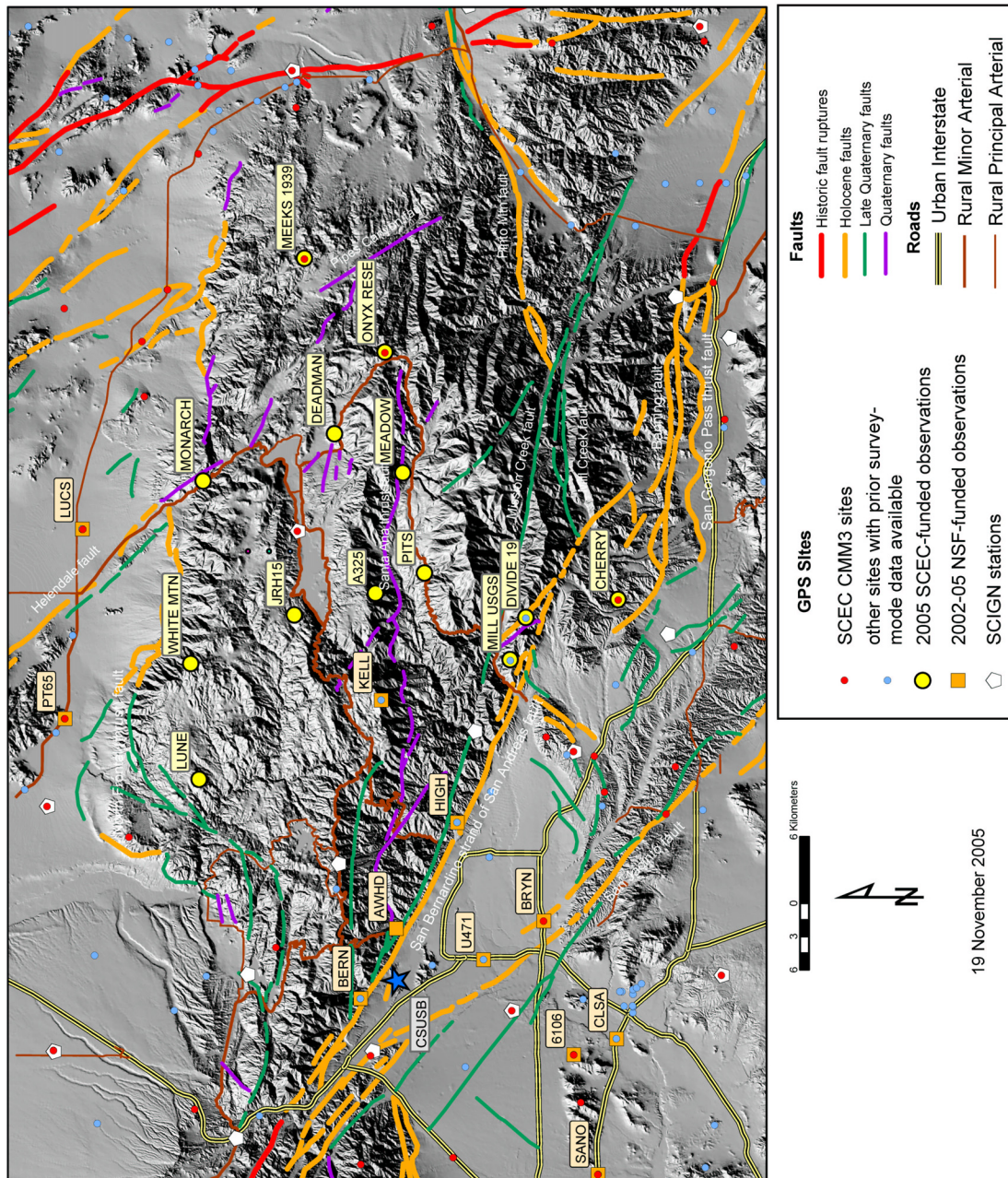


Figure 2: Map showing locations of stations where new GPS observations were made in 2005.

allow velocities to be calculated for these two sites. These two sites are both on Yucaipa Ridge, a block within the San Bernardino Mountains that has had a particularly rapid uplift rate during the past few million years, as judged from apatite fission track and helium ages (Blythe et al., 2002). The remaining 8 stations we visited are located in areas where no prior GPS observations were available. We selected existing benchmarks that would provide good coverage throughout a broad region within the San Bernardino Mountains. We plan to revisit these sites periodically in the future, with either SCEC or Earthscope funding, in order to obtain velocities for these sites.

Our work in 2005 built upon prior, NSF-funded work in which we conducted, during 2002-2004, 5 GPS surveys of 12 sites along a 70-km-long transect across the San Andreas and San Jacinto faults from Norco, through San Bernardino to Lucerne Valley (orange squares in Figure 2; see also Table 1). During the summer of 2005, we conducted our sixth NSF-funded campaign along this transect, which includes 4 sites within the San Bernardino Mountains (KELL, HIGH, BERN [6108] and AWH, [a pin installed at Arrowhead Springs by CSUSB]). SCEC interns Lopez and Skalenakis participated in the NSF-funded GPS campaign during June 2005, along with 17 high school teachers, 16 high school students, and 15 undergraduate students. Six of the undergraduate students and at least six of the high school students were from under-represented ethnic groups.

