

DR File 1. Fault compilation references, supplemental figures, decompaction parameters, and Figure 5 Rose diagram output data for:

Post–12 Ma deformation of the lower Colorado River corridor, southwestern USA: Implications for diffuse transtension and the Bouse Formation

Jacob O. Thacker¹, Karl E. Karlstrom¹, Laura C. Crossey¹, Ryan S. Crow², Colleen E. Cassidy², L. Sue Beard², John S. Singleton³, Evan D. Strickland³, Nikki M. Seymour³, Michael R. Wyatt³

¹Earth and Planetary Sciences, University of New Mexico, Albuquerque, NM 87131

²U.S. Geological Survey, 2255 N. Gemini Rd., Flagstaff, AZ 86001

³Department of Geosciences, Colorado State University, Fort Collins, CO 80523

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Supplemental Figures and Figure Captions

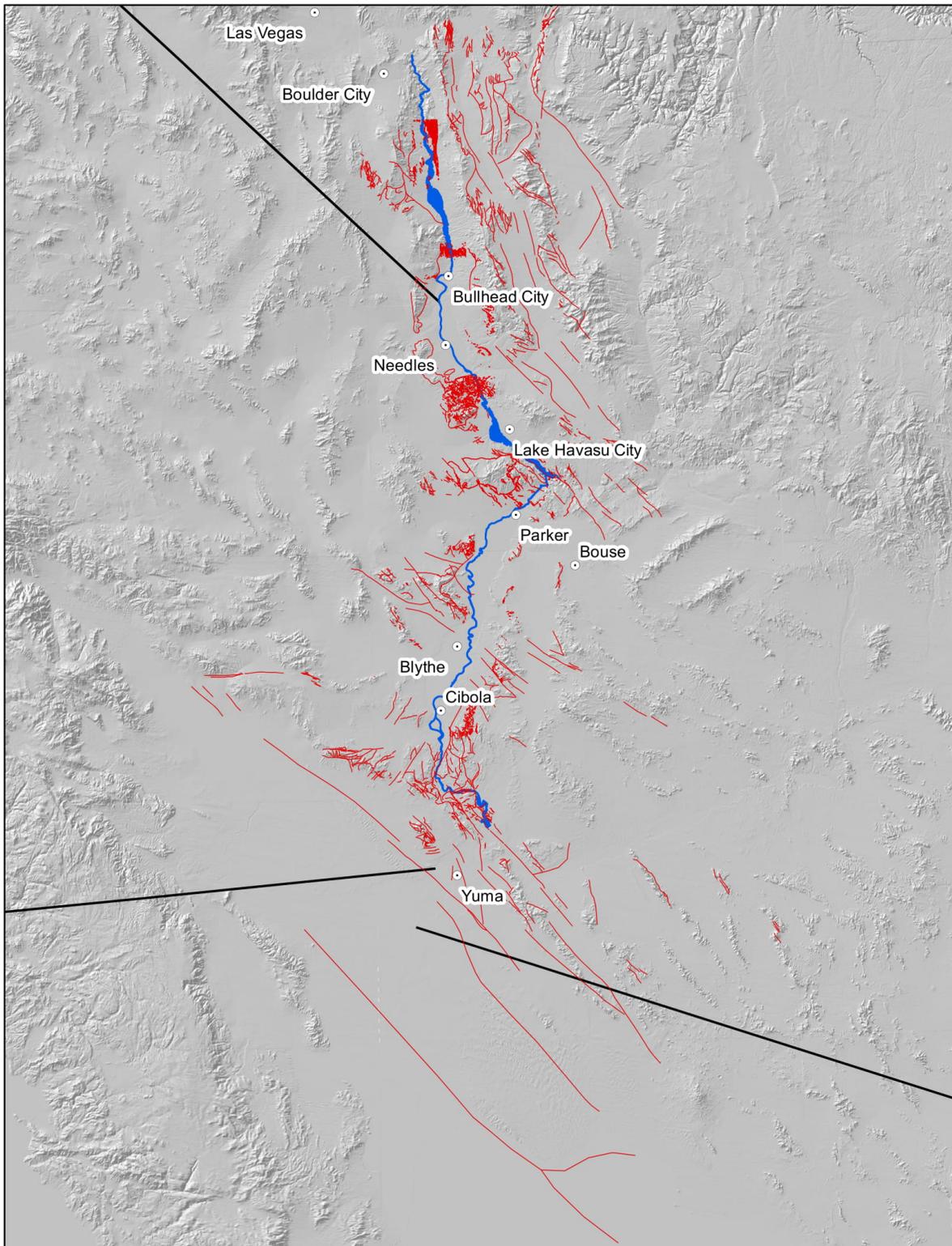


Figure DR 1: LOCO fault, fold, and dike compilation as used for geometric analyses conducted in this study. Faults: black; folds: green; dikes: red. See references above.

