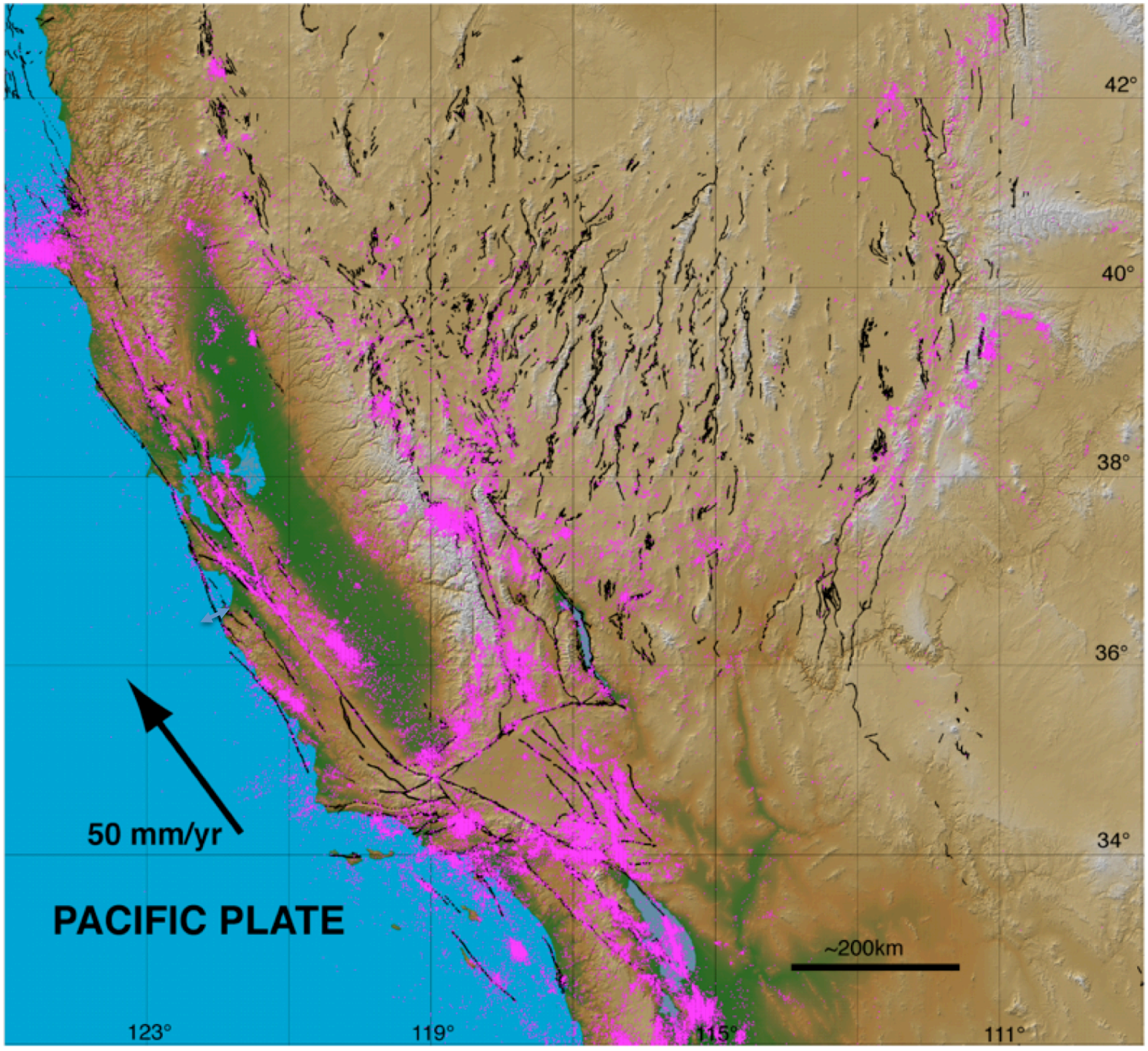
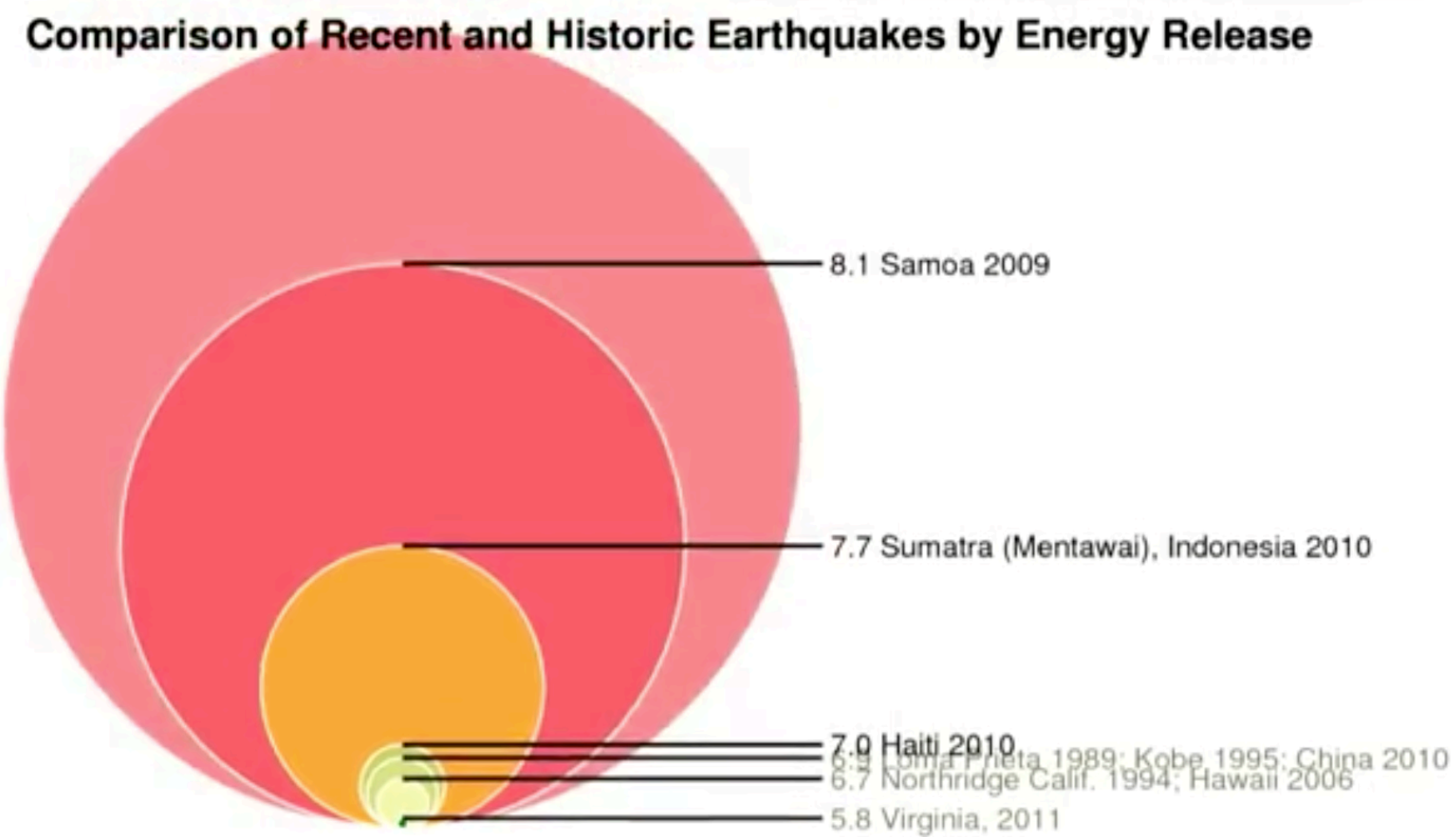
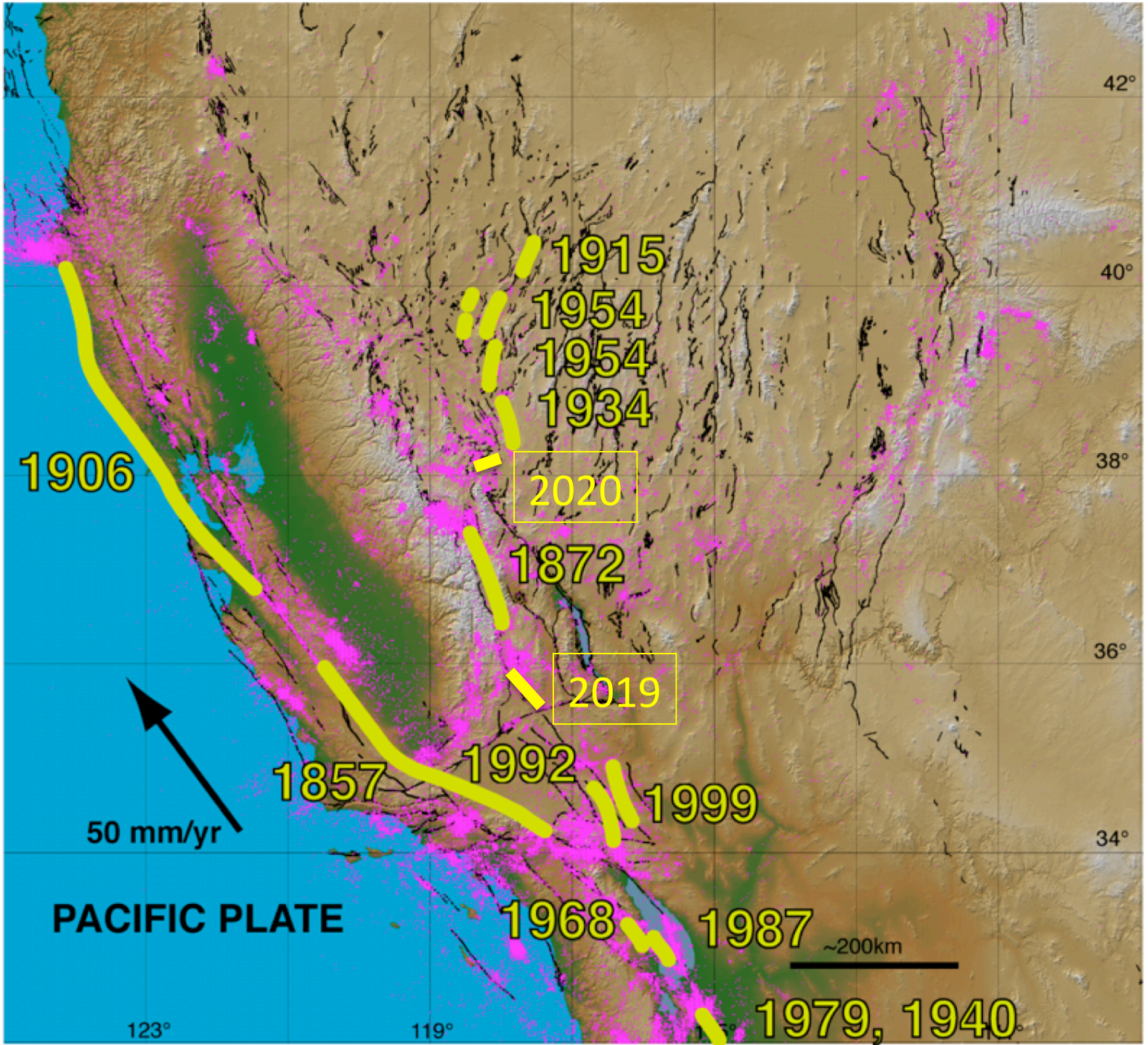


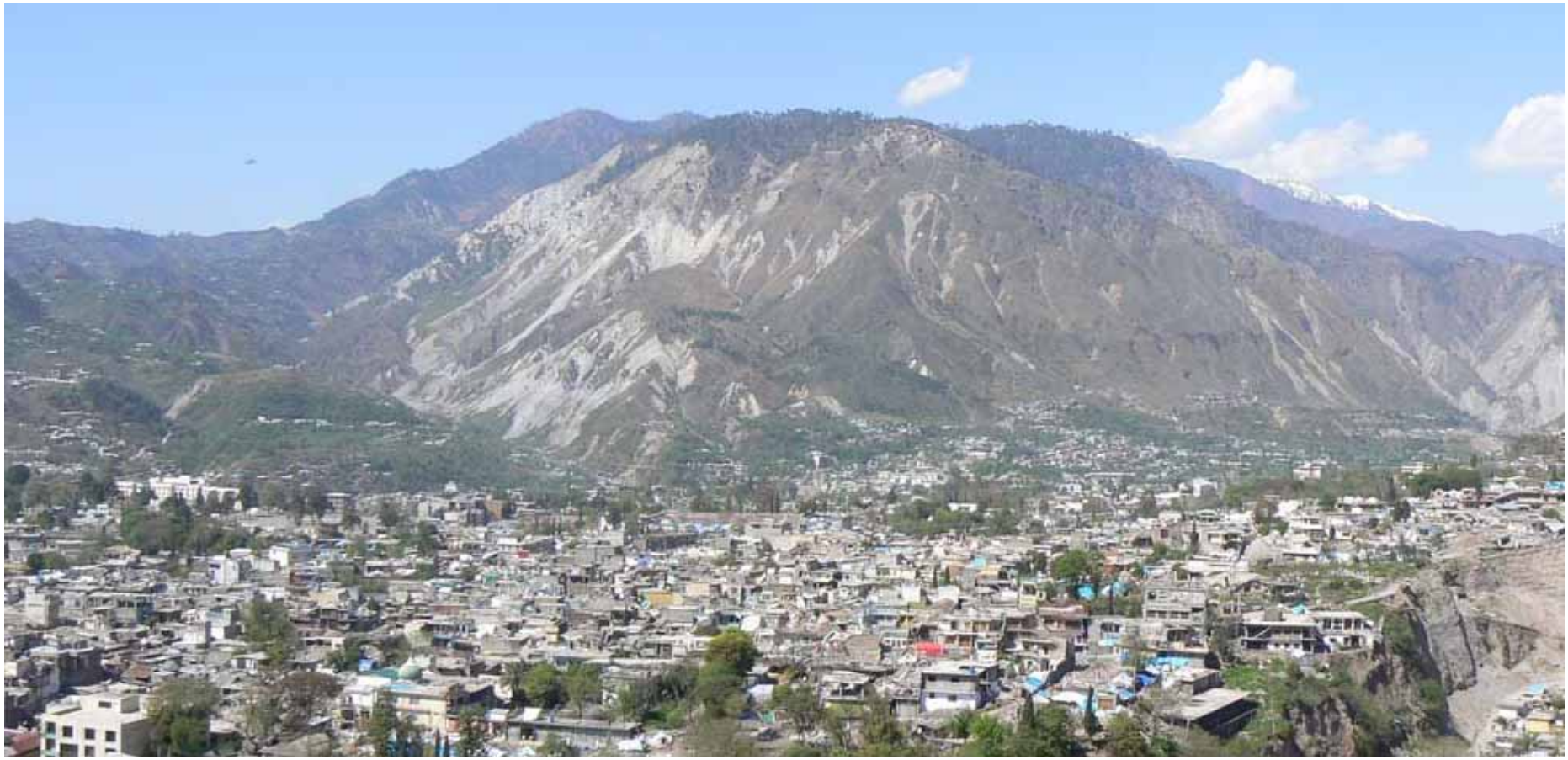
So that's where the black lines come from....

The little earthquakes do not accommodate much deformation relative to larger…



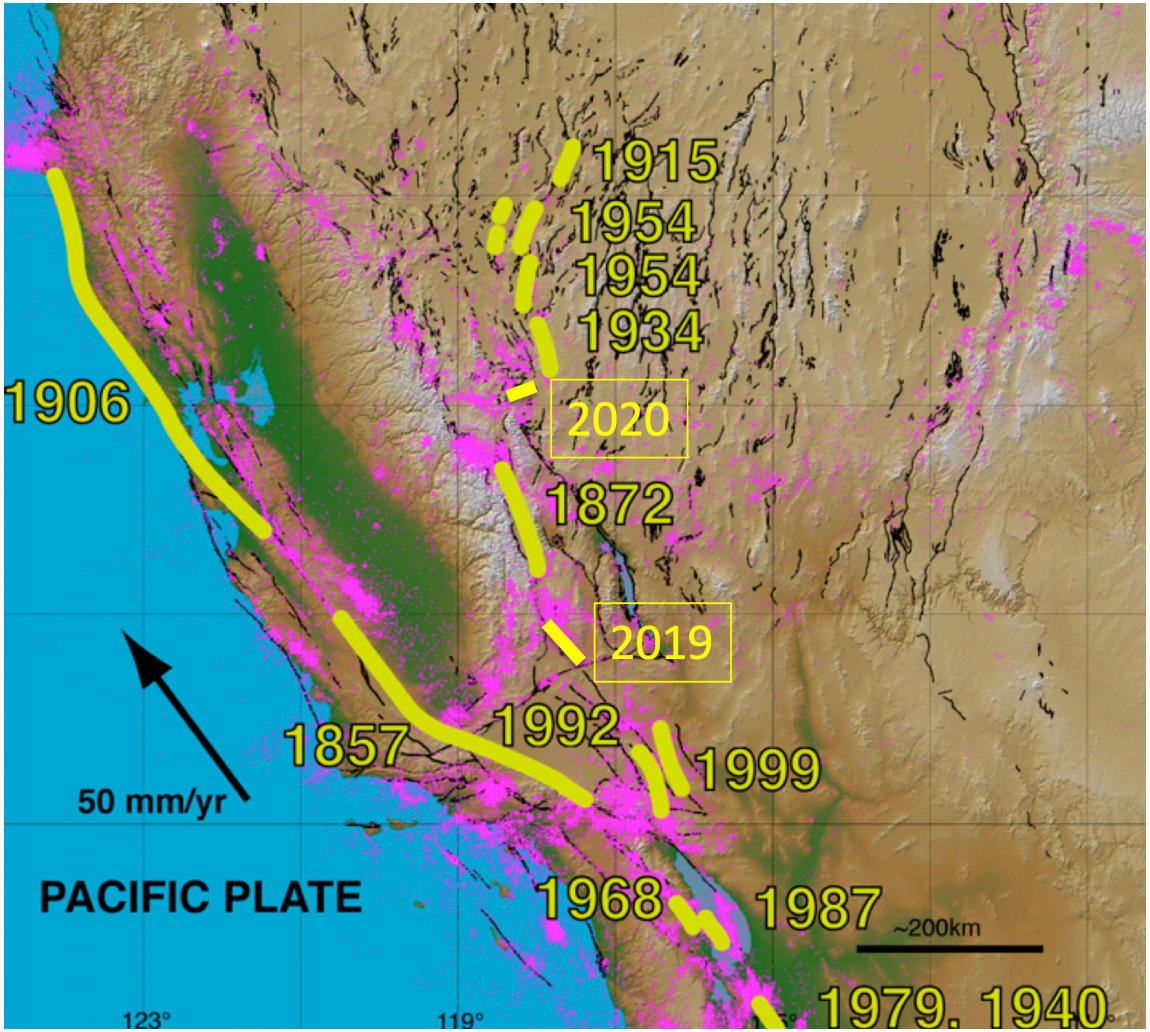

1915
1954
1954
1934
1906
2020
1872
2019
1857
1992
1999
50 mm/yr
PACIFIC PLATE
1968
1987
~200km
1979, 1940
42°
40°
38°
36°
34°
123°
119°