Both SCEC interns, Lopez and Skalenakis presented posters at the 2005 SCEC meeting. McGill worked with Lopez to use AutoGIPSY to process the data from the NSF-funded campaign (Figures 3 and 4) and Lyzenga worked with Skalenakis to model the GPS velocities using Disloc and Simplex. Lopez also presented her poster at the Southern California Conference on Undergraduate Research (SCURR) on November 19, 2005.

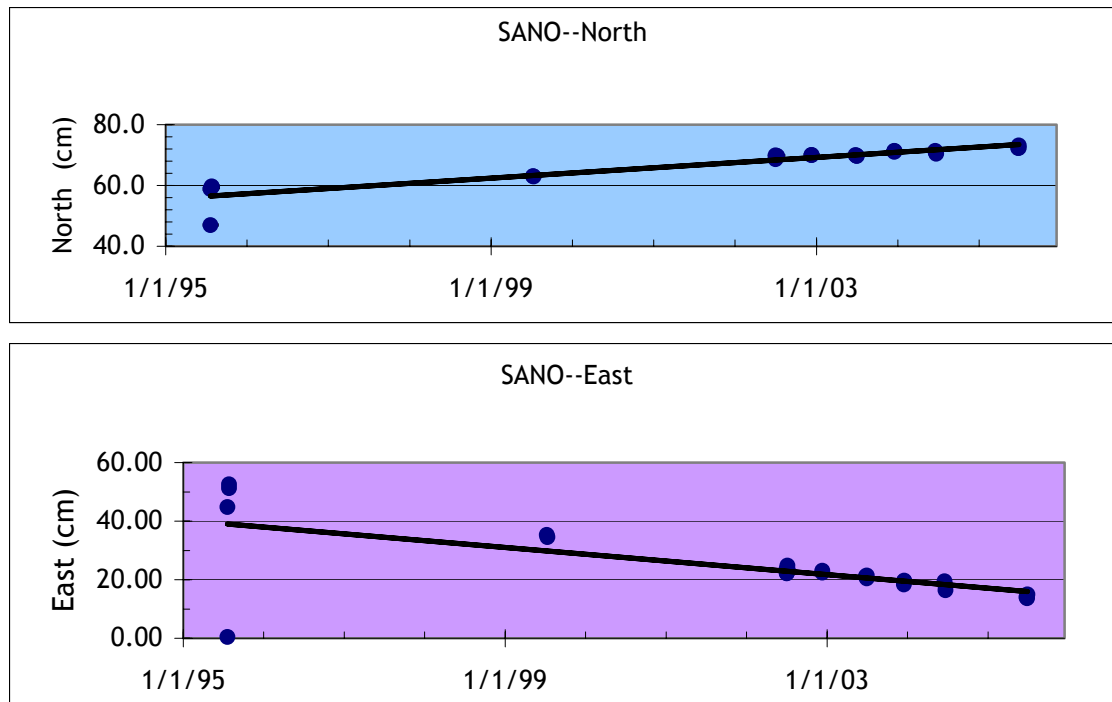


Figure 3: Position (relative to nominal coordinates) versus time for one of the stations (SANO) in the NSF-funded campaign.