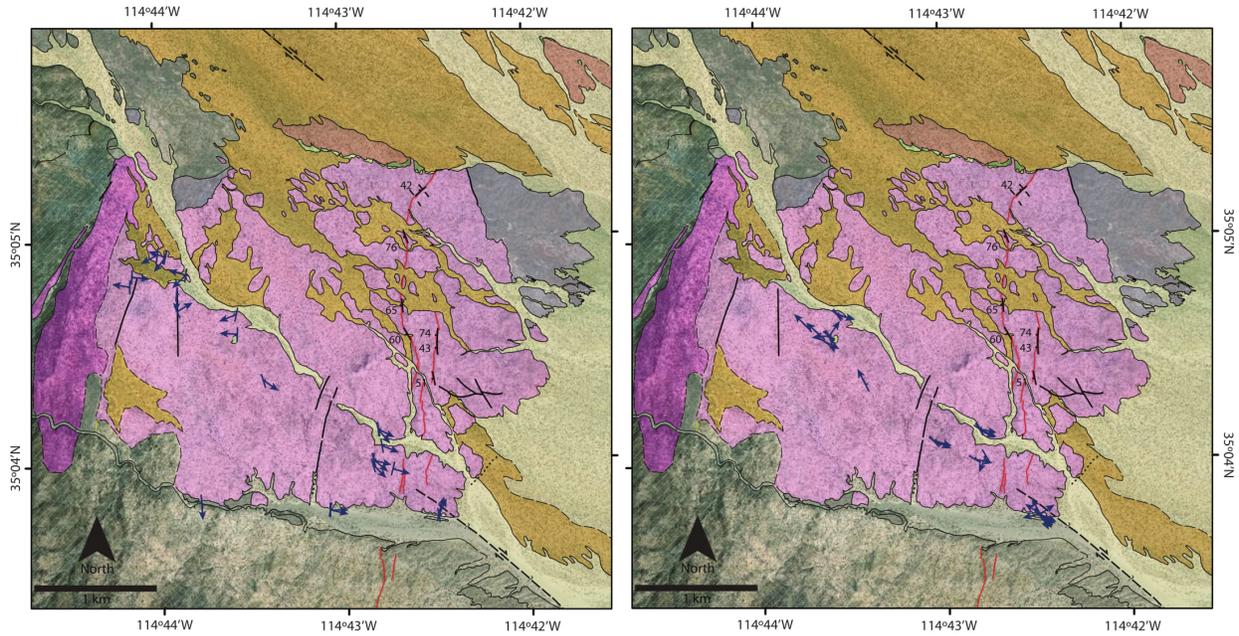


Figure DR 2: Generalized geologic map of the Manchester field area along the California-Nevada state line, as modified from House et al. (2004), and unpublished mapping from P. Kyle House and this study. Queried dextral fault at bottom right corner is approximate area of state line. Map at left shows all kinematic data for faults with N-S strike; map at right shows kinematic data for faults with a NW-SE strike. Arrow shows direction and interpreted sense of slip for minor- and macro-scale (outcrop) fault surfaces. The relative density of minor fault surfaces was absent to minor outside of this NW-SE zone, suggesting a discrete (though diffuse) structural feature, though determination of the age of deformation cannot be constrained to <17-15 Ma (the age of the Spirit Mountain plutonic complex; Walker et al., 2007).