Balakot after the earthquake

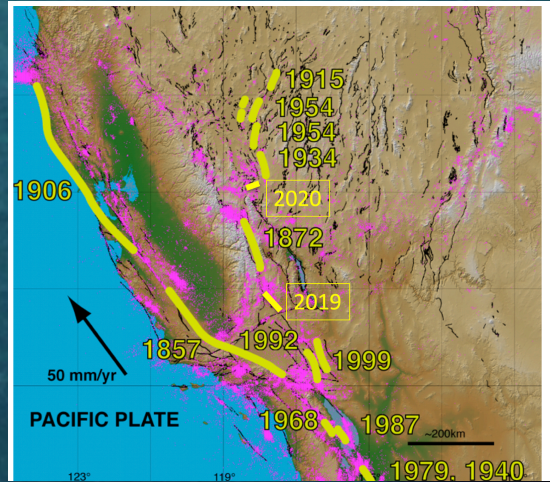


Muzaffarabad town after the earthquake

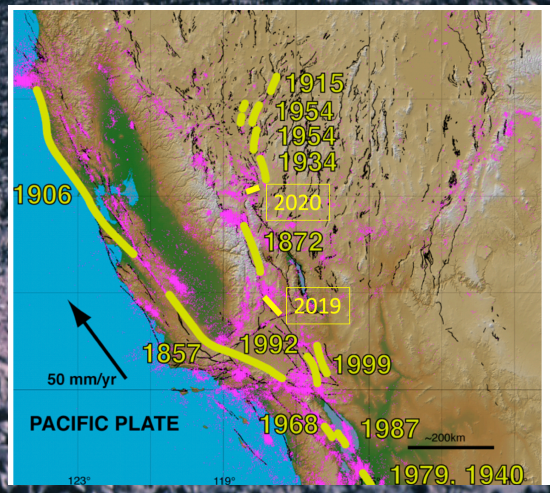
The geomorphic expression of large earthquake ruptures is also clear – and it is from that the yellow lines denoting location of earthquakes arises

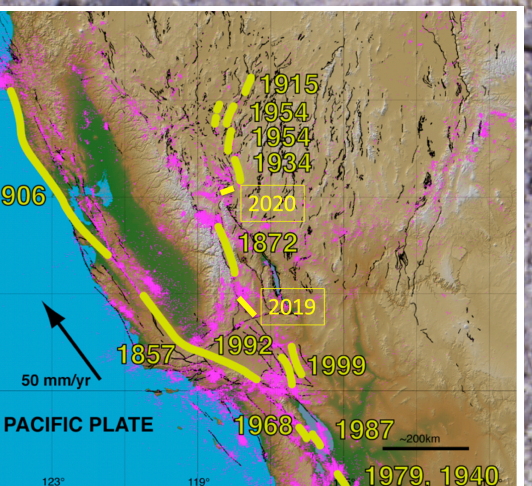


1857 San Andreas

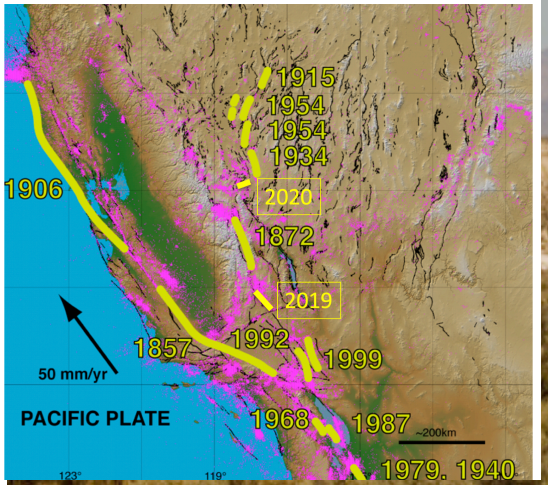


Oct 16, 1999
Hector Mine



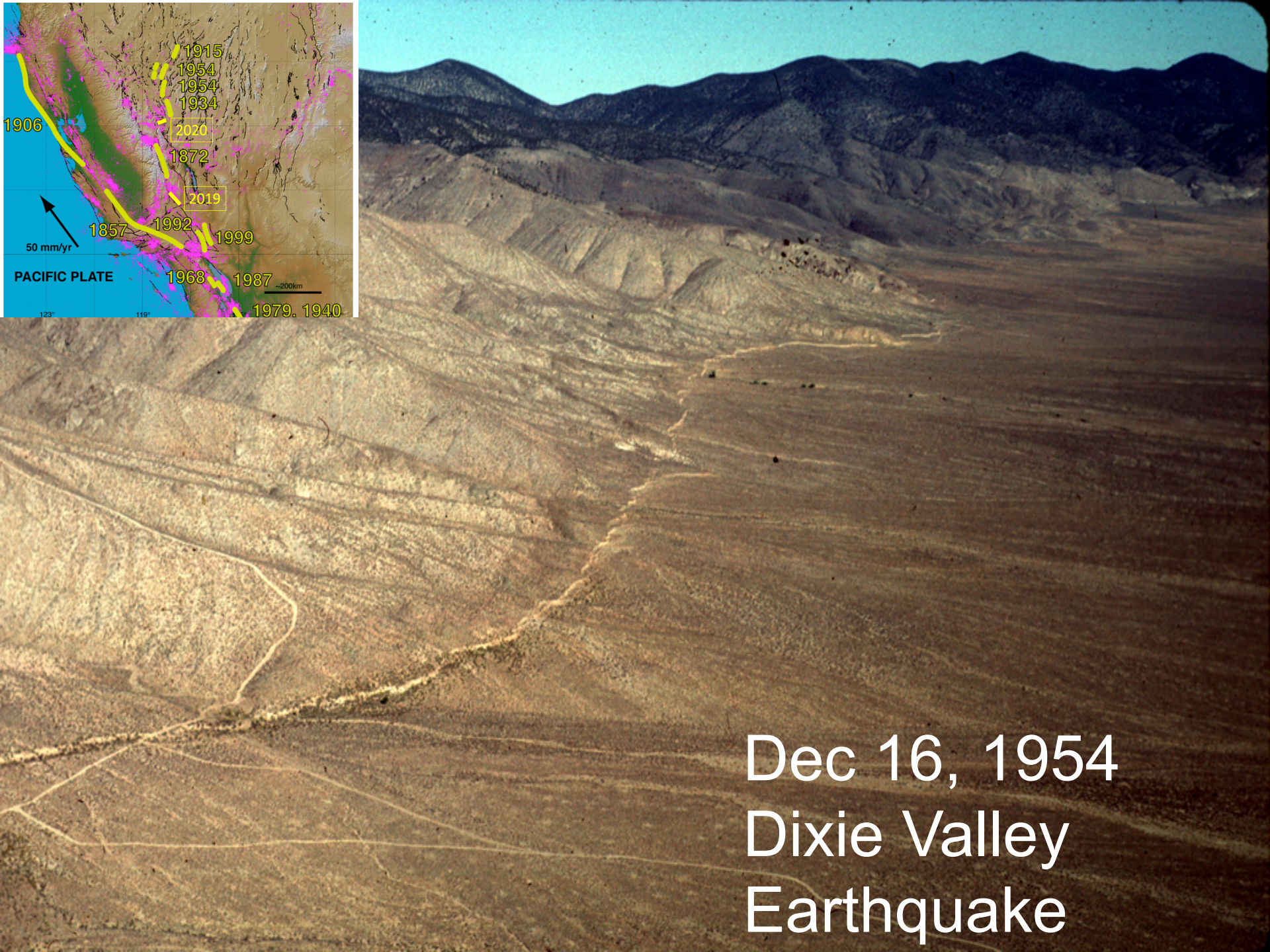


Nov 23, 1987
Superstition Hills

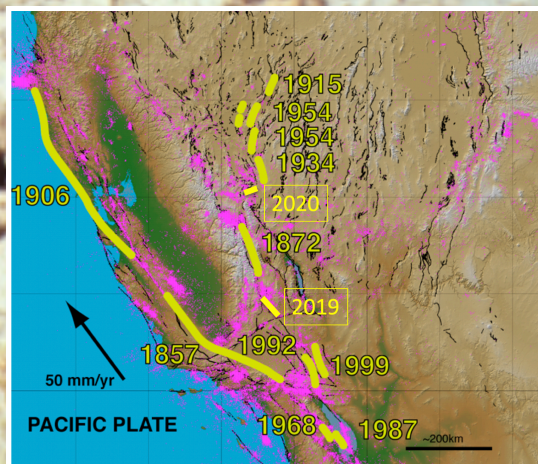


July 5, 2019
Ridgecrest


1915
1954
1954
1934
2020
1906
1872
2019
1857
1992
1999
50 mm/yr
PACIFIC PLATE
1968
1987
~200km
1979, 1940


1915
1954
1954
1934
1906
2020
1872
2019
1857
1992
1999
50 mm/yr
PACIFIC PLATE
1968
1987
~200km
1979, 1940
123°
119°
Dec 16, 1954
Dixie Valley
Earthquake

Dec 16, 1954 Dixie Valley Earthquake



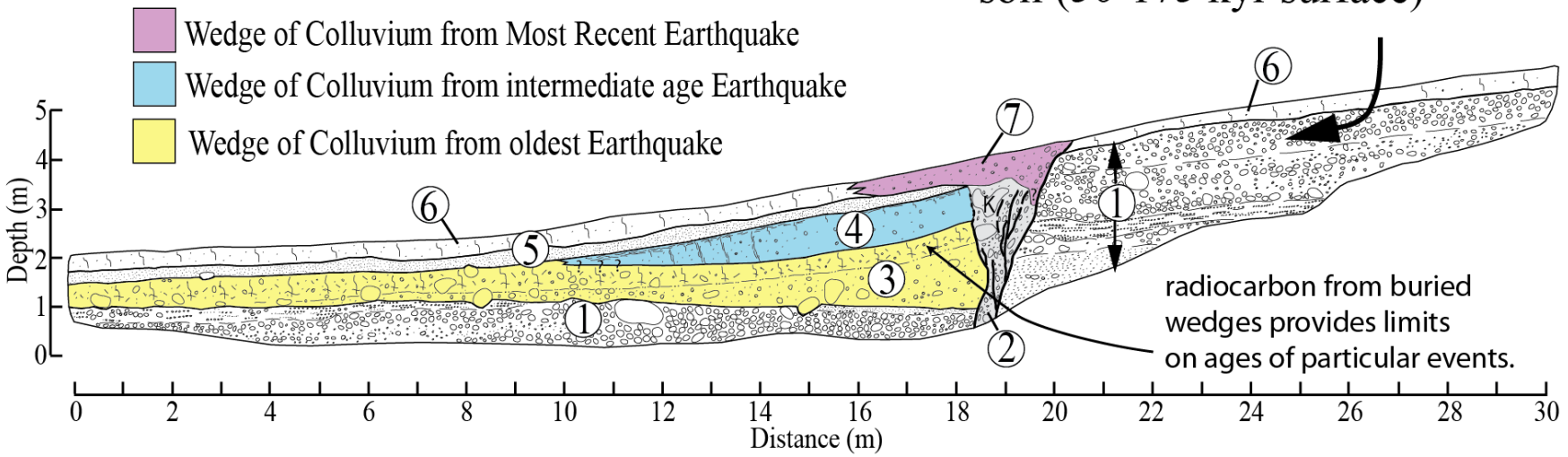

GMC


CASE


Trench

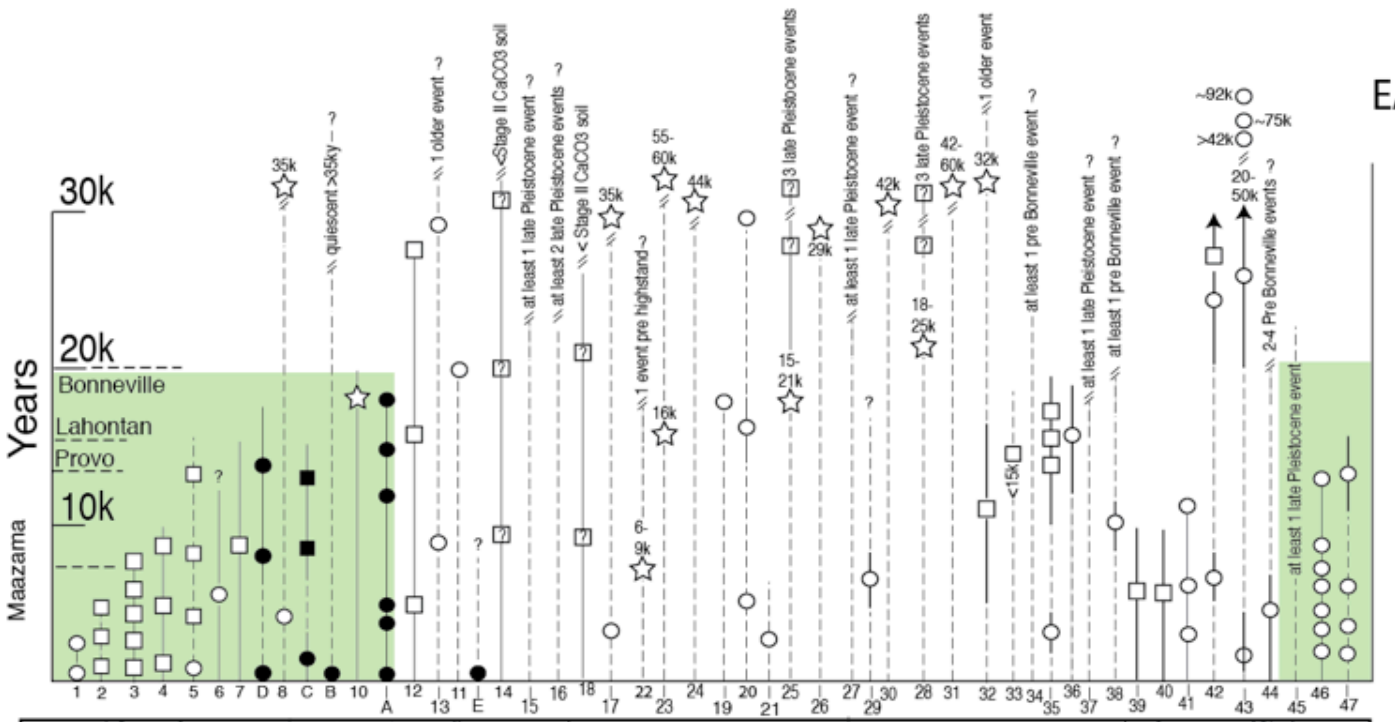
West side Desatoya Range, Edwards Creek trench log

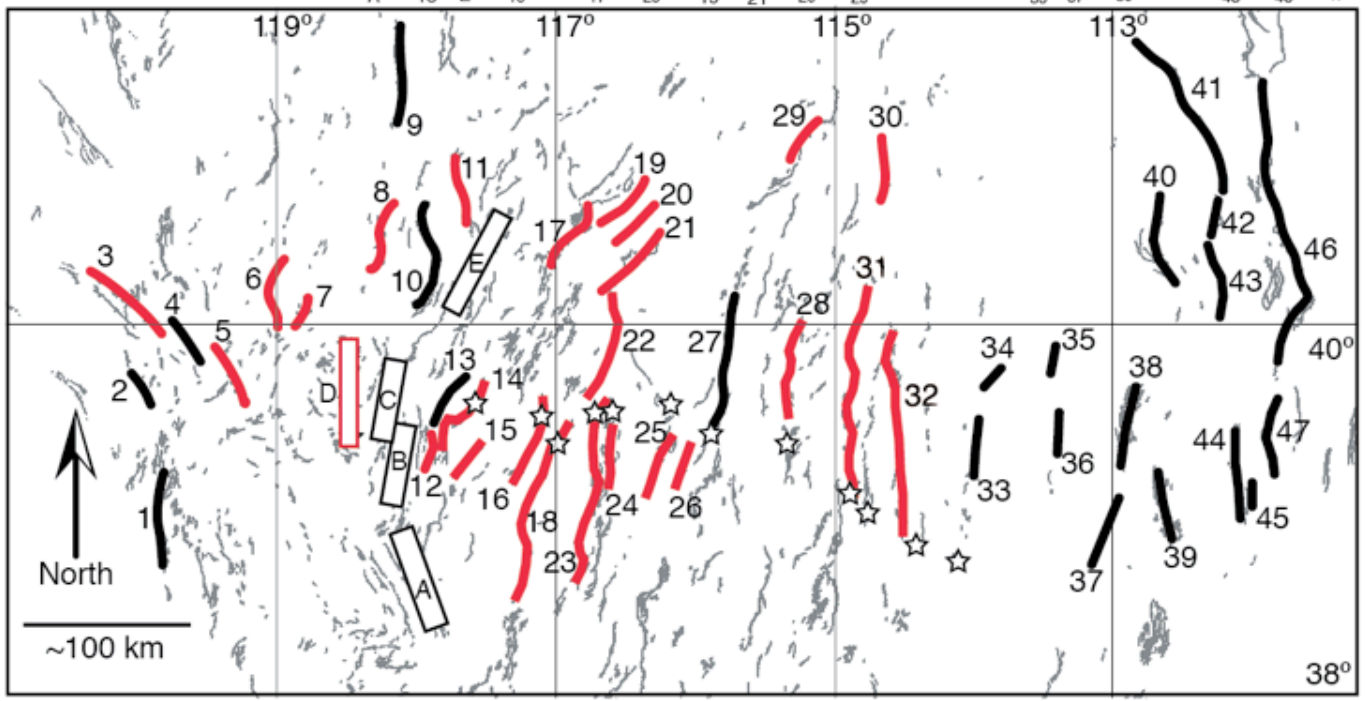
~60 cm thick stage II carbonate soil (50-175 kyr surface)



