Review of the Landers earthquake ("strike-slip") pre-rupture mapping assignment

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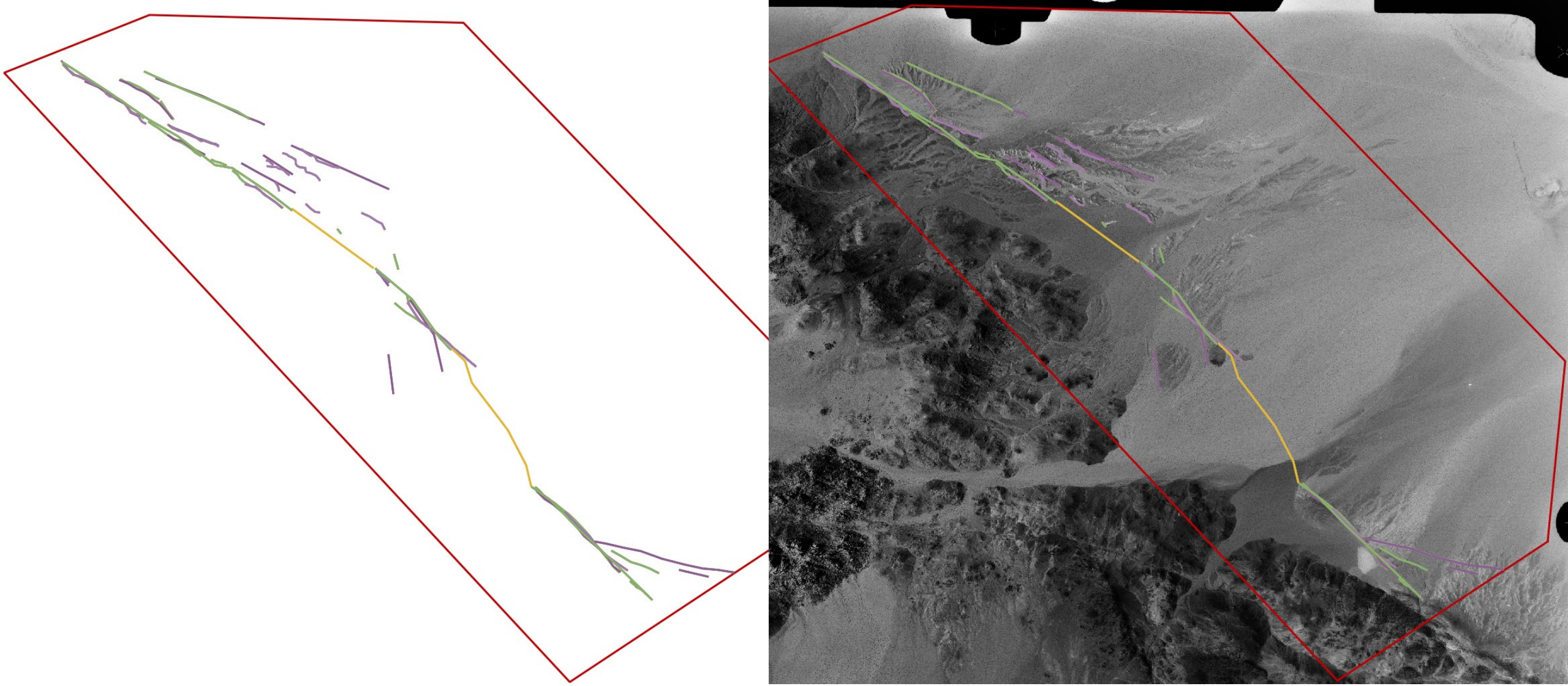
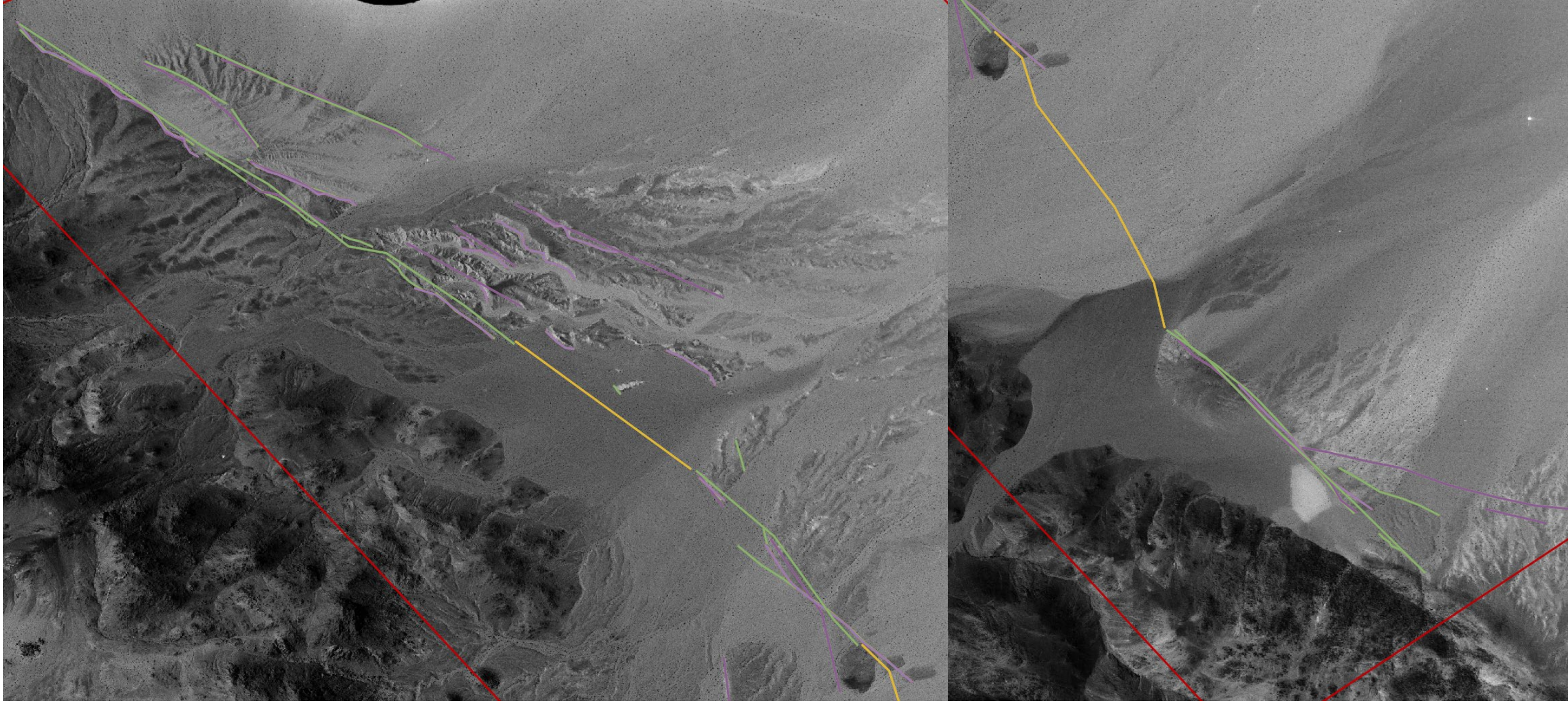