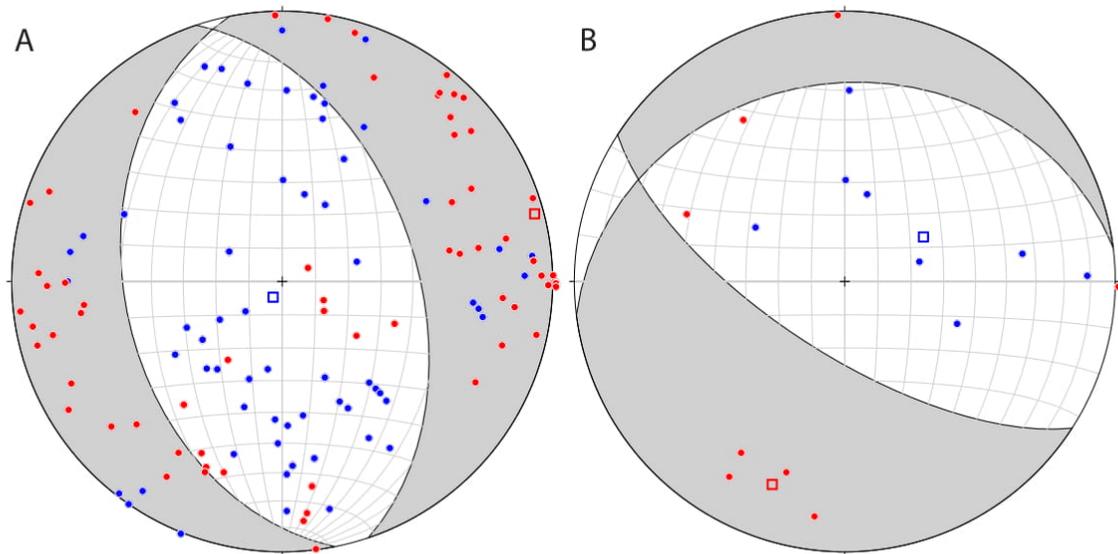


Figure DR 3: Paleostrain models for the Bill Williams fault zone that are likely heavily influenced by data related to syn-detachment deformation. (A) Shortening and extension axes and associated fault plane solution based on Linked Bingham axes for faults from the Bill Williams fault zone. The Linked Bingham extension axis is oriented 075/04 (n=83). (B) Shortening and extension axes and associated fault plane solution based on Linked Bingham axes for faults from the Bill Williams fault zone within pre-Bouse fanglomerate units. The Linked Bingham extension axis is oriented 200/22 (n=9).