Three steps in time evolution of fault scarp

SPACE-TIME PLOT OF EARTHQUAKE RECURRENCE





DATED EARTHQUAKES

EARTHQUAKES SINCE PARTICULAR TIME

SCARP DIFFUSION ANALYSIS

CENTRAL NEVADA SEISMIC BELT

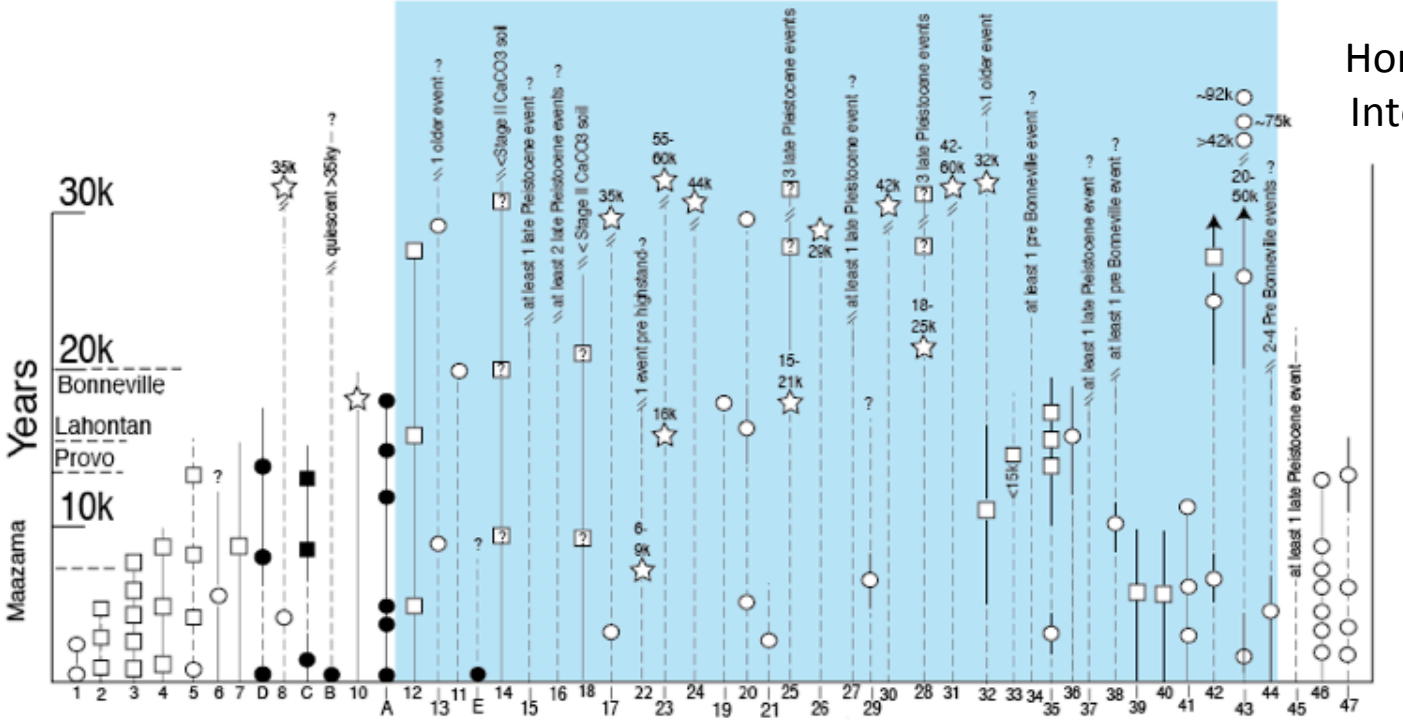
Center for Neotectonic Studies

USGS, NBMG, UGS (Utah)

Historical Ruptures of CNSB

Pts Along Hwy 50

Horizontal Extension Across Interior of Basin and Range

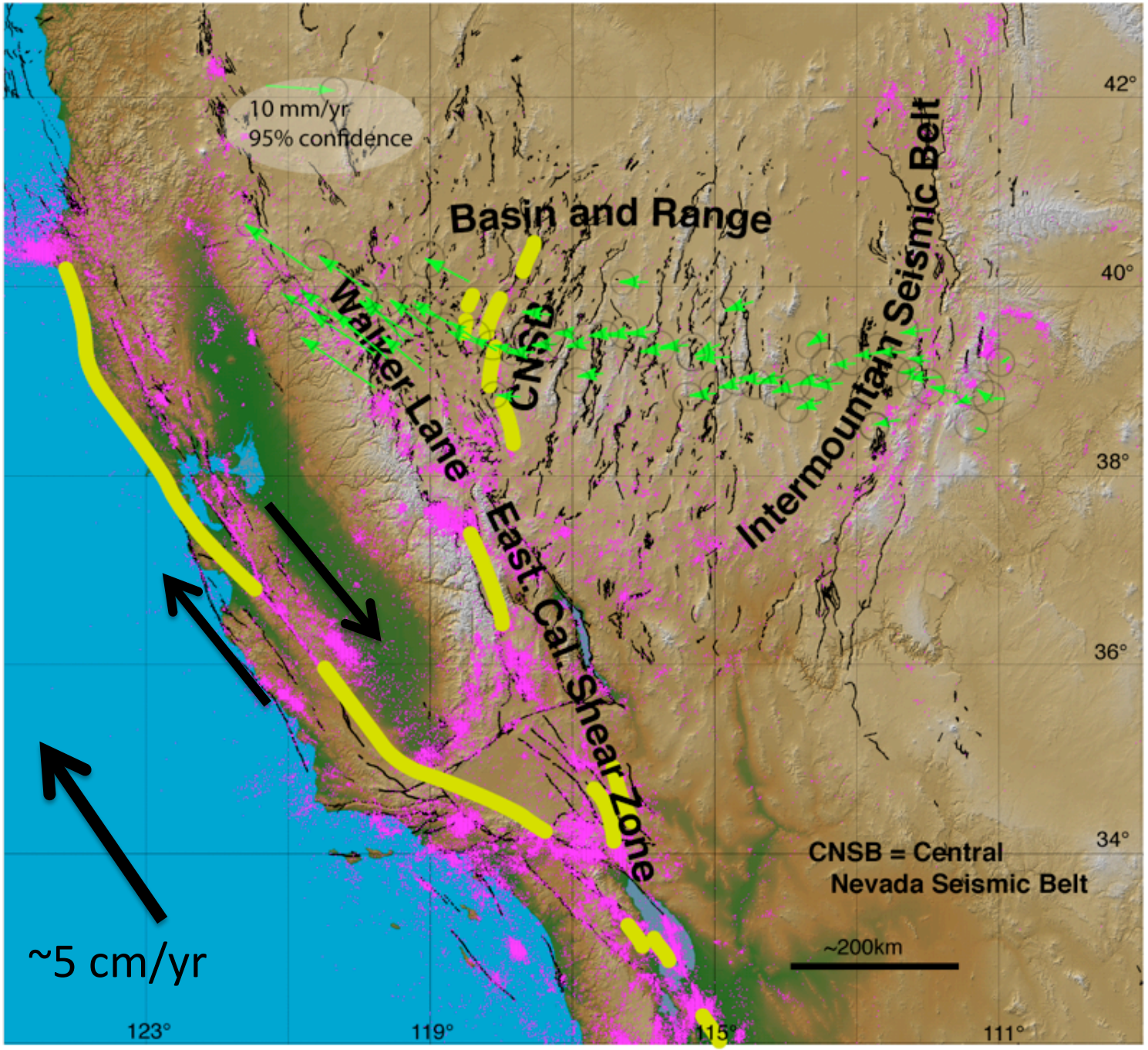


Fault	Vertical Separation (60 ky)	Extension	Strike	E-W Component of Extension
13. Clan Alpine	6 m	3.5 m	27°	3.1 m
.	.	.	.	.
.	.	.	.	.
SUM	91.3 m	58.5 m		48.4 m

48. 4 m / 60 ky = 0.8 mm/yr

Fault	Vertical Separation (20 ky)	Extension	Strike	E-W Component of Extension
13. Clan Alpine	1.2 m	0.7 m	27°	0.6 m
.	.	.	.	.
.	.	.	.	.
SUM	35.4 m	24.5 m		19.3 m

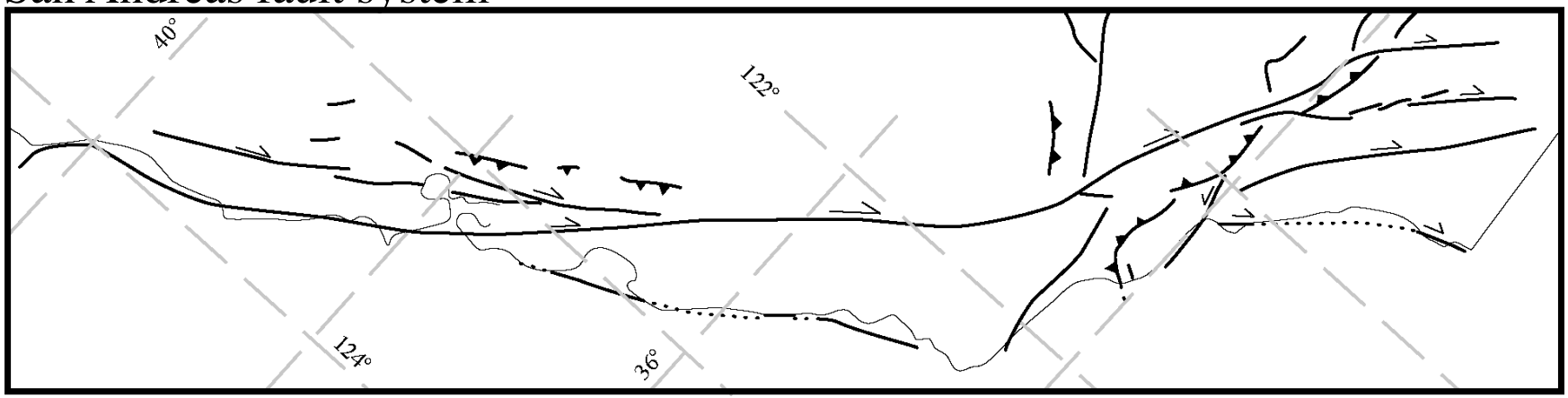
19.3 m / 20 ky = 1.0 mm/yr



About 3.5 cm/yr of ~5 cm/yr right-lateral transform motion is taken up on the San Andreas System, the remainder is distributed on faults of the Walker Lane and Basin and Range, with the majority of that on faults of the Walker Lane

Walker Lane fault system

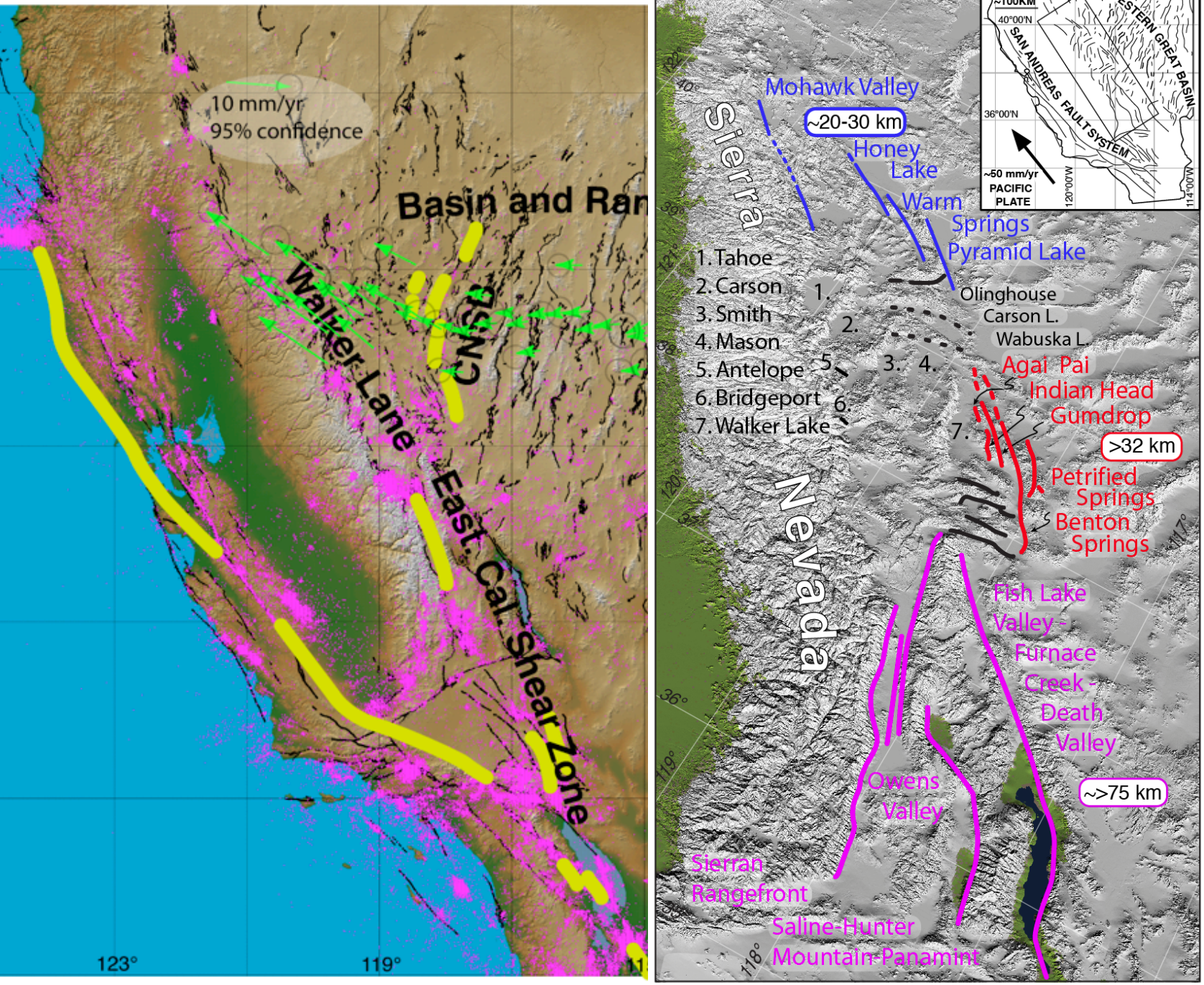
San Andreas fault system



The Walker Lane is a more complex fault system than the San Andreas

San Andreas has accommodated much more strike-slip

Walker Lane is Transtensional – San Andreas Transpressional


10 mm/yr
95% confidence
Basin and Ran
Walker Lane
CNSZ
East. Cal. Shear Zone
123°
119°

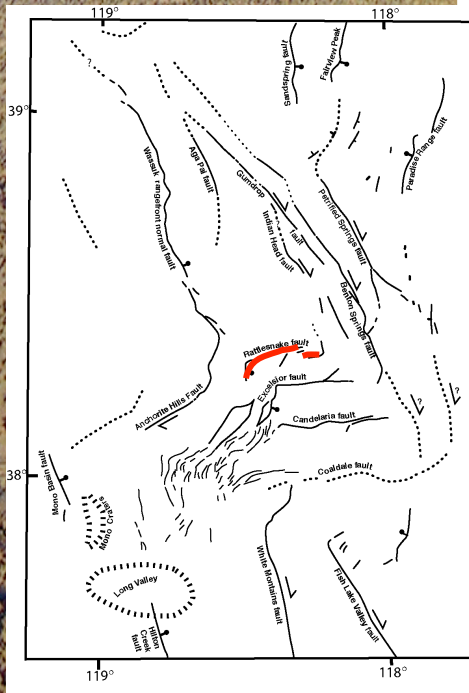
~100KM
40°00'N
36°00'N
WESTERN GREAT BASIN
SAN ANDREAS FAULT SYSTEM
~50 mm/yr
PACIFIC
PLATE
120°00'W
114°00'W
Mohawk Valley
~20-30 km
Honey
Lake
Warm
Springs
Pyramid Lake
Sierra
Nevada
1. Tahoe
2. Carson
3. Smith
4. Mason
5. Antelope
6. Bridgeport
7. Walker Lake
Olinghouse
Carson L.
Wabuska L.
Agai Pai
Indian Head
Gumdrop
>32 km
Petrified
Springs
Benton
Springs
Fish Lake
Valley -
Furnace
Creek -
Death
Valley
~>75 km
Owens
Valley
Sierran
Rangefront
Saline-Hunter
Mountain-Panamint