Fault traces from prior mapping (NOT FROM THIS CLASS):
Good repeatability along the main trace with some identification of secondary structures
Does not include GIR formally



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https://geomechanics.research.pdx.edu/publications/Landers/GSA-Mch082/index.html
Photo courtesy of I. K. Curtis Services, Inc., Burbank, CA

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Photo courtesy of I. K. Curtis Services, Inc., Burbank, CA

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POST event mapping

Surficial slip distribution on the central Emerson fault during the June 28, 1992, Landers earthquake, California

Sally F. McGill

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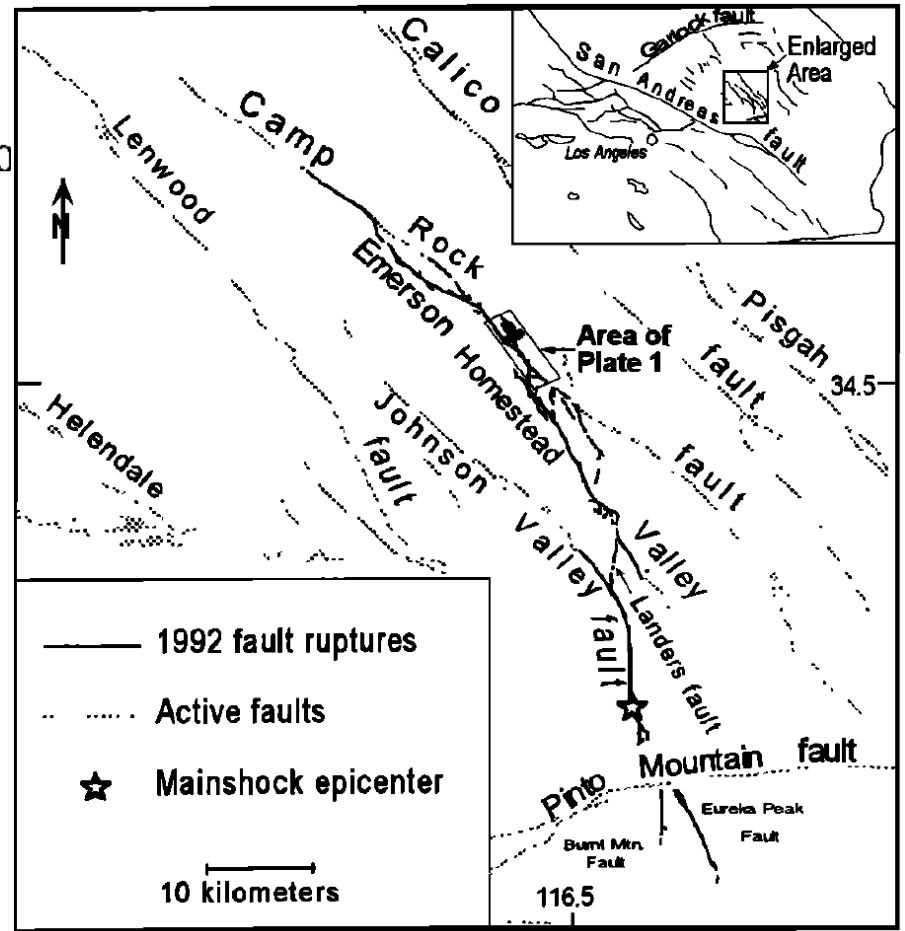
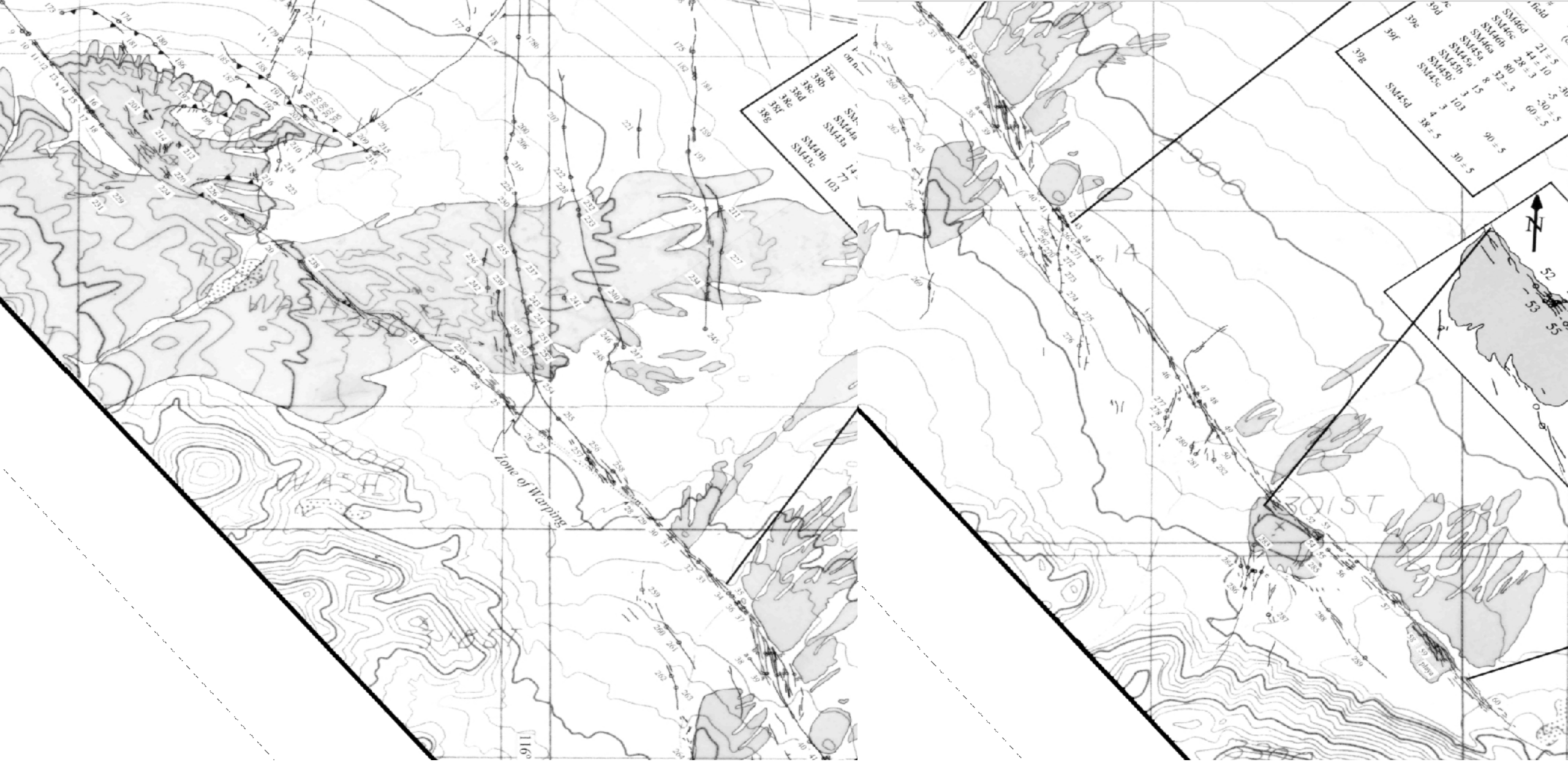
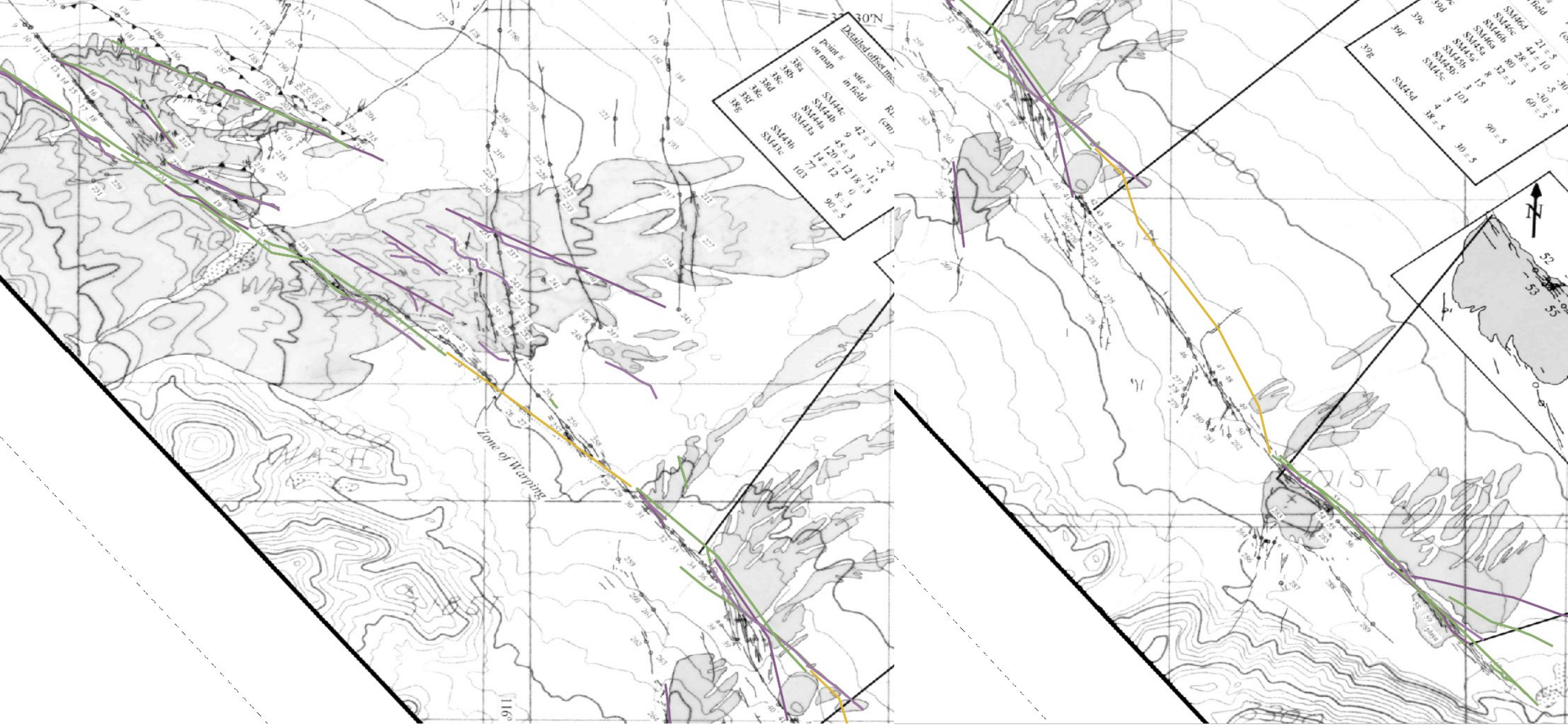