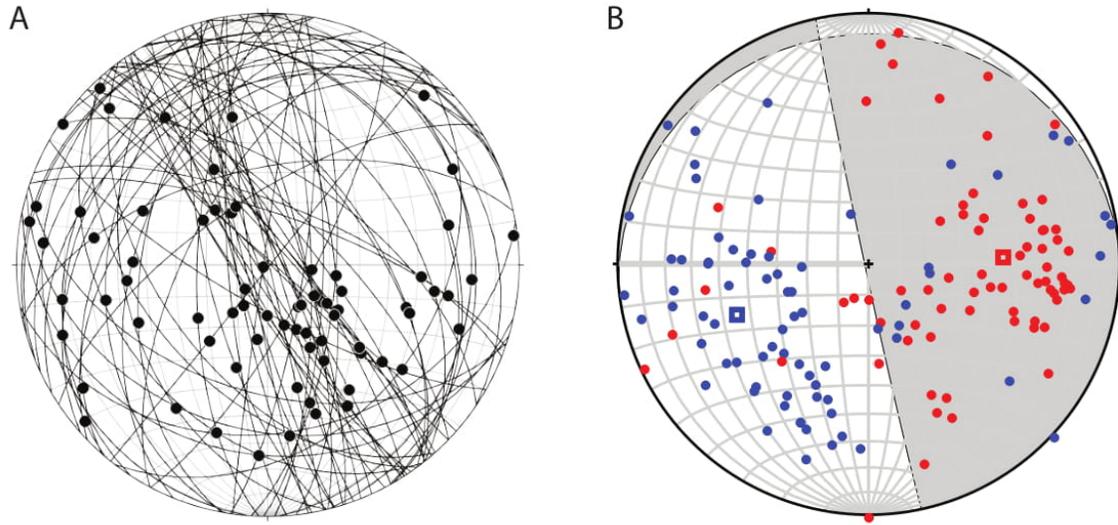


Figure DR 4: Mt. Manchester fault data corrected for 45° westward tilting during Miocene detachment deformation. For both plots: n=73. (A) Planes and slickenline lineations for Mt. Manchester data, rotated 45° back to horizontal (eastward) to account for 40-50° of syn-detachment tilting of the Spirit Mountain plutonic complex (Walker et al., 2007). A NNW-strike is evident. (B) Shortening and extension axes and associated fault plane solution based on Linked Bingham axes for rotated faults shown in A from the Mt. Manchester structural domain. The Linked Bingham extension axis is oriented 087/46, and the fault plane solution is suggestive of a low-angle (nearly horizontal) thrust motion. These data are inconsistent with syn-detachment faulting, and it is therefore deemed likely that non-rotated measurements taken at Mt. Manchester (Fig. 7F-E) are representative of post-detachment (<12 Ma) deformation.

References from DR Figures above

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Walker, B.A., Miller, C.F., Lowery Claiborne, L., Wooden, J.L., Miller, J.S., 2007, Geology and geochronology of the Spirit Mountain batholith, southern Nevada: Implications for timescales and physical processes of batholith construction: *Journal of Volcanology and Geothermal Research*, v. 167, p. 239-262.

Input data for decompaction (from Discussion section on *Magnitude of Deformation*)

Decompaction was conducted using a MatLab script written by Dr. Jay Chapman, University of Wyoming. The script is available at: <https://www.jaychapman.org/research.html>

Ages, thicknesses, and designated lithologies are as follows

Bouse carbonate:	6 Ma	2-30 m*	Limestone
Bouse siliciclastics:	5 Ma	100 m	Shale
Bullhead Alluvium:	4 Ma	300 m	Sandstone
Younger CR sediment:	0 Ma	100 m	Sandstone

*Multiple iterations were run to check the amount of compaction vs. decompaction (we ignored the calculated tectonic subsidence curves). In these iterations, the thickness of the Bouse carbonate varied between 2 m and 30 m. These did not change the overall amount of compaction by more than a couple meters.

Rose Diagram Output Data (for rose diagrams shown in manuscript Fig. 5)

All Faults

azimuth	count	tot_length	rel_length
0-10	918	918	0.767559
10-20	719	719	0.601171
20-30	514	514	0.429766
30-40	446	446	0.37291
40-50	436	436	0.364548
50-60	428	428	0.35786
60-70	422	422	0.352843
70-80	456	456	0.381271
80-90	504	504	0.421405
90-100	529	529	0.442308
100-110	610	610	0.510033
110-120	773	773	0.646321
120-130	1023	1023	0.855351
130-140	1182	1182	0.988294
140-150	1196	1196	1
150-160	1155	1155	0.965719
160-170	1141	1141	0.954013
170-180	1108	1108	0.926421