View westward

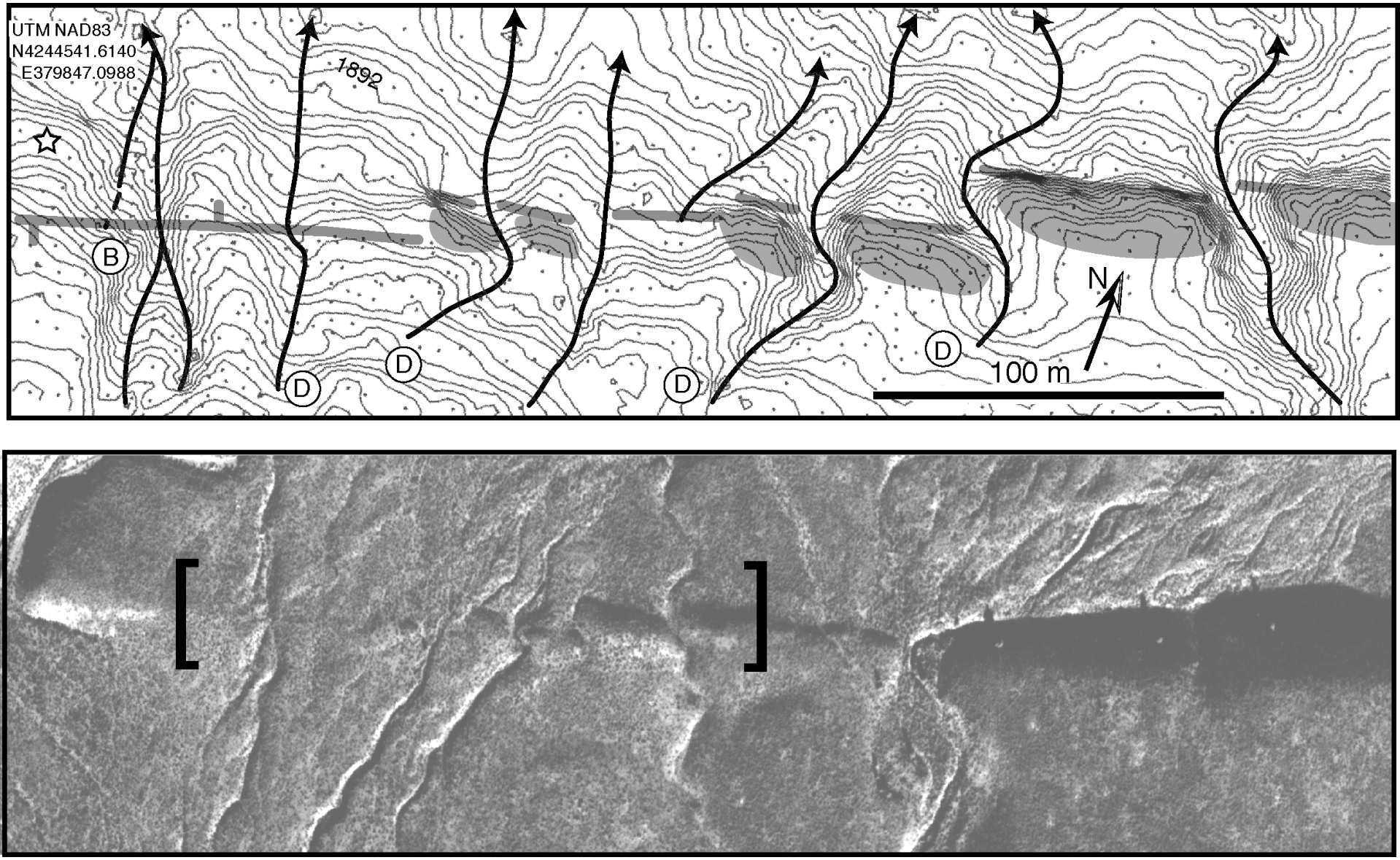
Mable Mountain

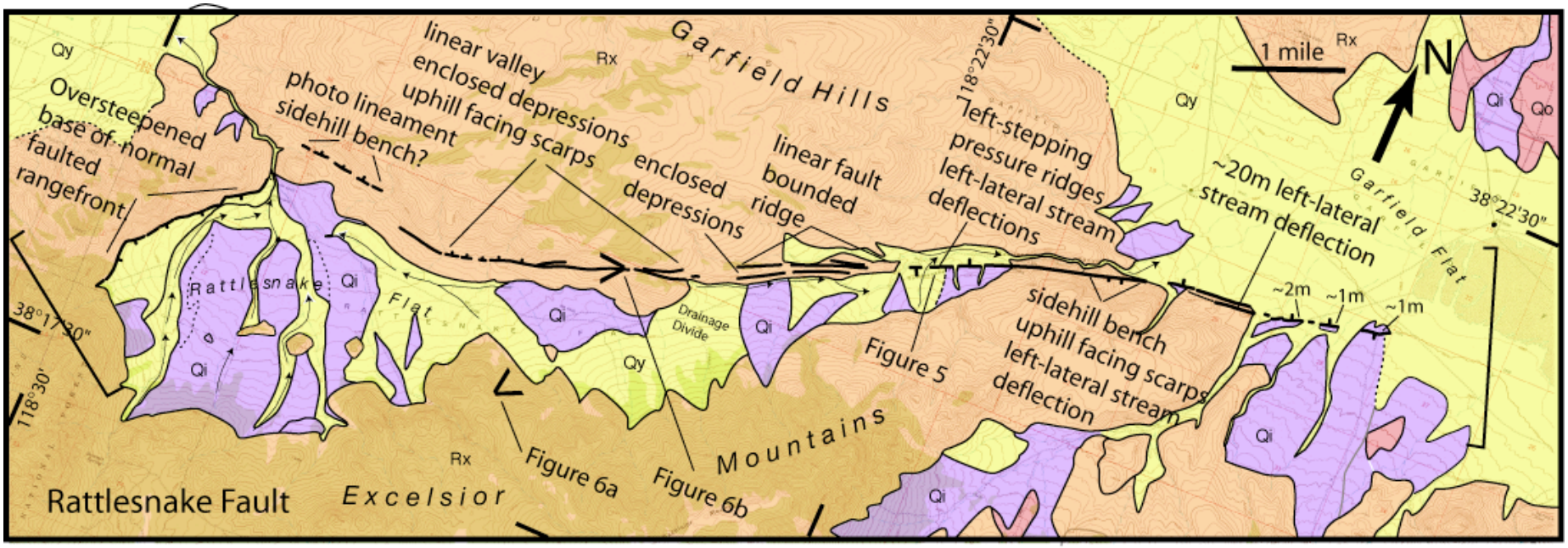
Garfield Flat

next slide



35cm contour interval



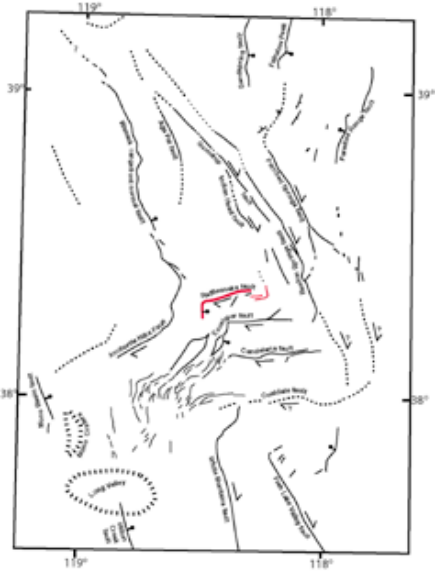


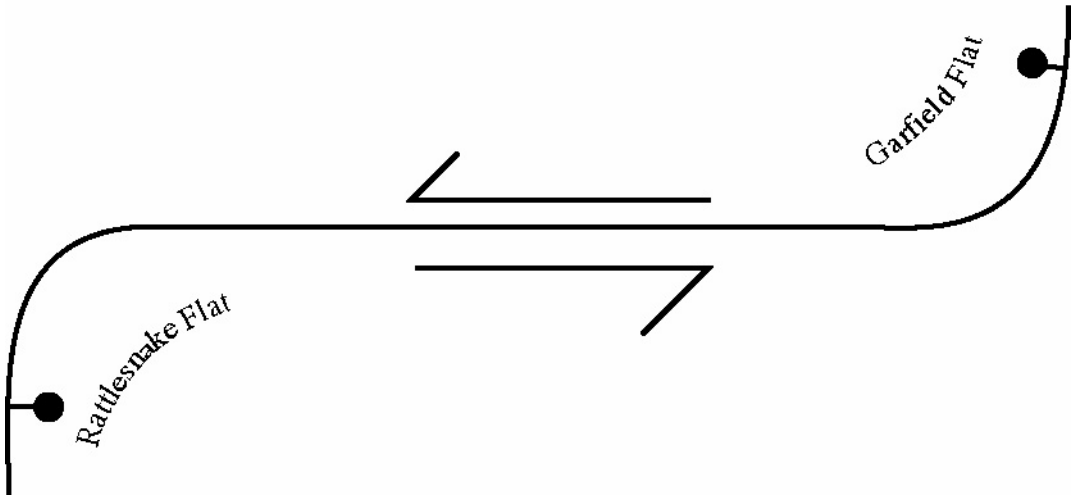
Qy Youngest alluvial deposits and surfaces

Qi Intermediate age alluvial deposits and pediment surfaces

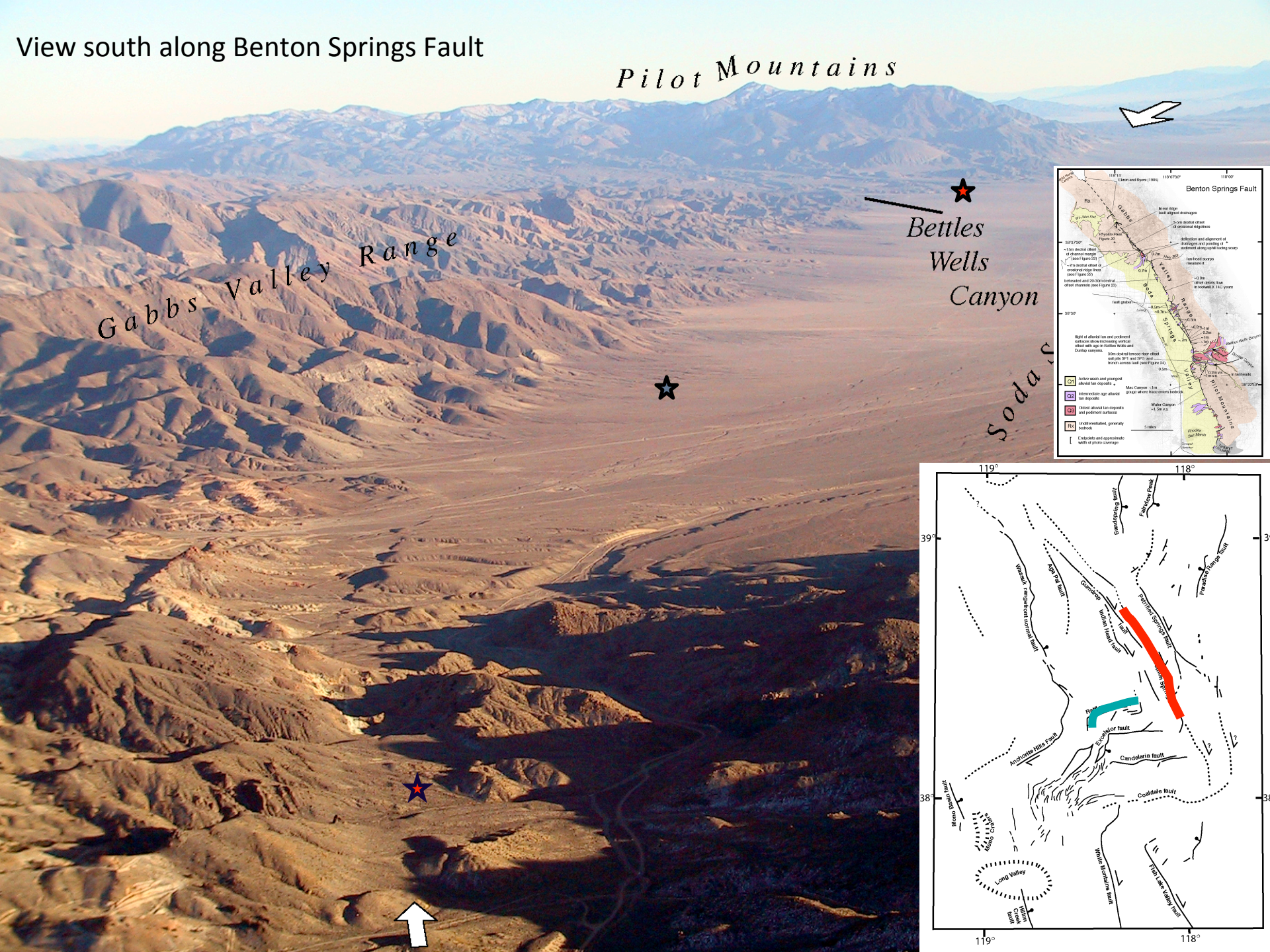
Qo Oldest alluvial fan deposits and pediment surfaces

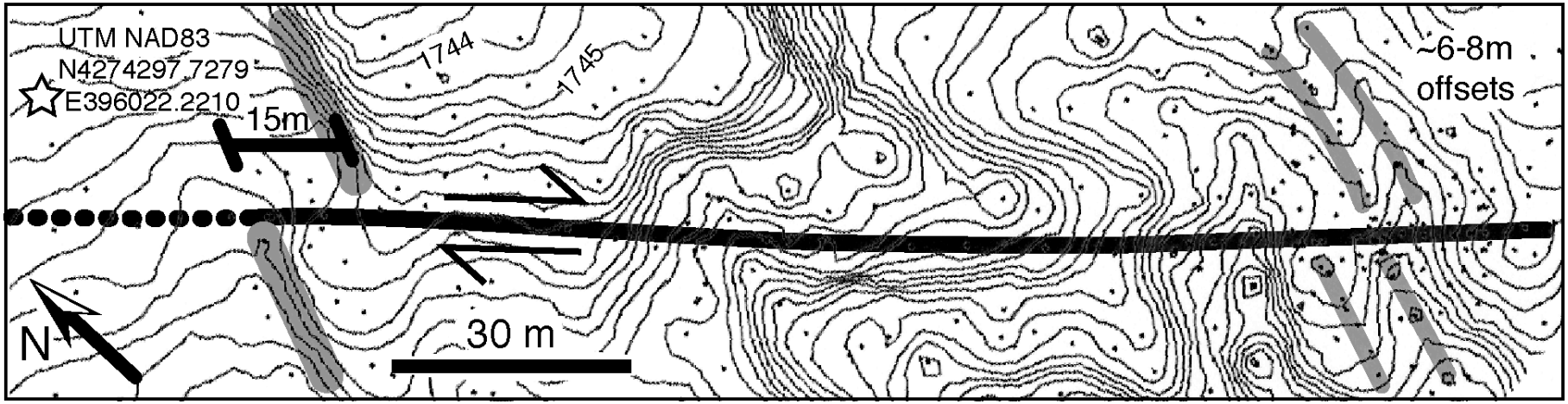
Rx Undifferentiated, generally bedrock.