McGill and Rubin, 1999


Zone of Warping
WASH
N
52
53
55


Detailed offset measurements
Point # on map
site # in field
38a
38b
38c
38d
38e
38f
38g
SM44c
SM44b
SM44a
SM43a
SM43b
SM43c
42 ± 3
9
45 ± 3
120 ± 12
14 ± 12
77
103
-5
18 ± 3
0
8 ± 3
90 ± 5
Zone of Warping
WASH
116°
39e
39f
39g
SM46d
SM45c
SM46b
SM46a
SM45a
SM45a'
SM45b'
SM45c
SM45d
21 ± 5
41 ± 10
28 ± 3
80
32 ± 3
8
15
3
103
-5
-30 ± 5
60 ± 5
4
38 ± 5
90 ± 5
30 ± 5
N
52
53
55

Earth and Space Science

TECHNICAL REPORTS: METHODS
10.1029/2019EA000651

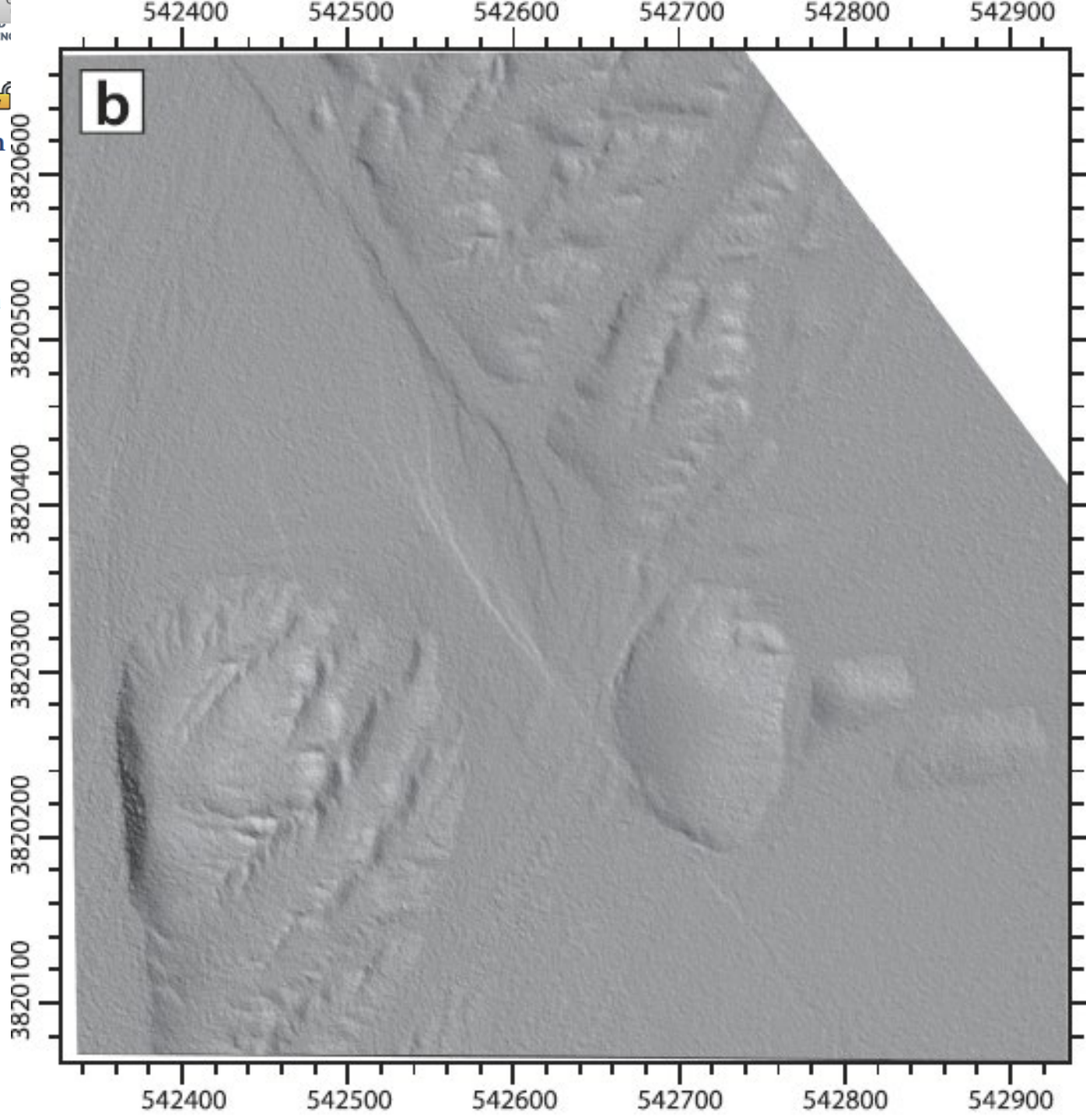
Submeter Resolution Surface Rupture Topography From Legacy Aerial Photographs—A Test Case From the 1992 Landers Earthquake

Key Points:

- We use legacy air photos to map submeter resolution topography along the 1992 M_w 7.3 Landers earthquake rupture
- Point clouds constructed using Structure from Motion and

Lia J. Lajoie[1], Edwin Nissen[1,2], Kendra L. Johnson[3], and Kenneth R. Lajoie[4]