All Faults – Normal

azimuth	count	tot_length	rel_length
0-10	185	185	1
10-20	113	113	0.610811
20-30	73	73	0.394595
30-40	57	57	0.308108
40-50	38	38	0.205405
50-60	29	29	0.156757
60-70	26	26	0.140541
70-80	35	35	0.189189
80-90	27	27	0.145946
90-100	32	32	0.172973
100-110	50	50	0.27027
110-120	90	90	0.486486
120-130	108	108	0.583784
130-140	148	148	0.8
140-150	150	150	0.810811
150-160	155	155	0.837838
160-170	160	160	0.864865
170-180	184	184	0.994595

All Faults – Dextral

azimuth	count	tot_length	rel_length
0-10	0	0	0
10-20	0	0	0
20-30	0	0	0
30-40	1	1	0.018519
40-50	0	0	0
50-60	0	0	0
60-70	0	0	0
70-80	0	0	0
80-90	0	0	0
90-100	1	1	0.018519
100-110	5	5	0.092593
110-120	22	22	0.407407
120-130	44	44	0.814815
130-140	54	54	1
140-150	53	53	0.981481
150-160	19	19	0.351852
160-170	10	10	0.185185
170-180	1	1	0.018519

Folds

azimuth	count	tot_length	rel_length
0-10	0	0	0
10-20	1	1	0.090909
20-30	0	0	0
30-40	0	0	0
40-50	1	1	0.090909
50-60	4	4	0.363636
60-70	7	7	0.636364
70-80	6	6	0.545455
80-90	10	10	0.909091
90-100	11	11	1
100-110	7	7	0.636364
110-120	3	3	0.272727
120-130	6	6	0.545455
130-140	2	2	0.181818
140-150	3	3	0.272727
150-160	0	0	0
160-170	1	1	0.090909
170-180	1	1	0.090909

Dikes

azimuth	count	tot_length	rel_length
0-10	11	11	0.478261
10-20	8	8	0.347826
20-30	2	2	0.086957
30-40	2	2	0.086957
40-50	3	3	0.130435
50-60	0	0	0
60-70	1	1	0.043478
70-80	1	1	0.043478
80-90	0	0	0
90-100	0	0	0
100-110	1	1	0.043478
110-120	1	1	0.043478
120-130	6	6	0.26087
130-140	7	7	0.304348
140-150	2	2	0.086957
150-160	3	3	0.130435
160-170	6	6	0.26087
170-180	23	23	1

≤6 Ma Faults

azimuth	count	tot_length	rel_length
0-10	37	37	0.770833
10-20	29	29	0.604167
20-30	12	12	0.25
30-40	9	9	0.1875
40-50	13	13	0.270833
50-60	5	5	0.104167
60-70	2	2	0.041667
70-80	2	2	0.041667
80-90	14	14	0.291667
90-100	14	14	0.291667
100-110	36	36	0.75
110-120	48	48	1
120-130	46	46	0.958333
130-140	15	15	0.3125
140-150	23	23	0.479167
150-160	22	22	0.458333
160-170	25	25	0.520833
170-180	42	42	0.875

≤6 Ma Faults – Normal

azimuth	count	tot_length	rel_length
0-10	20	20	0.625
10-20	10	10	0.3125
20-30	7	7	0.21875
30-40	4	4	0.125
40-50	4	4	0.125
50-60	0	0	0
60-70	0	0	0
70-80	0	0	0
80-90	4	4	0.125
90-100	7	7	0.21875
100-110	20	20	0.625
110-120	32	32	1
120-130	26	26	0.8125
130-140	9	9	0.28125
140-150	4	4	0.125
150-160	5	5	0.15625
160-170	3	3	0.09375
170-180	13	13	0.40625

≤6 Ma Faults – Dextral

azimuth	count	tot_length	rel_length
0-10	0	0	0
10-20	0	0	0
20-30	0	0	0
30-40	0	0	0
40-50	0	0	0
50-60	0	0	0
60-70	0	0	0
70-80	0	0	0
80-90	0	0	0
90-100	0	0	0
100-110	0	0	0
110-120	0	0	0
120-130	1	1	1
130-140	0	0	0
140-150	1	1	1
150-160	0	0	0
160-170	0	0	0
170-180	0	0	0