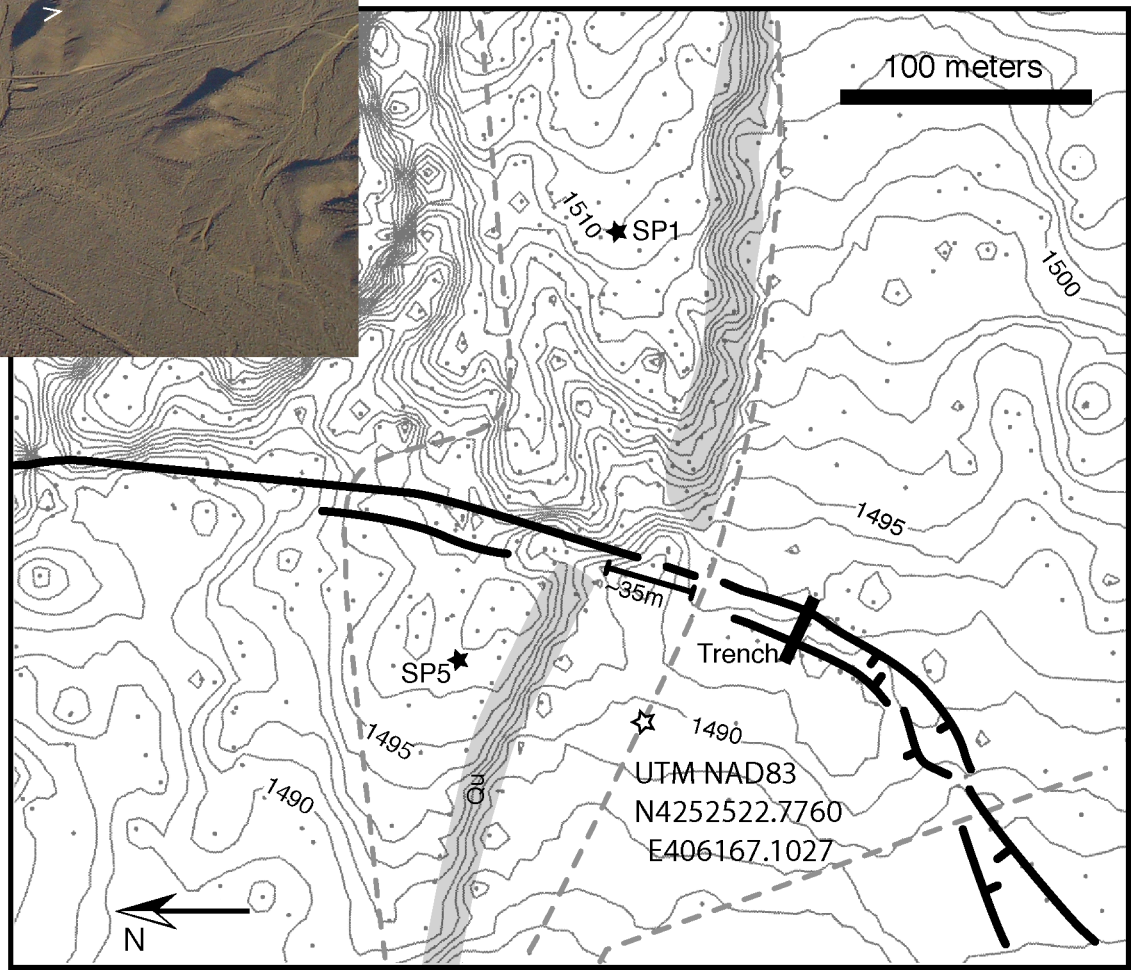


View south along Benton Springs Fault

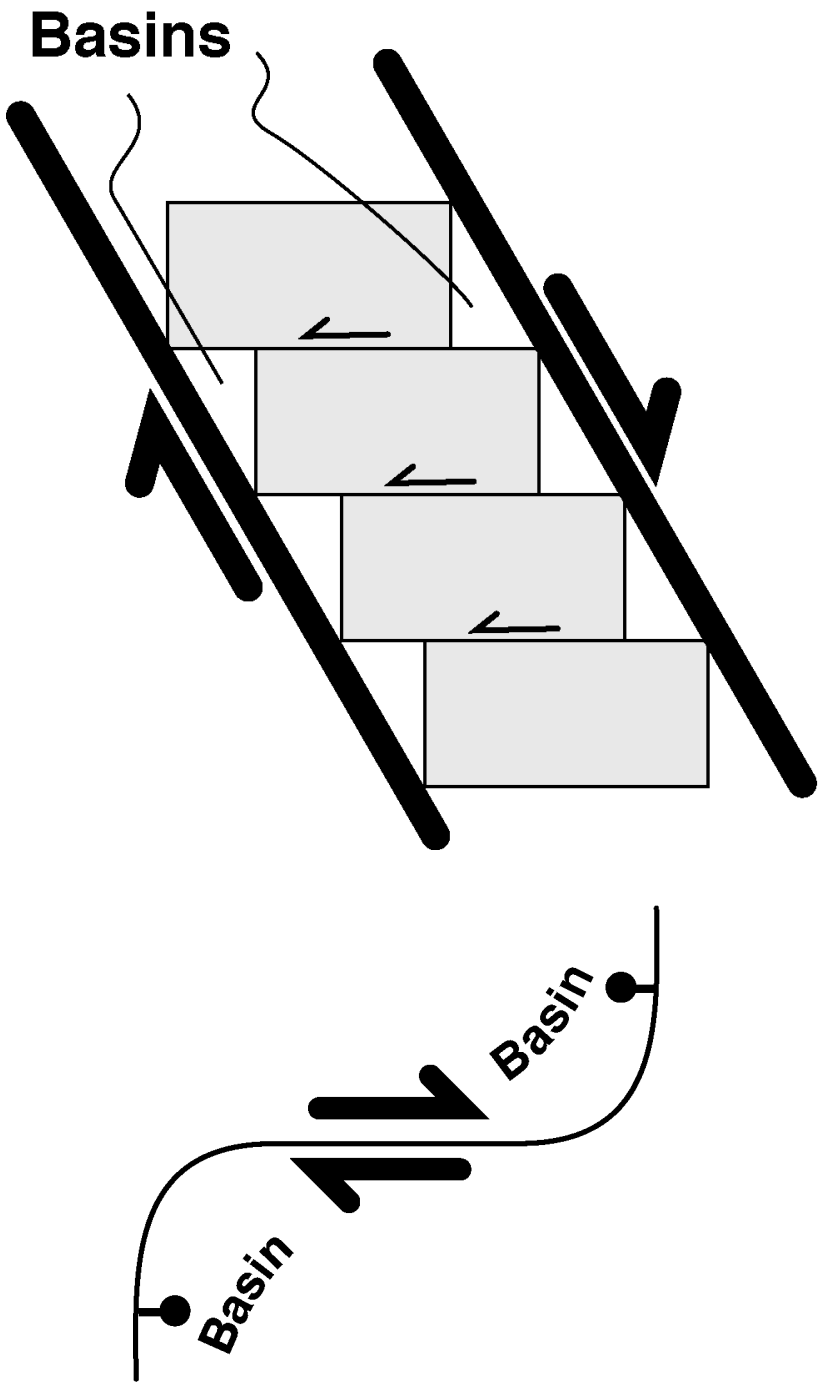


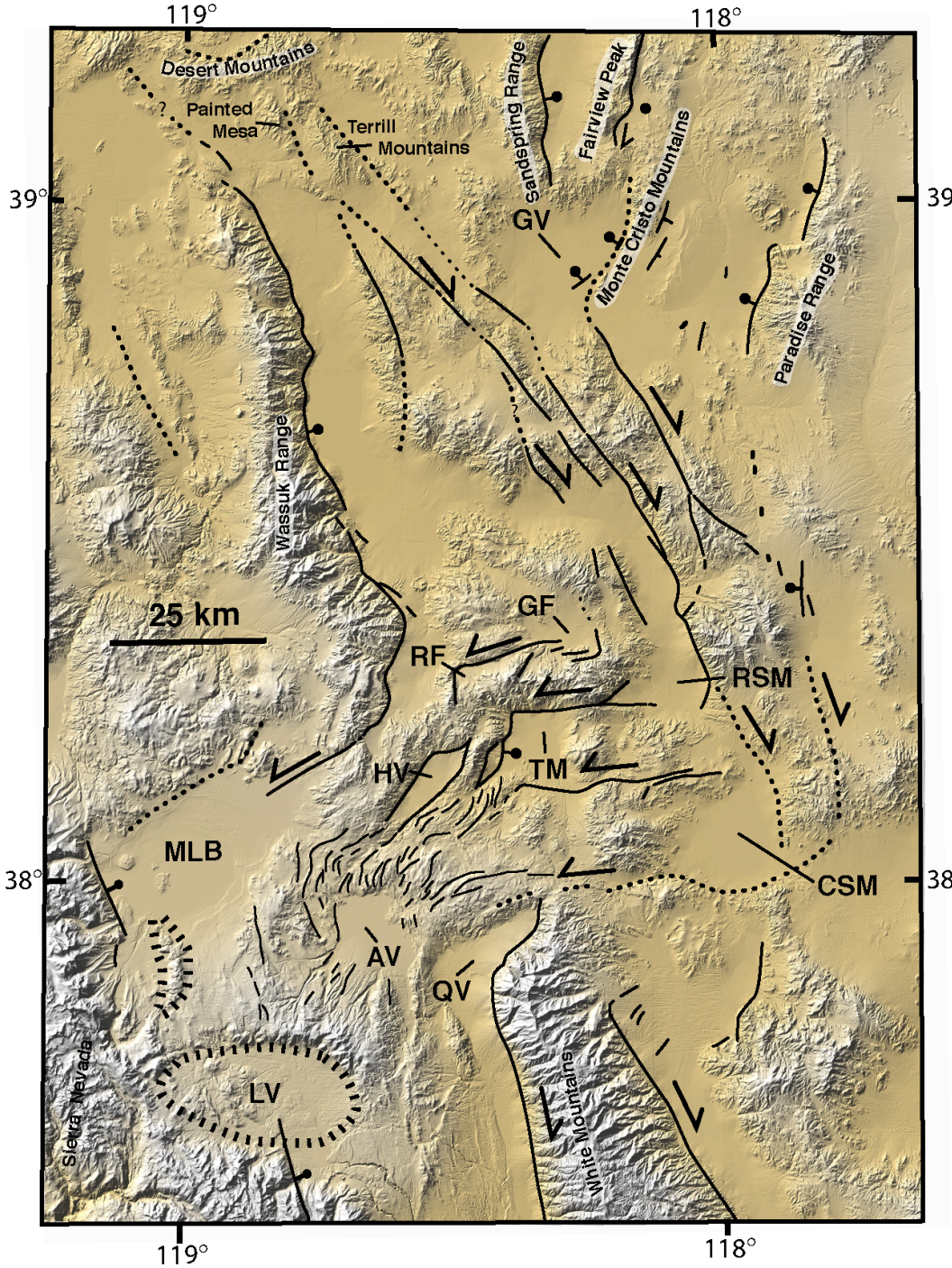


50cm contour interval

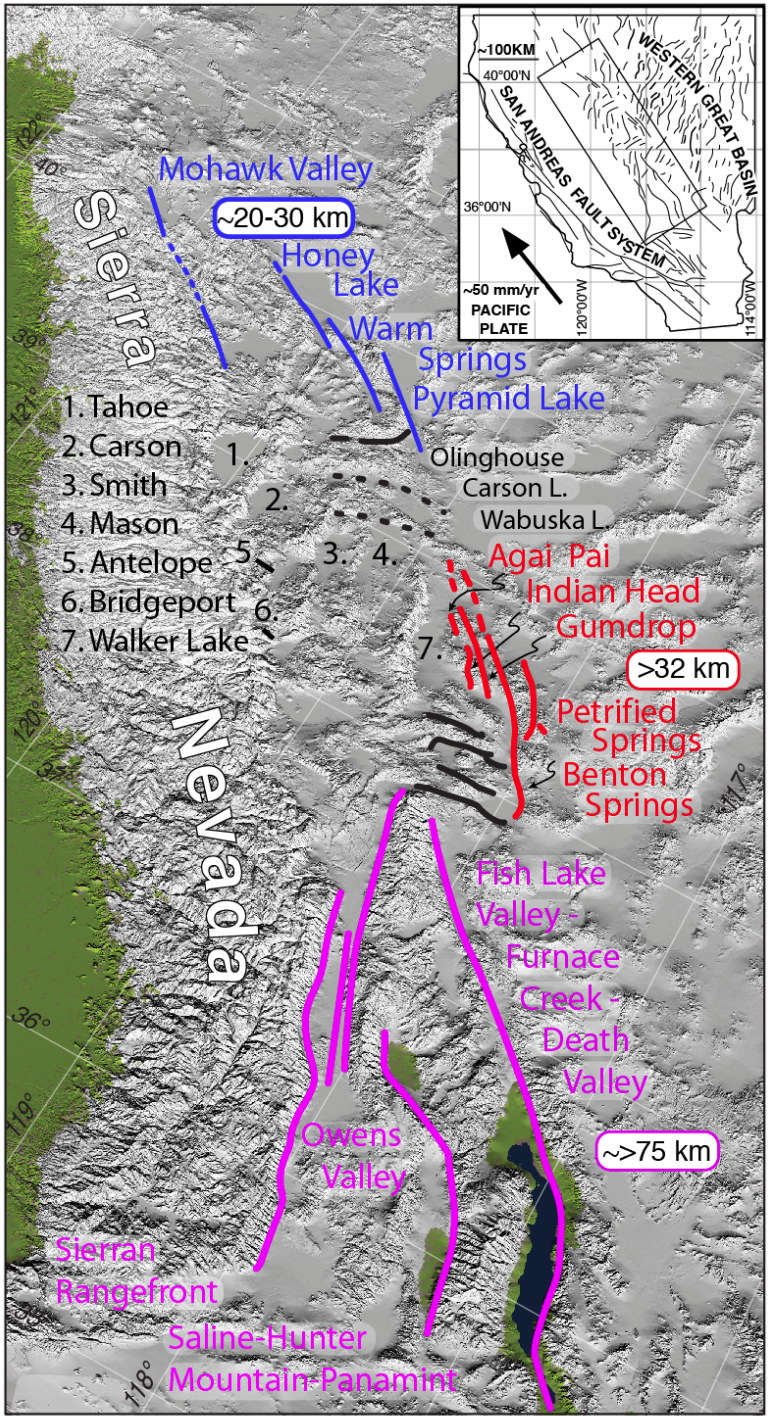


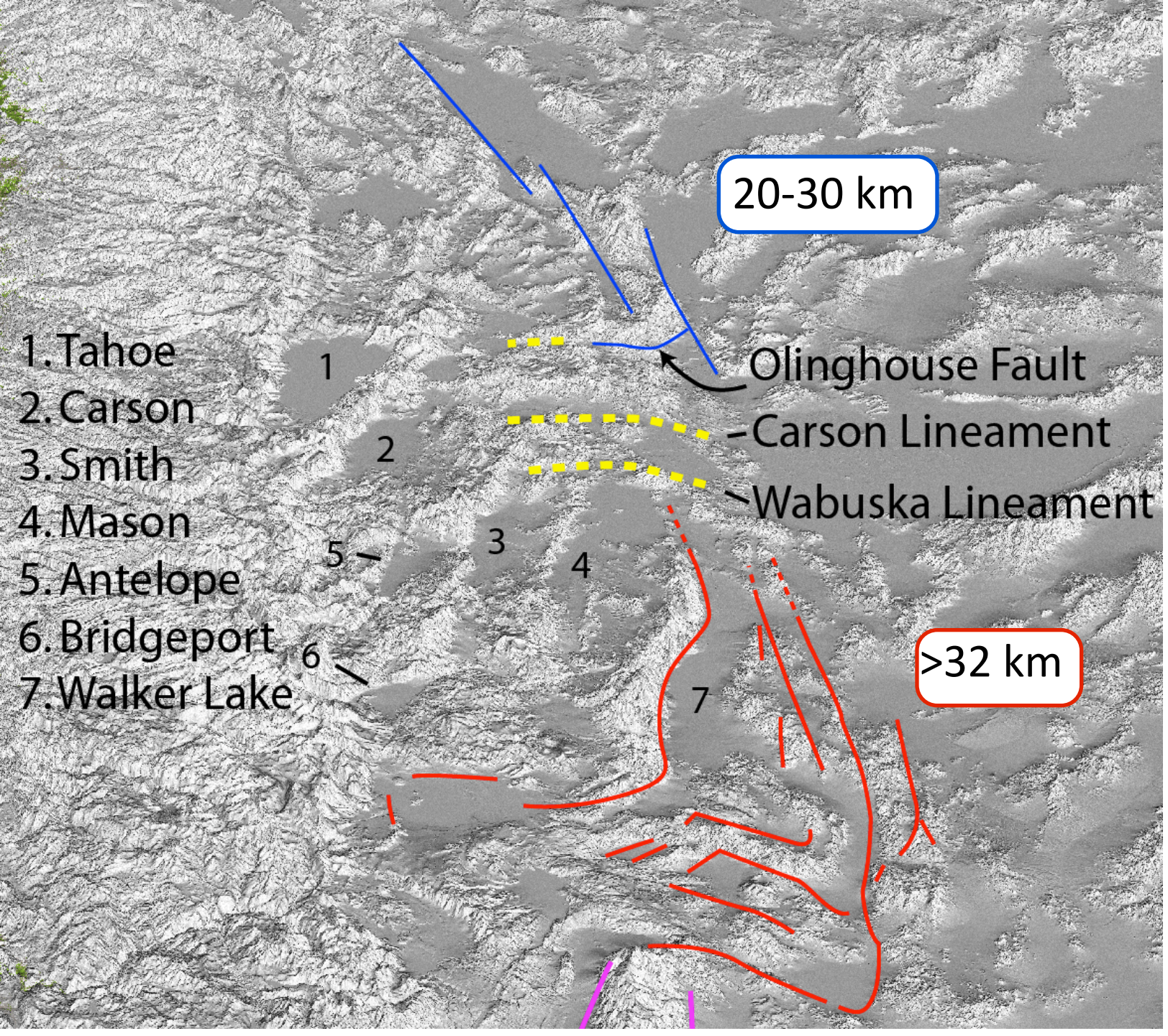
1 meter contour interval

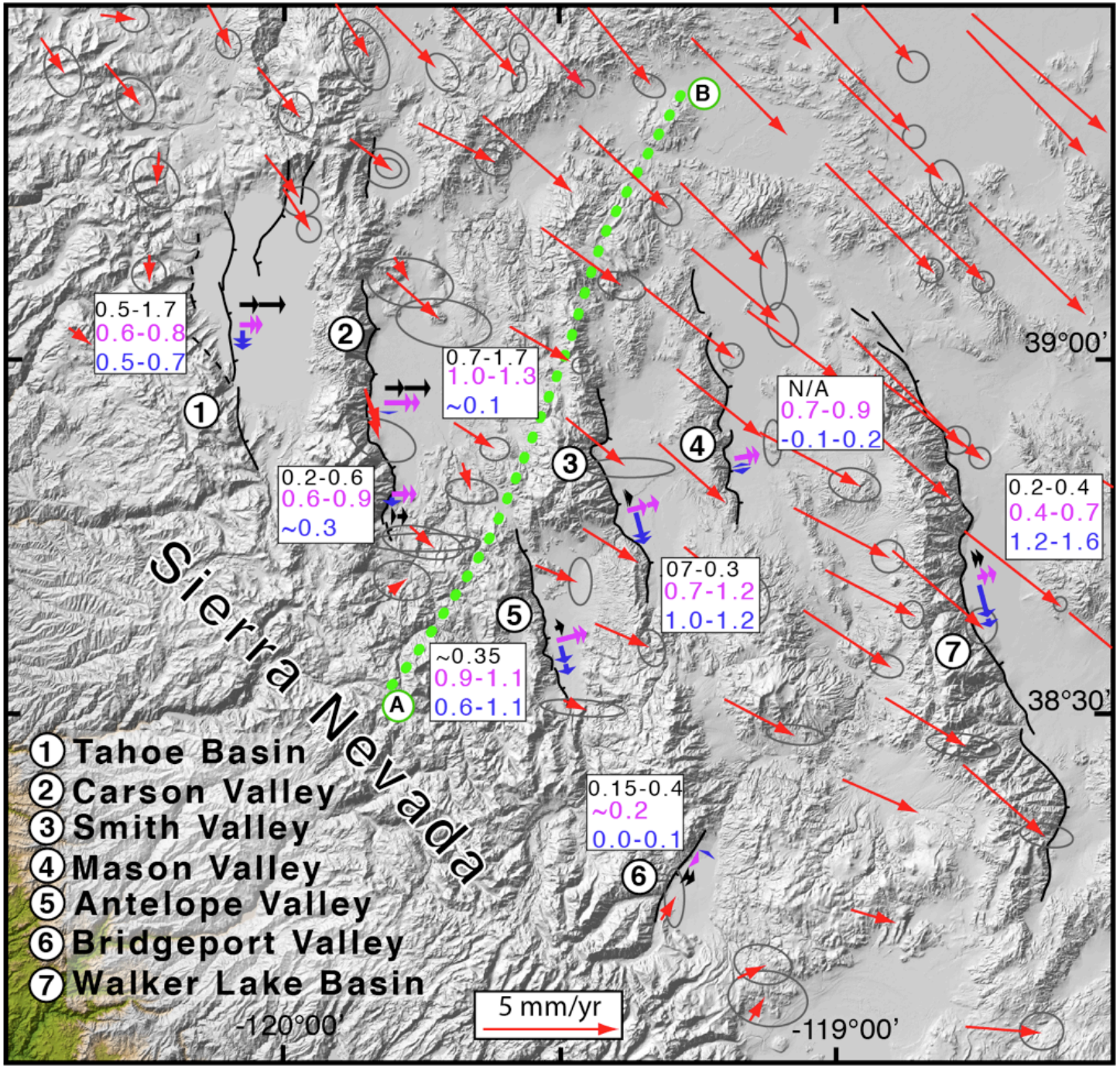

Basins
Basin
Basin

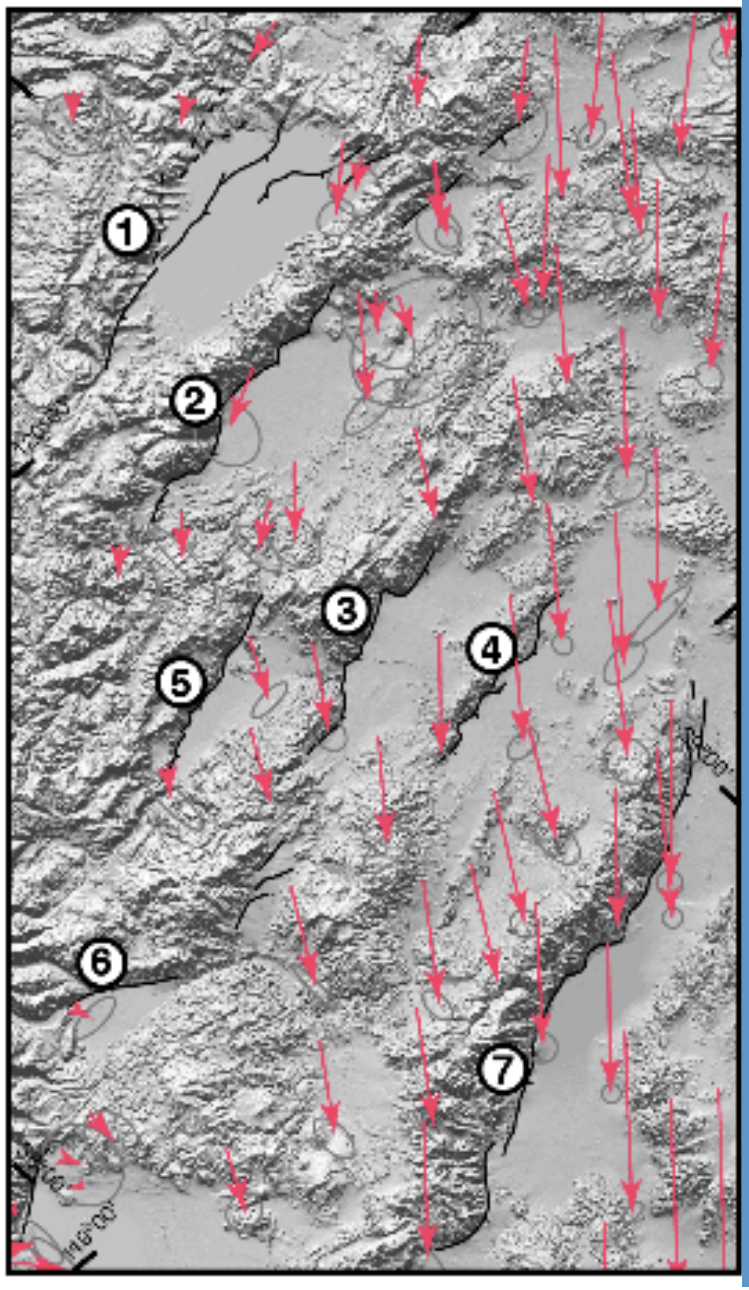

119°
118°
39°
38°
Desert Mountains
Painted Mesa
Terrill Mountains
Sandspring Range
Fairview Peak
Monte Cristo Mountains
Paradise Range
Wassuk Range
GV
GF
RF
RSM
HV
TM
MLB
CSM
AV
QV
LV
Sierra Nevada
White Mountains
25 km

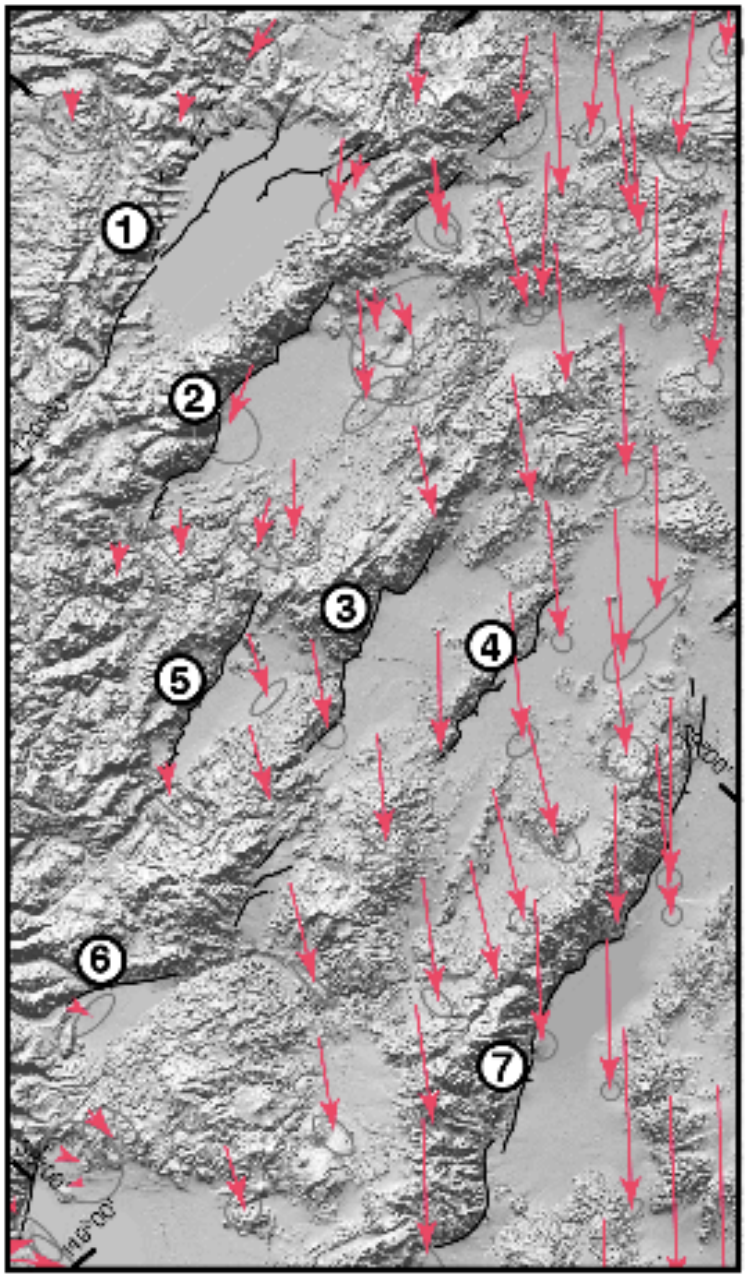
moving north now.....