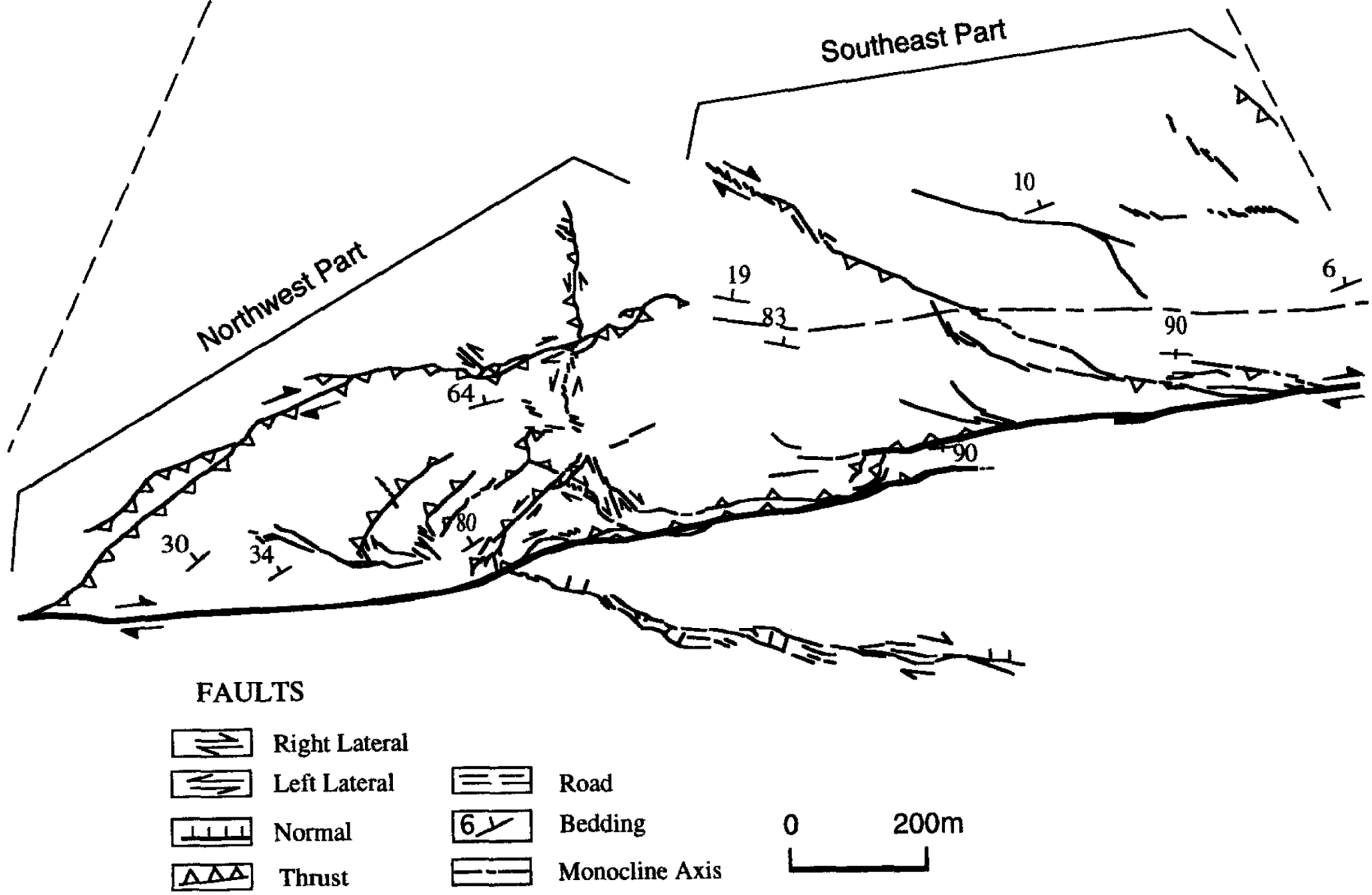
[1]Department of Geophysics, Colorado School of Mines, Golden, CO, USA, [2]School of Earth and Ocean Sciences, University of Victoria, Victoria, British Columbia, Canada, [3]Global Earthquake Model, Pavia, Italy, [4]Retired, United States Geological Survey, Menlo Park, CA, USA