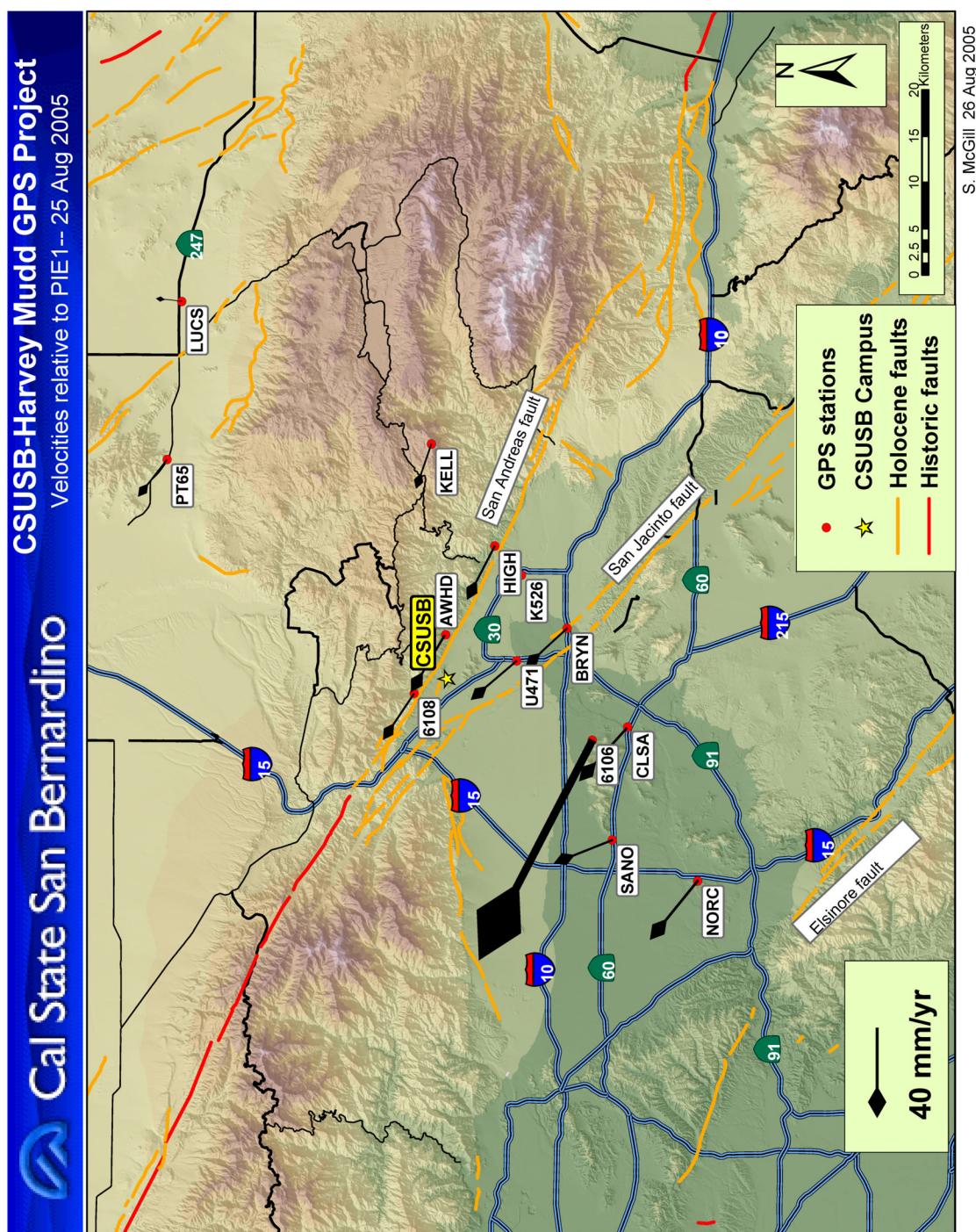


Figure 4: Velocities of sites in NSF-funded transect, relative to Pietown, New Mexico, which is taken to approximate velocities relative to the North American plate.

Table 1. Summary of GPS observations conducted during summer 2005.

Designation	SCEC 4-letter code	U.S.G.S. 7.5' Topographic			2005 Day # (UTC)	New Observations		Previous Observations	
		NGS ID	LATITUDE	LONGITUDE		Collected	Start	Stop	# of files
SCEC-Funded Observations in the San Bernardino Mountains									
A325	A325*	EV0474	34.20056	-116.94583	189	13			none
CHERRY	CHER	AH5235	34.00278	-116.95194	194	23	1988.233	1997.178	30
DEADMAN	DMAN	EV9220	34.23377	-116.78950	189, 208	18, 22			none
DIVIDE	DIVD	none	34.07802	-116.96919	287, 288	22.5, 24	1992.498	1992.501	2
JRH15	JR15*	none	34.26667	-116.96667	216	20			none
LUNE	LUNE*	EV3143	34.34417	-117.12806	188, 189	20, 24			none
MEADOW	MEAD*	EV9232	34.17816	-116.82779	201	24			none
MEEKS	MEEK	EV4009	34.25791	-116.61743	232-235	20.5, 24, 24, 23	1992.318	2004.312	35
MILL	MILL	AH5242	34.09072	-117.01062	287, 288	5, 24	1991.14	1993.569	13
MONARCH	MONA*	EV9212	34.34083	-116.83556	189	20			none
ONYX	ONYX	EV4030	34.19250	-116.70944	218	23	1991.865	2000.03	20
PITS	PITS*	EV9238	34.16054	-116.92594	208	23			none
WHITE MTN	WHMT*	EV3141	34.35111	-117.01444	230-232	24, 24, 11			none
NSF-Funded Observations in the San Bernardino Mountains									
ARROWHEAD	AWHD	none	34.18351	-117.27319	174, 175, 178, 179	8, 9, 9, 6	2002.517	2004.479	15
BERN	6108	EV3622	34.21236	-117.34197	174, 179, 180	9, 8.5, 7.0	1991.641	2004.479	15
HIGHLAND	HIGH	EV3608	34.13392	-117.16925	174, 175, 178, 180	9.5, 9, 9, 9	1991.137	2004.479	35
KELL	KELL	AH5240	34.19589	-117.04951	174, 175, 179, 180	8, 8, 8, 8	1991.14	2004.479	21

\*= suggested 4-character id