20-30 km
1. Tahoe
2. Carson
3. Smith
4. Mason
5. Antelope
6. Bridgeport
7. Walker Lake
1
2
3
4
5
6
7
Olinghouse Fault
Carson Lineament
Wabuska Lineament
>32 km


0.5-1.7
0.6-0.8
0.5-0.7
0.7-1.7
1.0-1.3
~0.1
N/A
0.7-0.9
-0.1-0.2
0.2-0.6
0.6-0.9
~0.3
0.2-0.4
0.4-0.7
1.2-1.6
07-0.3
0.7-1.2
1.0-1.2
~0.35
0.9-1.1
0.6-1.1
0.15-0.4
~0.2
0.0-0.1
Sierra Nevada
1 Tahoe Basin
2 Carson Valley
3 Smith Valley
4 Mason Valley
5 Antelope Valley
6 Bridgeport Valley
7 Walker Lake Basin
5 mm/yr
39°00'
38°30'
-120°00'
-119°00'
A
B


1
2
3
4
5
6
7


1
2
3
4
5
6
7

Bridgeport Valley, CA

Buckeye Creek

tonal lineament

~5m

~2m

Spring

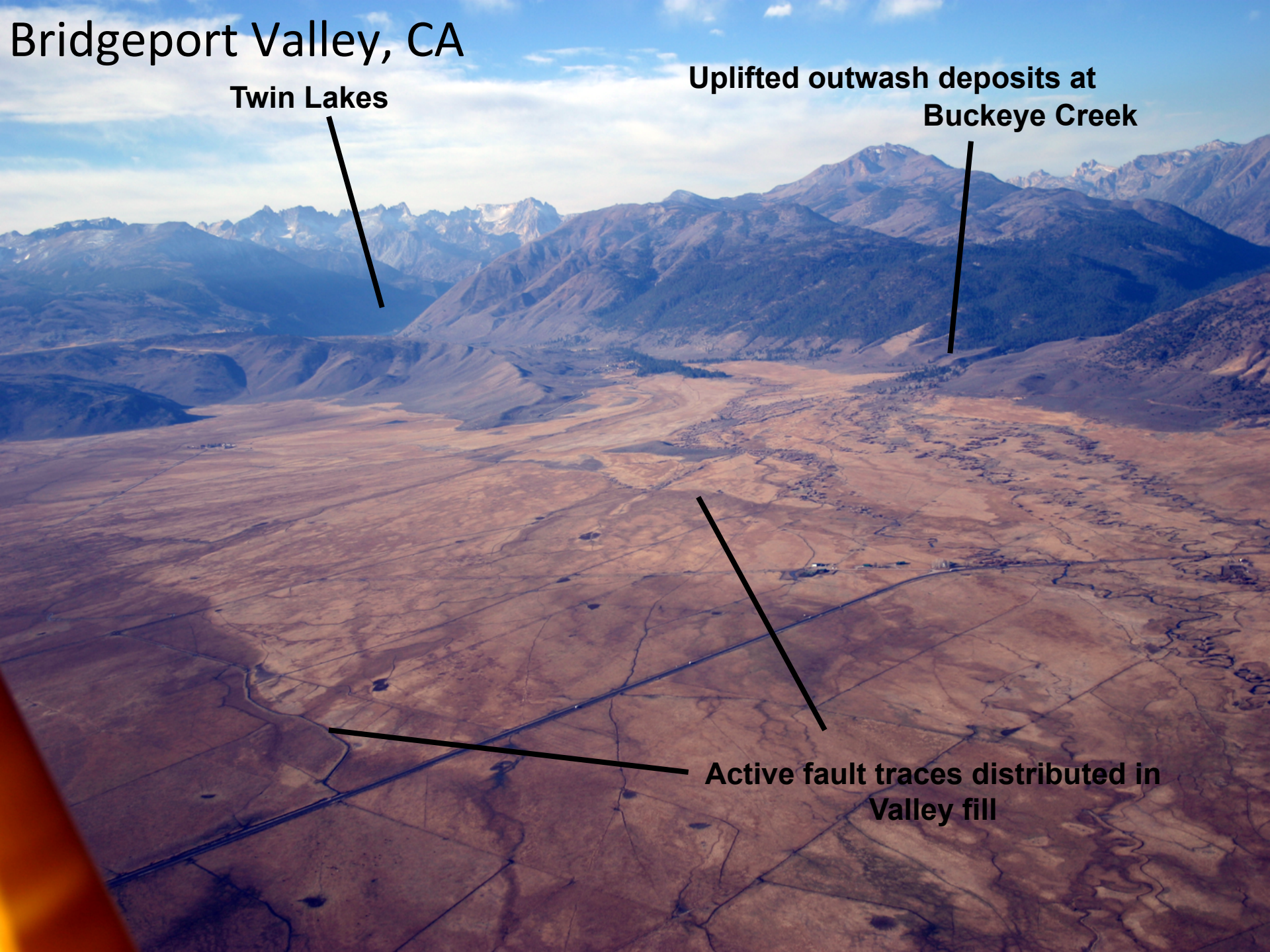
≤1m (vs)

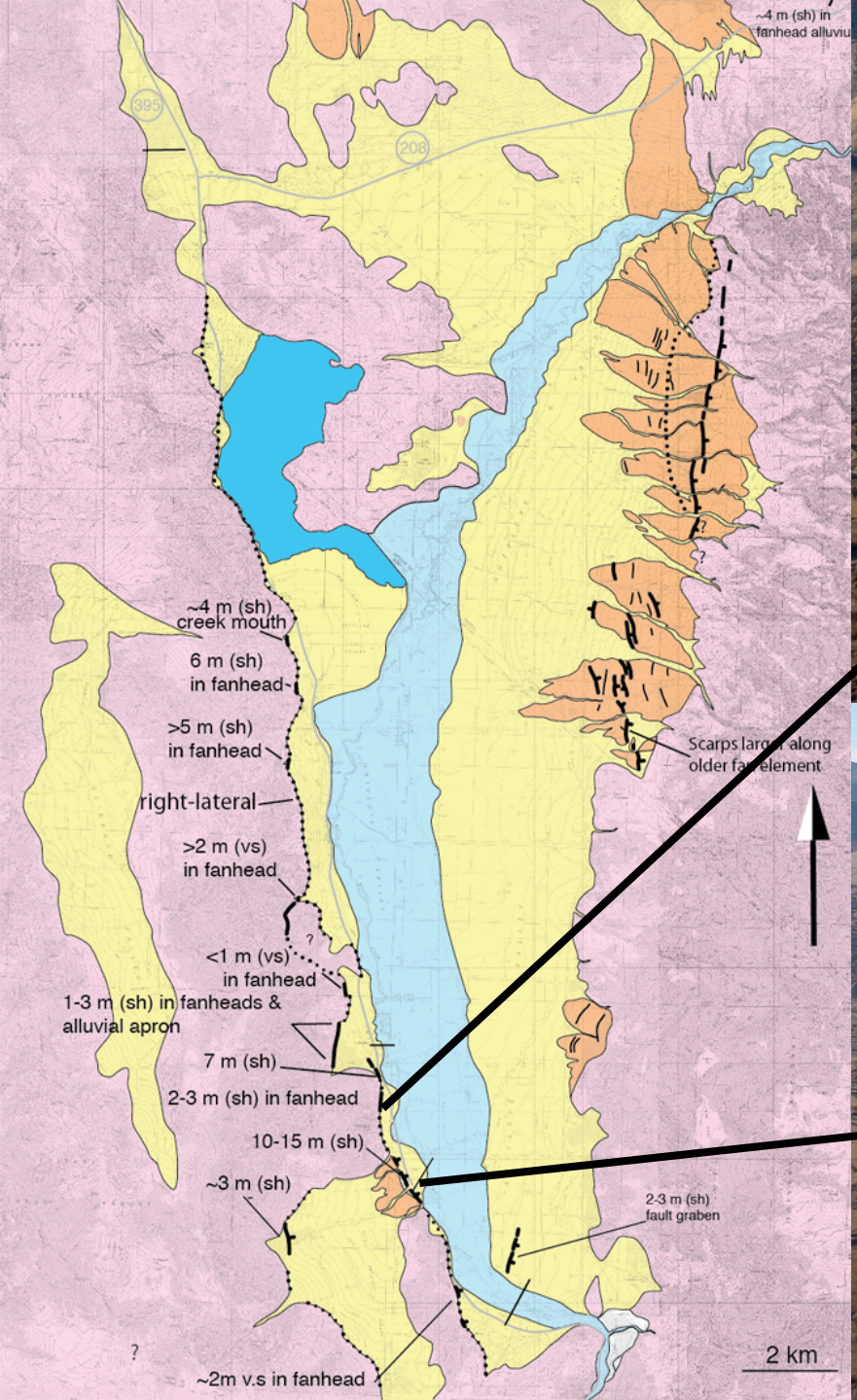
1-1.5 (vs)

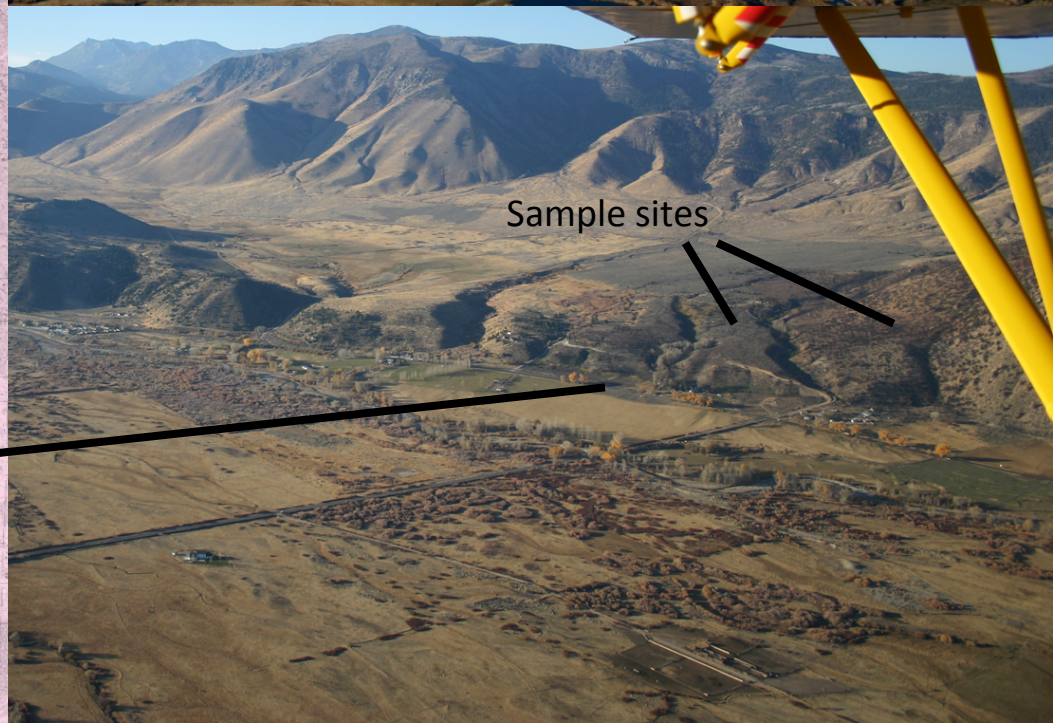
1-2 m

Twin Lakes

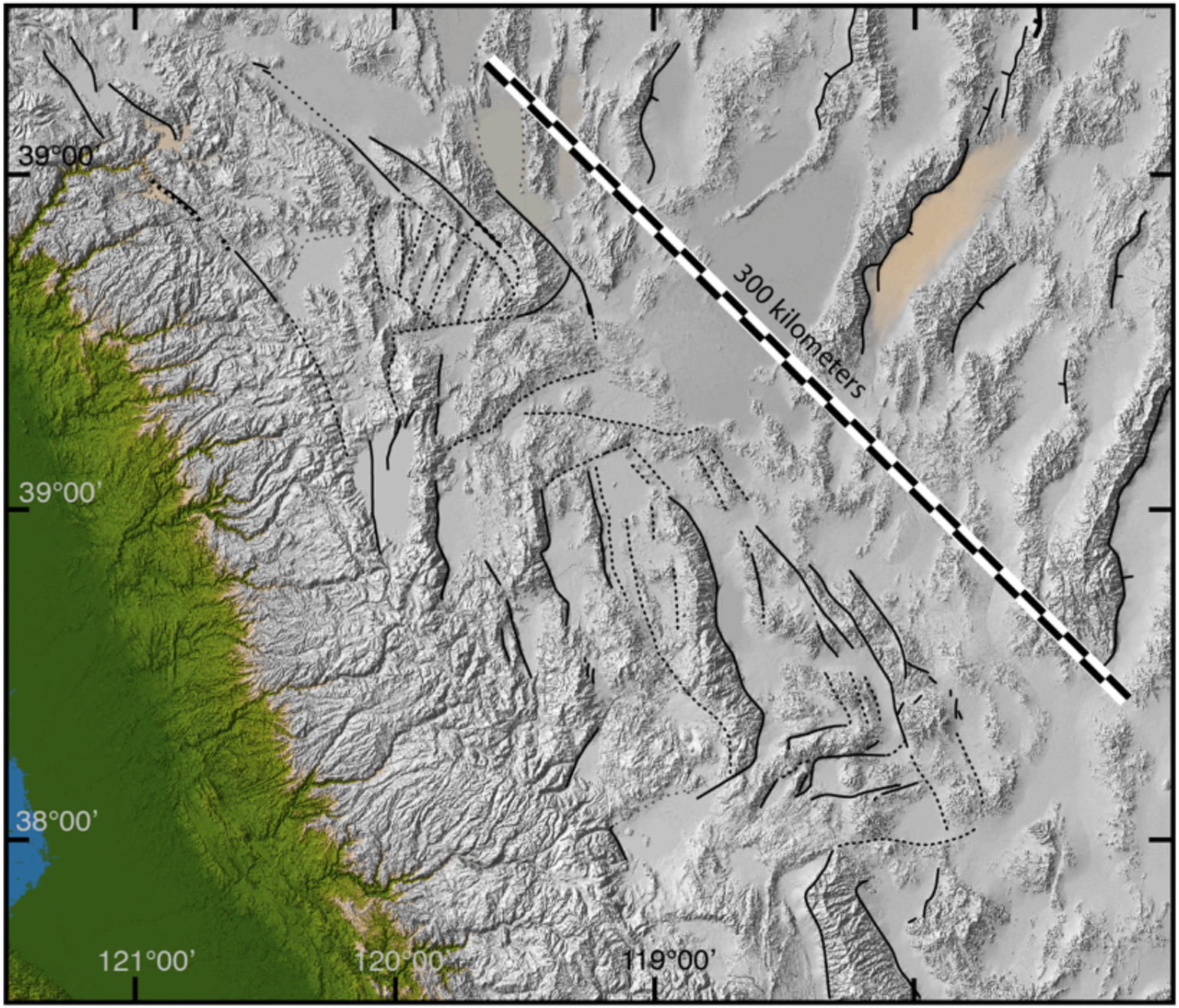
5km


Bridgeport Valley, CA
Twin Lakes
Uplifted outwash deposits at
Buckeye Creek
Active fault traces distributed in
Valley fill


~4 m (sh) in fanhead alluviu
395
208
~4 m (sh) creek mouth
6 m (sh) in fanhead
>5 m (sh) in fanhead
Scarps larger along older fan element
right-lateral
>2 m (vs) in fanhead
<1 m (vs) in fanhead
1-3 m (sh) in fanheads & alluvial apron
7 m (sh)
2-3 m (sh) in fanhead
10-15 m (sh)
~3 m (sh)
2-3 m (sh) fault graben
~2m v.s in fanhead
2 km