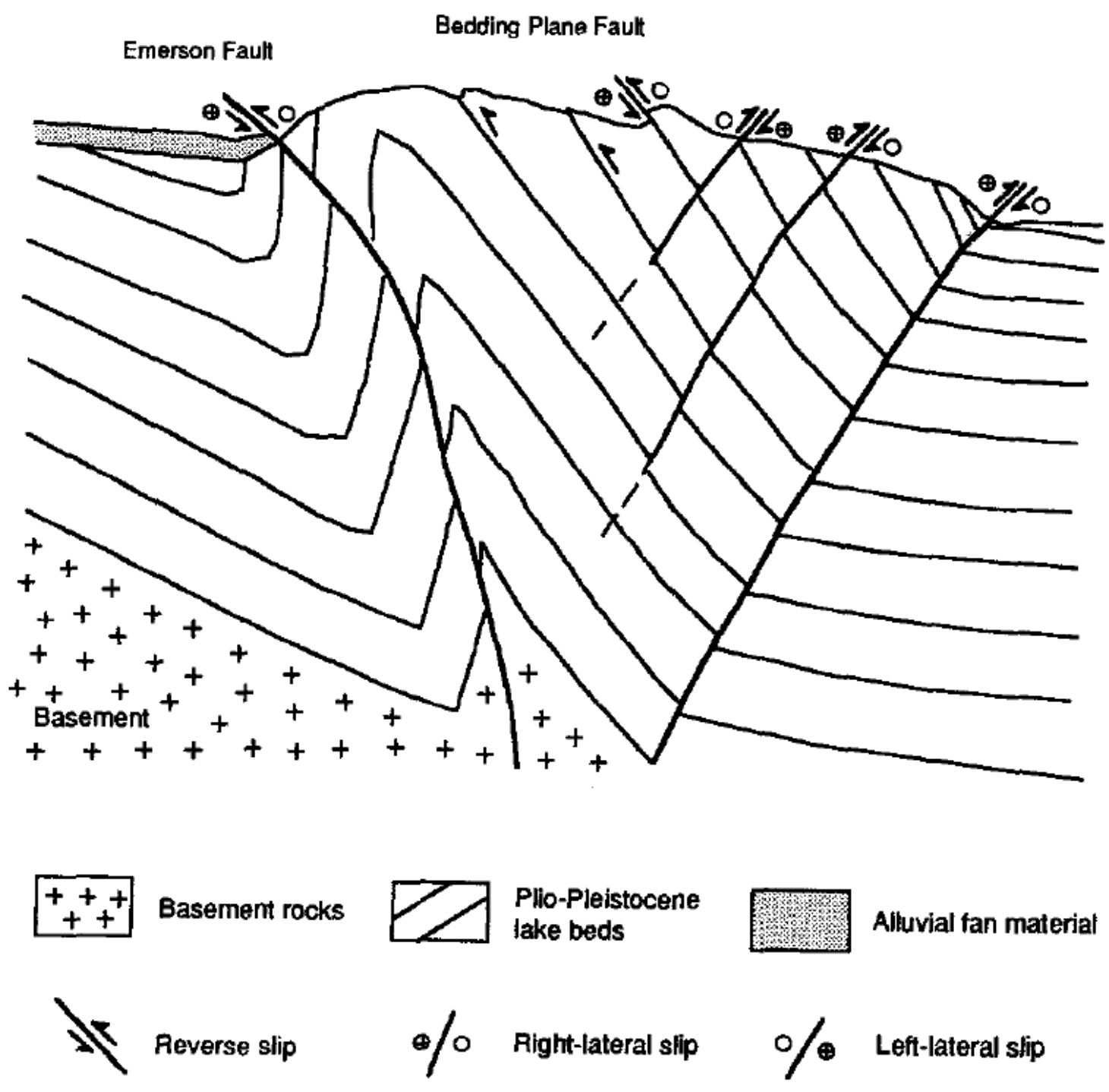


Bulletin of the Seismological Society of America, Vol. 85, No. 1, pp. 111–128, February 1995

Surface Rupture at a Fault Bend: the 28 June 1992 Landers, California, Earthquake

by Atilla Aydin and Yijun Du


Southeast Part
Northwest Part
10
19
6
83
90
64
90
30
34
80
FAULTS
Right Lateral
Left Lateral
Normal
Thrust
Road
6
Bedding
Monocline Axis
0
200m


Emerson Fault
Bedding Plane Fault
Basement
Basement rocks
Plio-Pleistocene lake beds
Alluvial fan material
Reverse slip
Right-lateral slip
Left-lateral slip