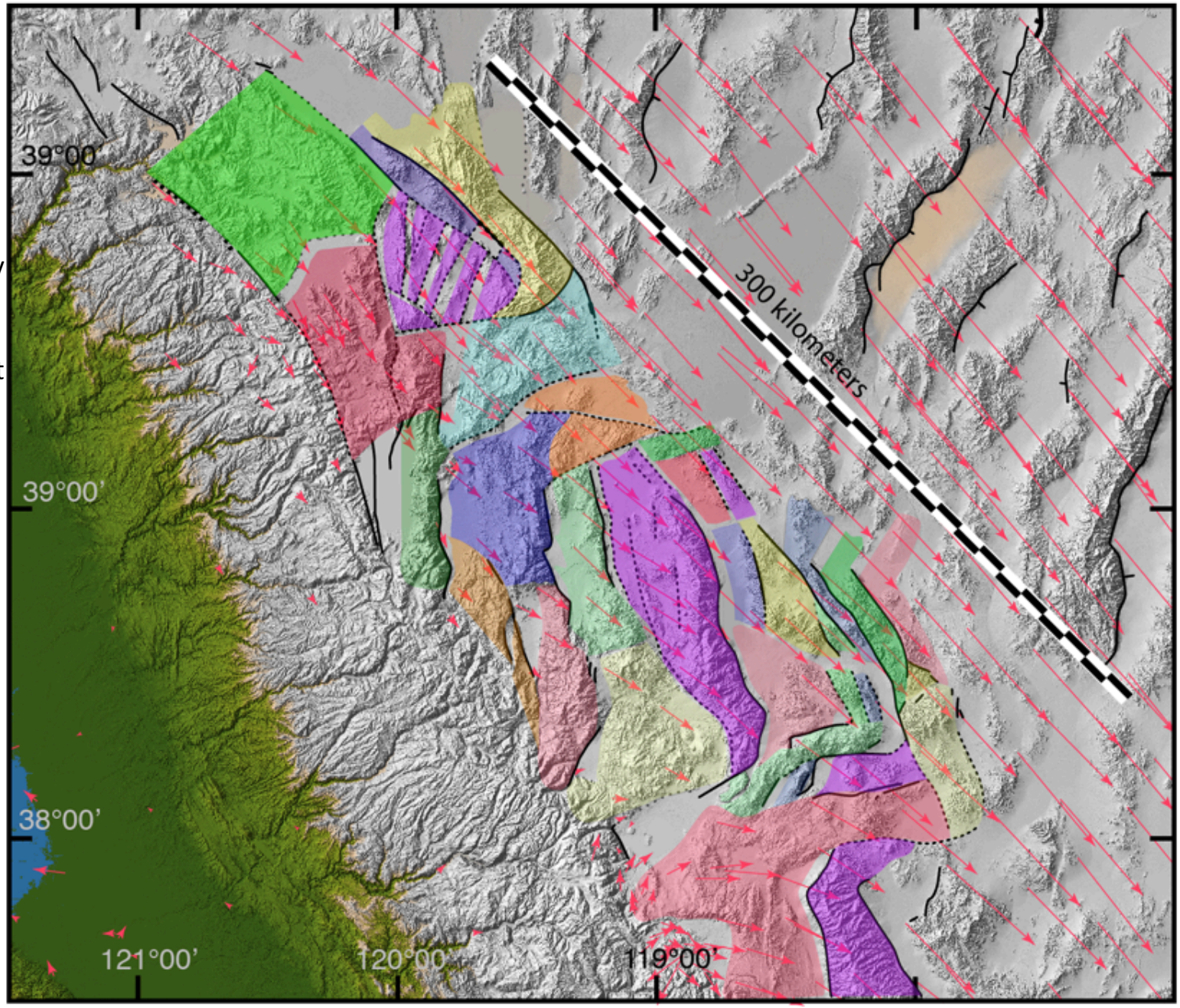

Sample sites

Topo with Faults

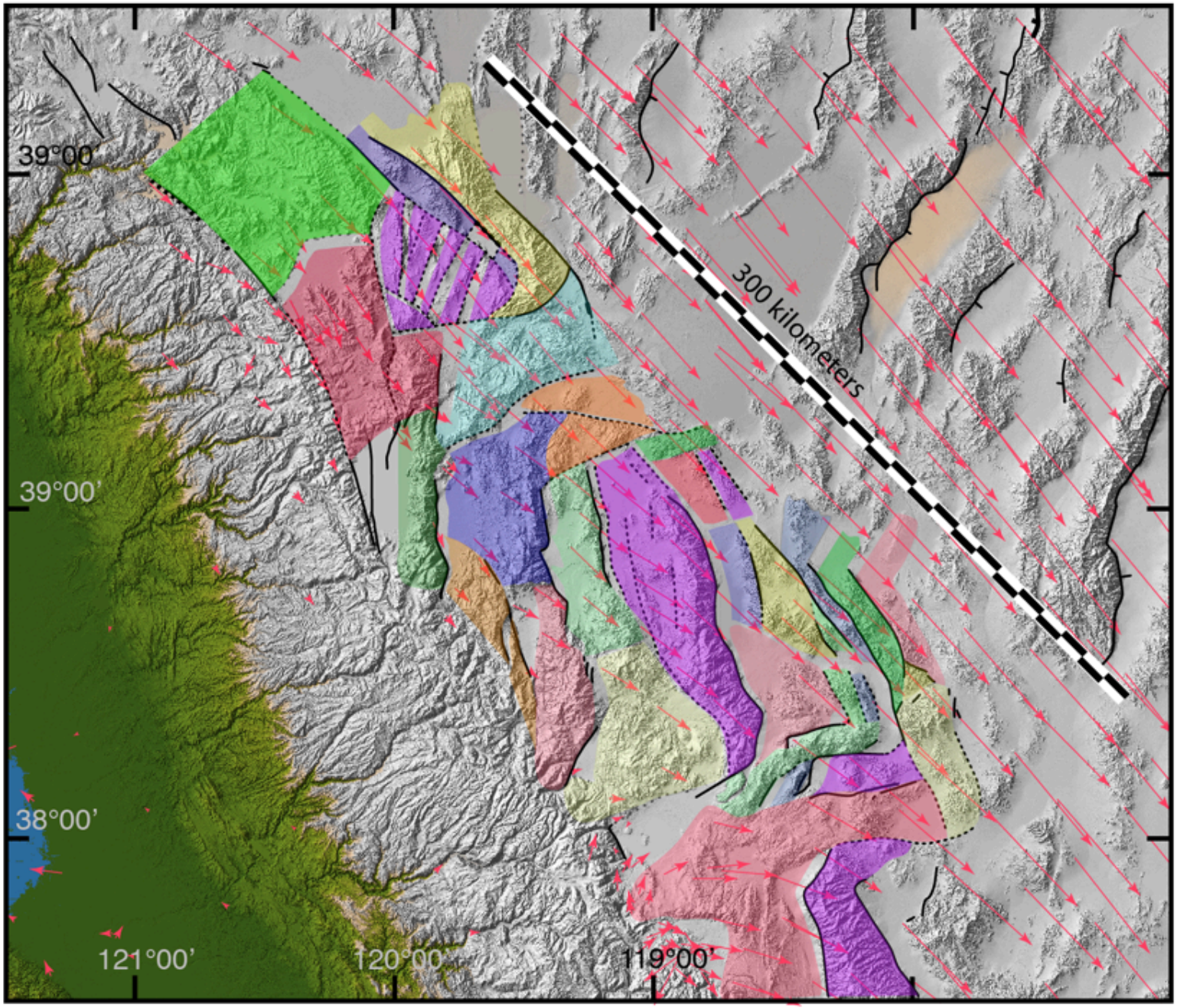


and to that add division of crustal terranes based on faults and physiography

and geodetic displacement rate vectors with respect to stable Sierra Nevada



and to that a simplified boundary to the Sierra Nevada

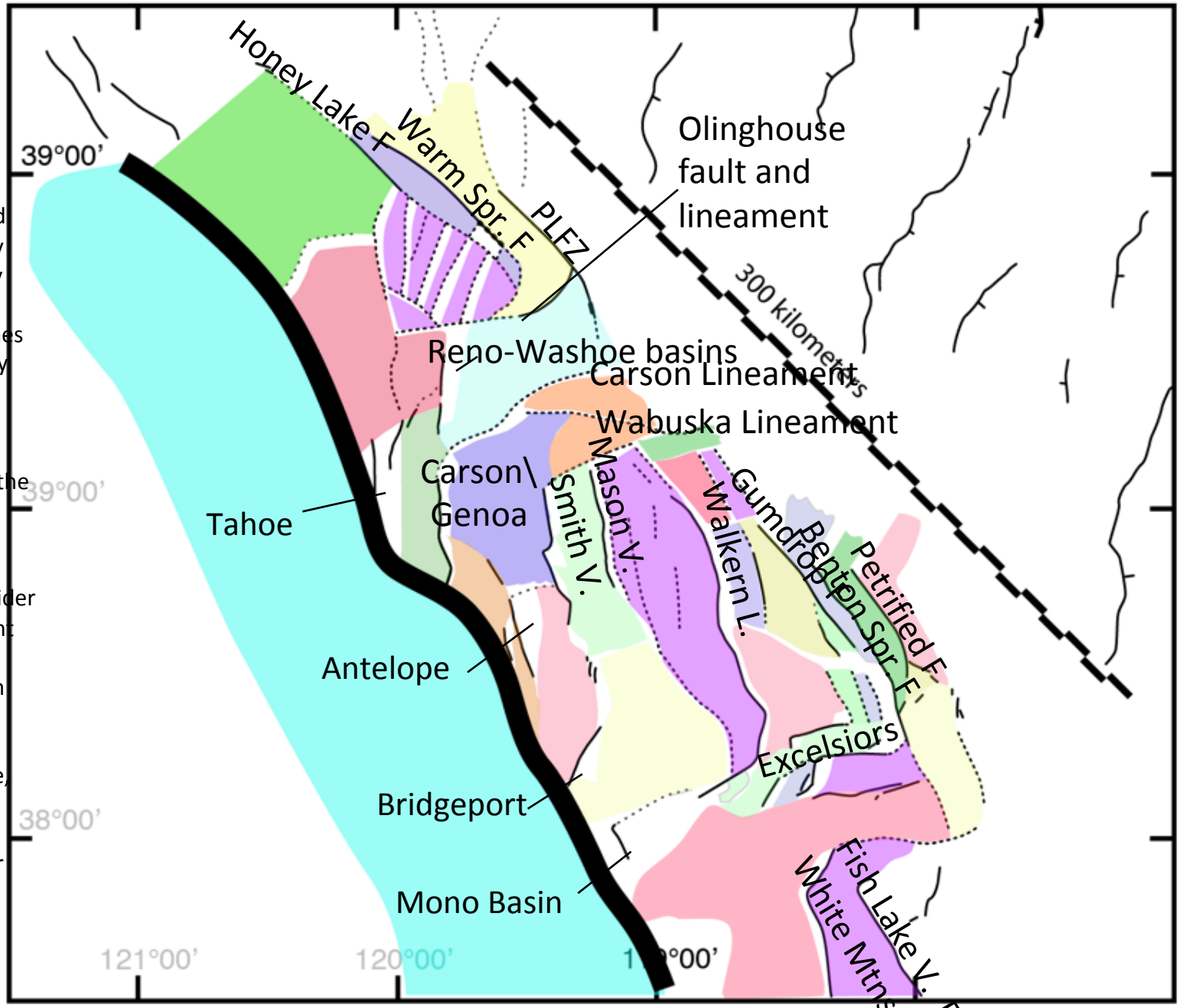


remove physiography for clarity

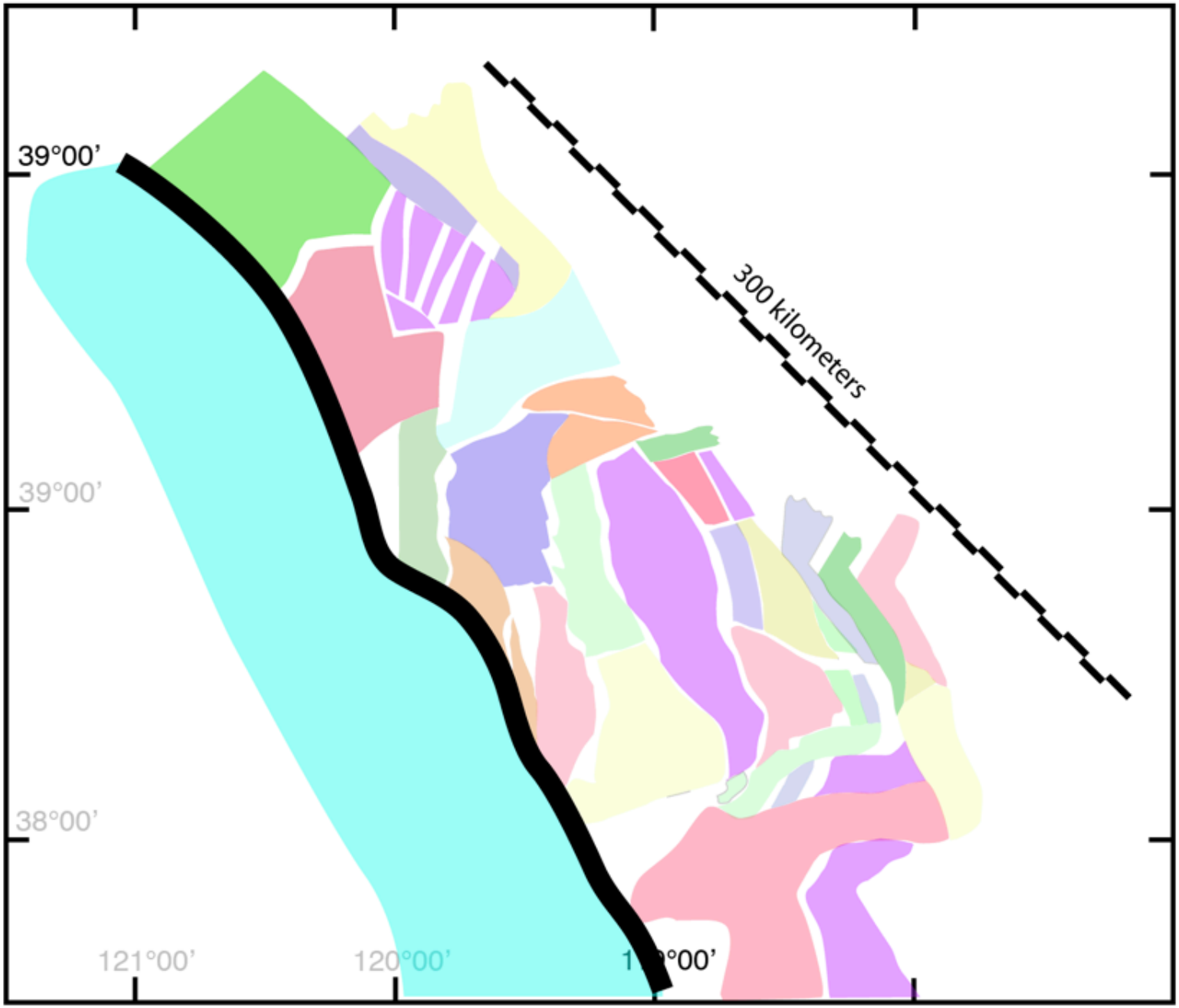
amount of extension producing the basins observed in physiography is delineated by white areas between terranes and bounded by active faults.

because of sedimentation the width of physiographic basins will invariably be wider than the amount of extension producing them

extension in tahoe, antelope, and bridgeport basins is exaggerated for clarity of basin shape and my interest...