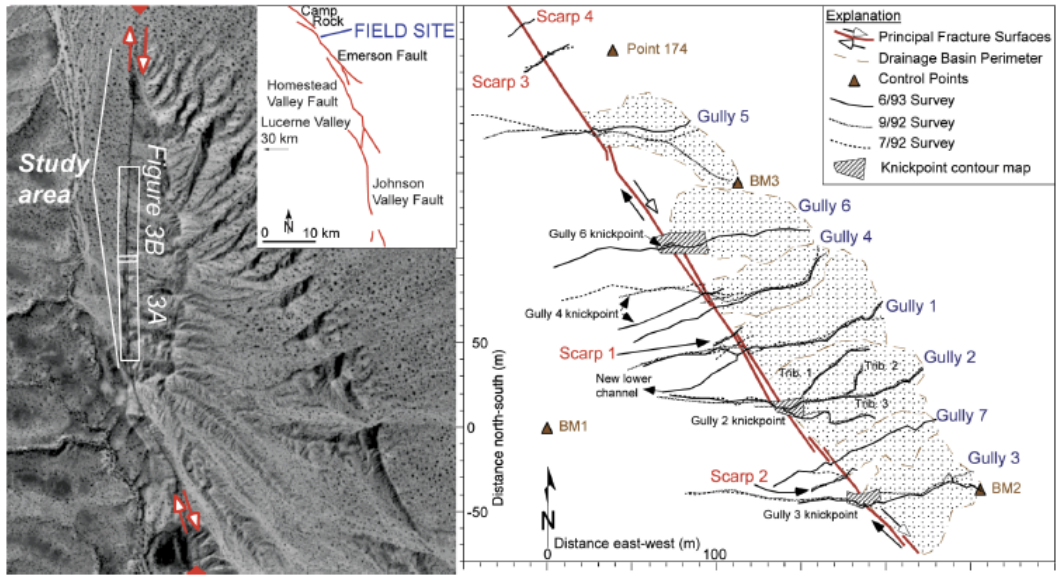
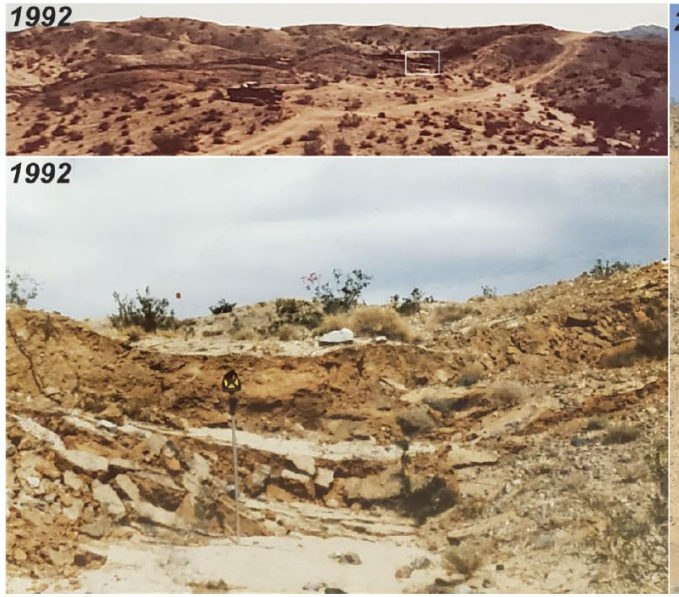
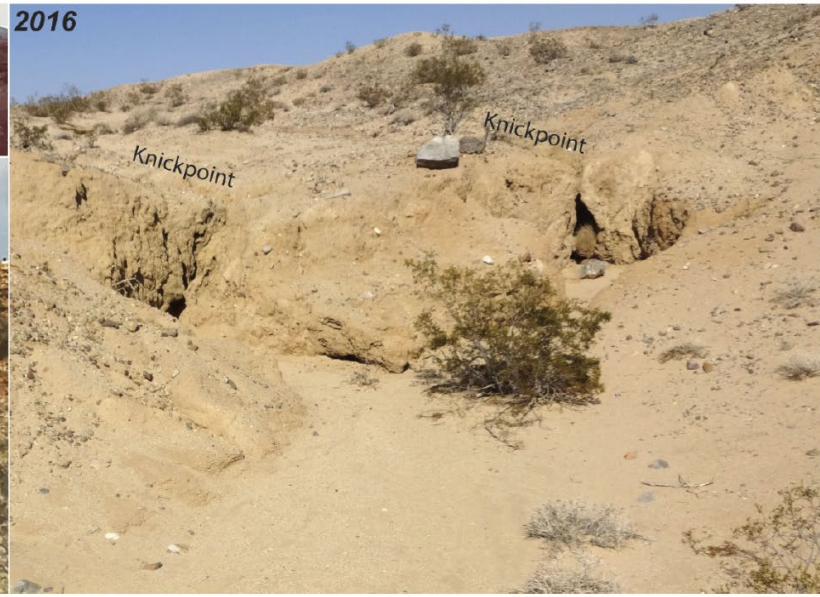


Figure 1. Field site along the northern Emerson fault which ruptured in the M7.3 1992 Landers earthquake. Left image inset shows the study area location along the rupture zone (red lines). Aerial photograph taken by USGS immediately after the earthquake shows surface rupture trace along uplifting folded basin and alluvial fan sedimentary units and the study area. White rectangles indicate Figure 3 panel locations. At right, the map illustrates the main landforms whose investigations and monitoring began immediately after the earthquake (Table 1; modified from Arrowsmith and Rhodes, 1994).

Activity	July 1-8, 1992	Sept 26-27, 1992	June 2-4, 1993	May 19-21, 1994	May 4-5, 1995	May 20-21, 1997	Dec 18-19, 1998	March 11-12, 2000	May 1, 2008	Sept 15, 2009	Aug 26, 2012	June 7, 2016
Observations and general photography	F	F	F	F	F	F	F	F	D	D	D	D
Mapping of surface ruptures	X											
Establishment of permanent benchmarks		X										
Ground stereo photography		F	F	F	F	F	F	F		D	D	D, SfM
Scarp and Gully Profiles		OTS	OTS	OTS	OTS	OTS	OTS	OTS	TLS		SfM	SfM
Knickpoint Contour Maps		OTS	OTS	OTS	OTS	OTS	OTS	OTS	TLS		SfM	SfM
Basin Topography						OTS			TLS		SfM	SfM
Total points surveyed	375	625	858	1130	1221	597	1643	987	9.5M		>46M	>100M

Table 1. Survey activity at the site. Note evolving technology. F is film; D is digital; OTS is Optical Total Station; TLS is Terrestrial Laser Scanner; SfM is Structure from Motion.





Arrowsmith, Reitman, et al.: **Landers Earthquake scarp after 30 years**