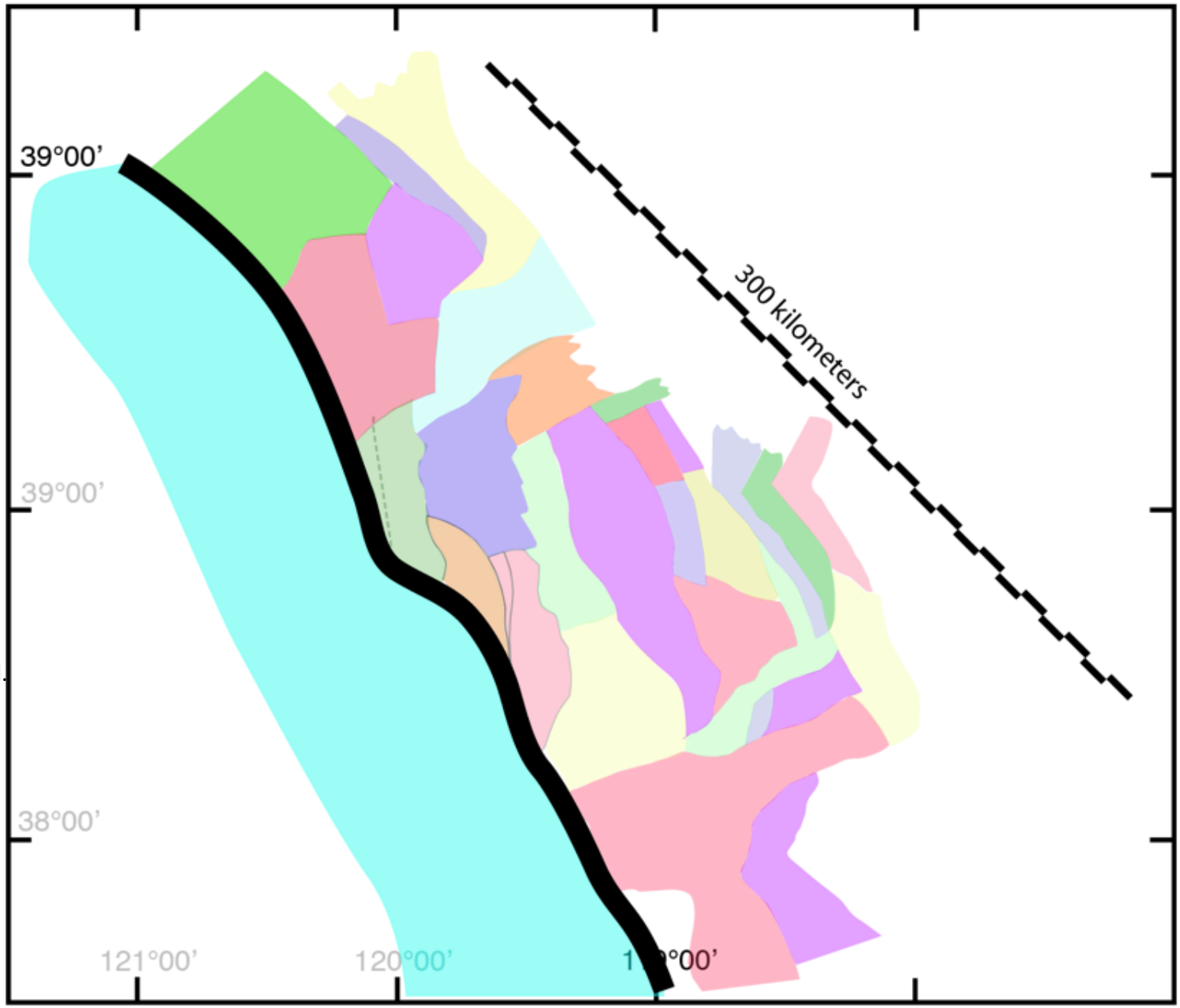


Remove Faults and verbage for clarity

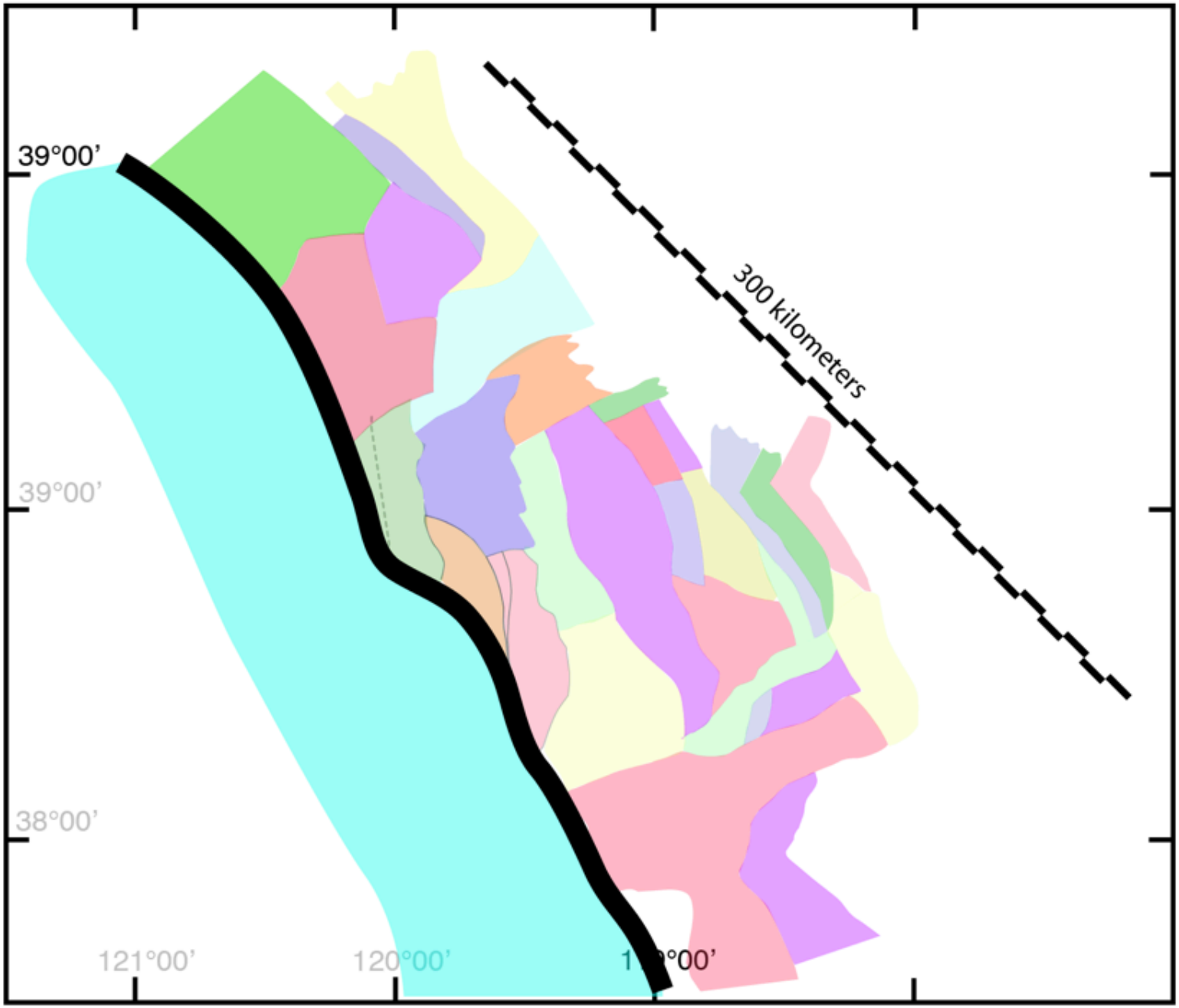


now move blocks to eliminate ‘white spaces’ - the basins between faults...

Note the extra added width of the Tahoe and Antelope basins - if not done, the extension associated with each basin will be overestimated. .. said this already



The black arrows indicate the motion points on the blocks would need to move to return to position of last slide (or ‘to get to where they are today’)



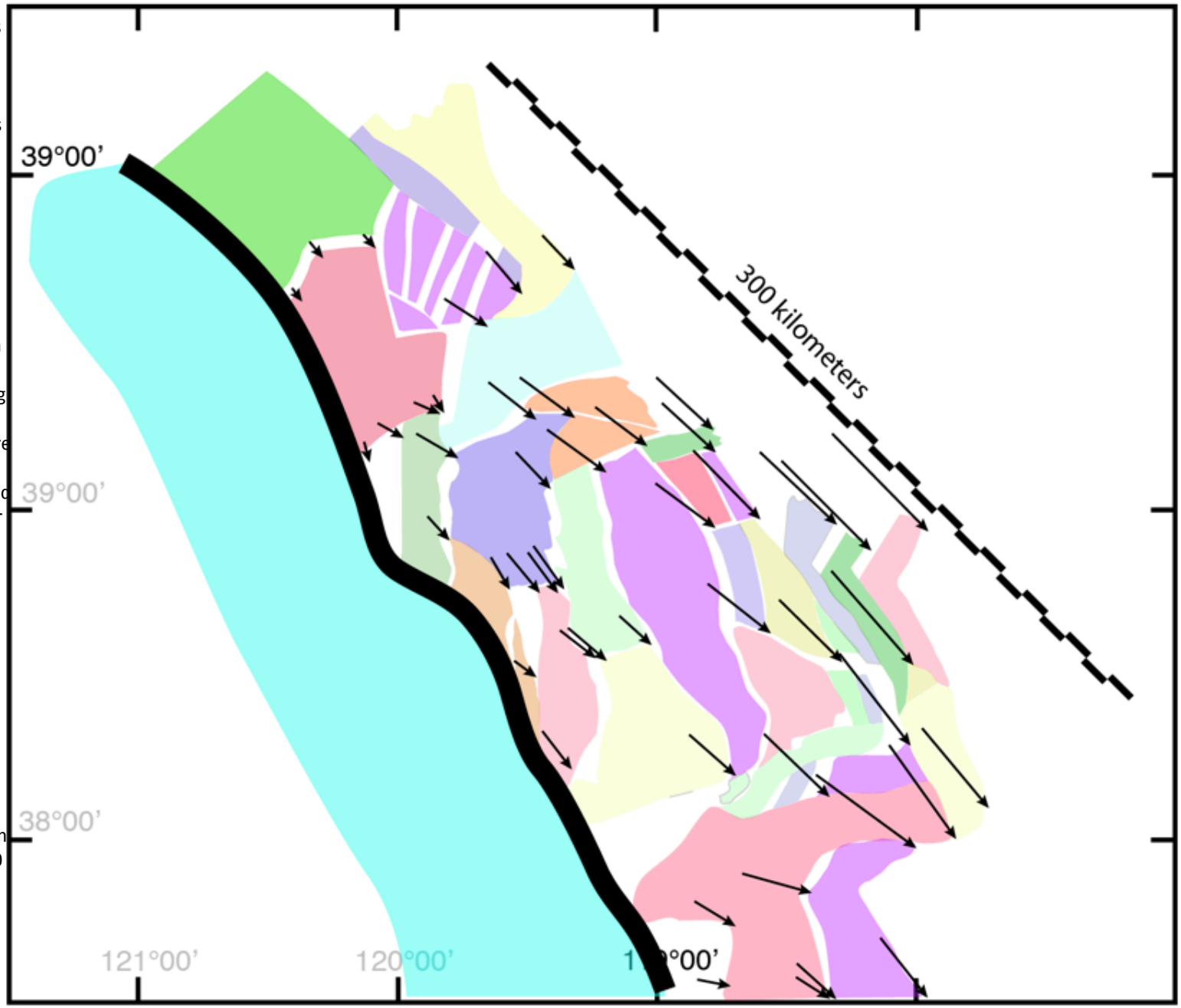
Same black arrows

The non pointed end
of each arrow thus represents from where the particular point at the
arrow tip came from....

if it is assumed the geodetic strain accumulation field has been operating since the point in time all blocks were connected - the black arrows should be oriented similar to today geodetic vectors...

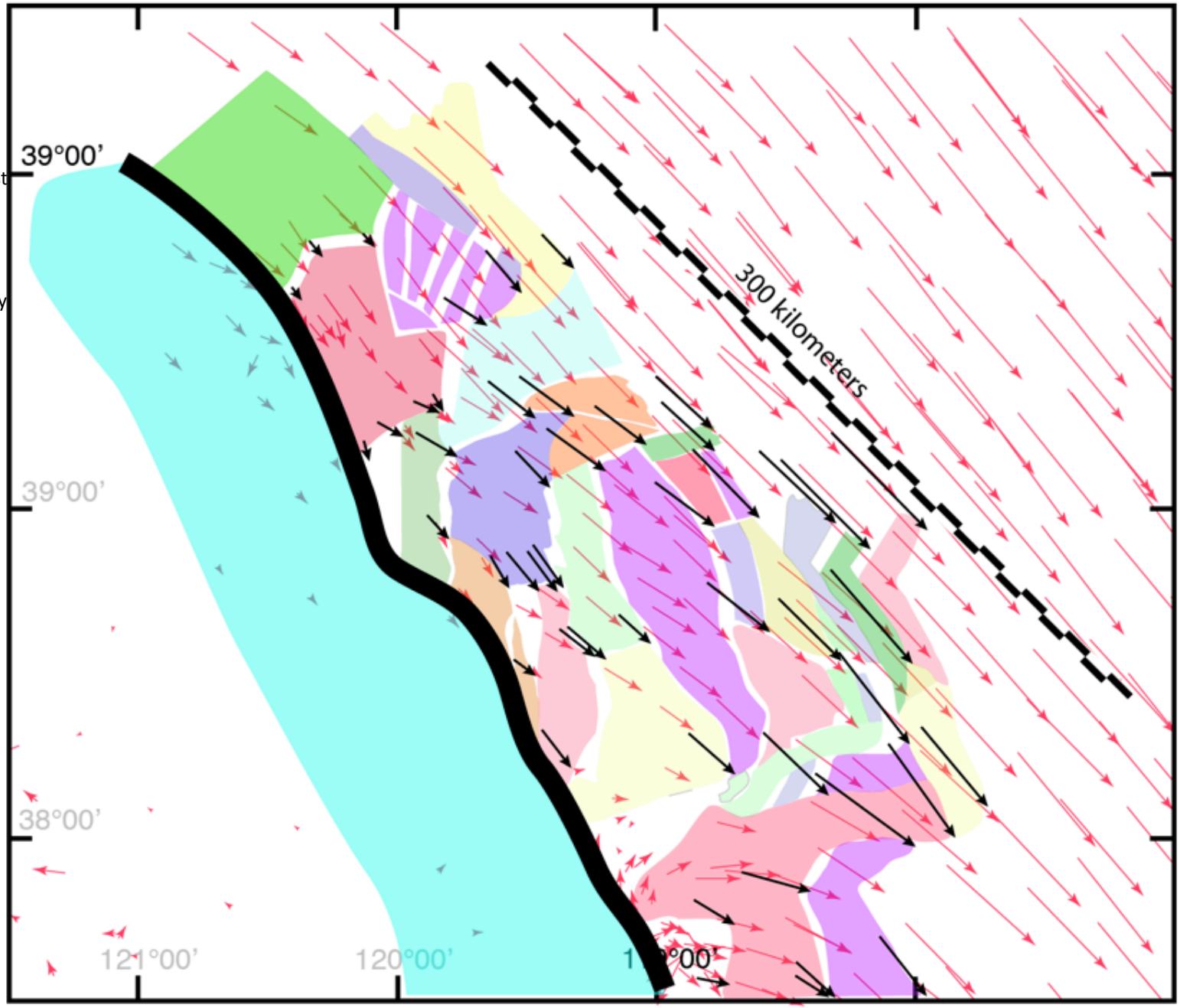
this is of course a big assumption - but
seems the most reasonable...

as with geology cumulative displacement is on order or ~20-30 km to north and 40-50 to the south

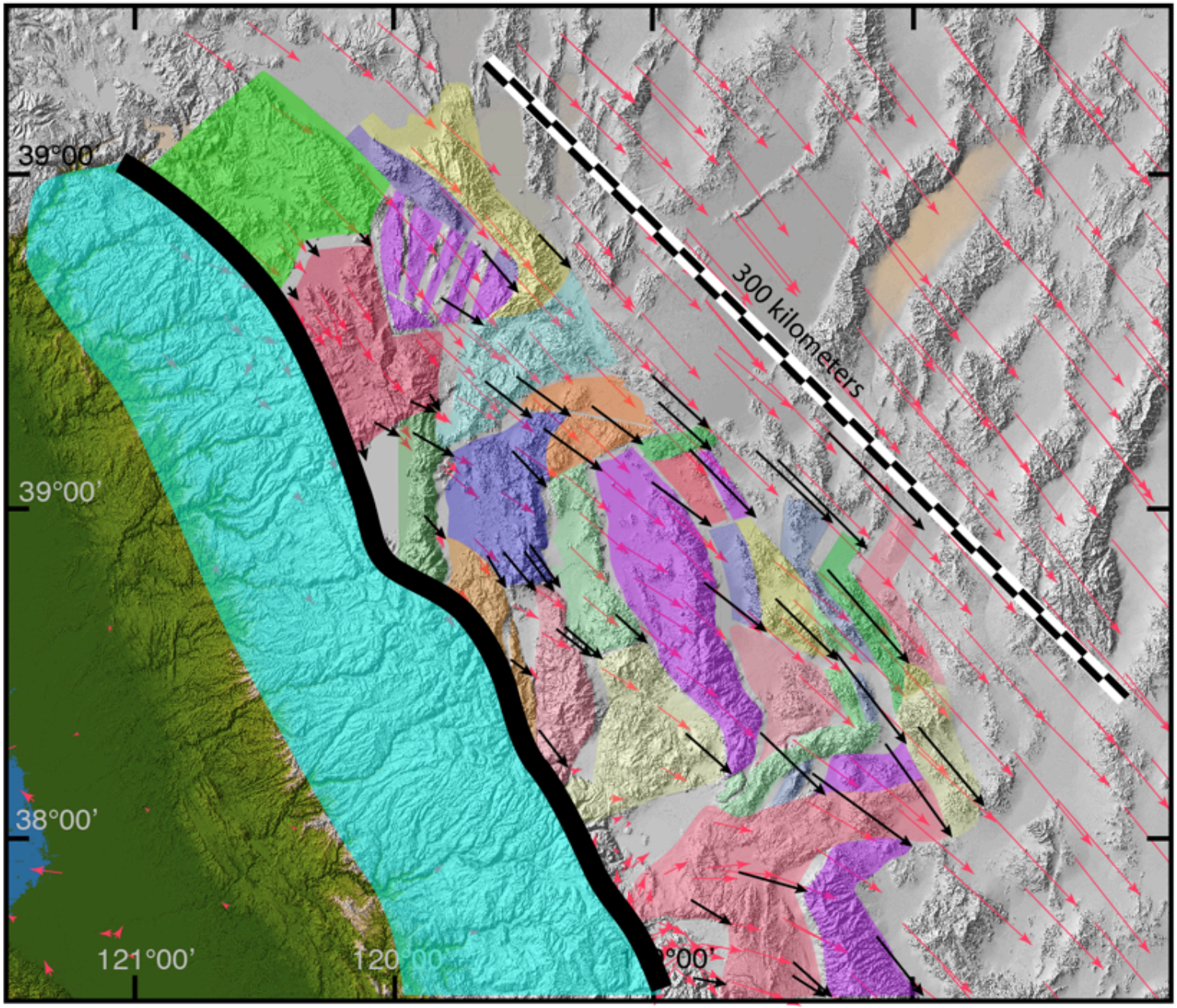


Red arrows are geodetic vectors with respect to Sierra Nevada - don't have scale on this plot but largest is about 1 cm/yr...

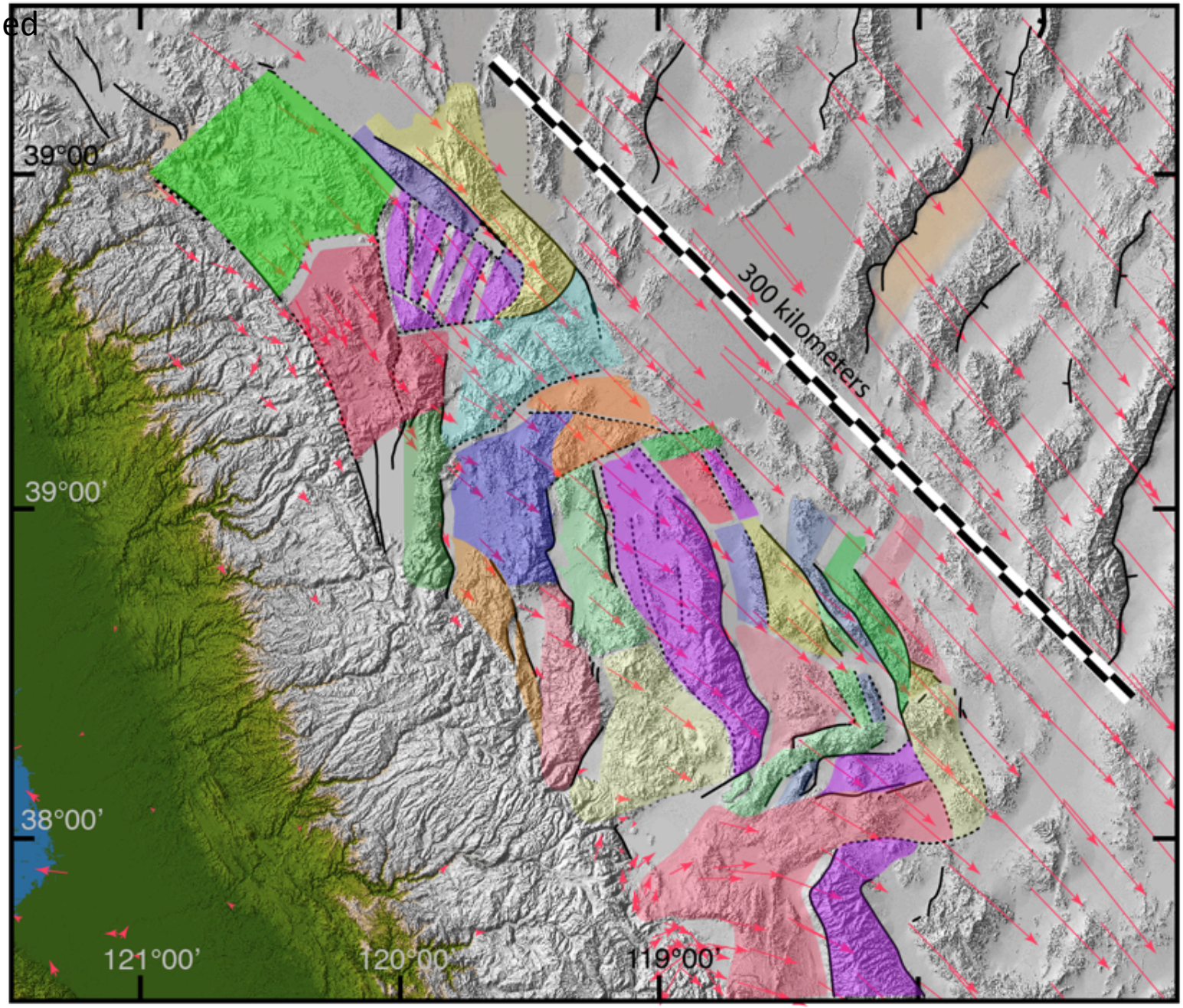
Scale of black arrows not the same! They are cumulative displacement of blocks...



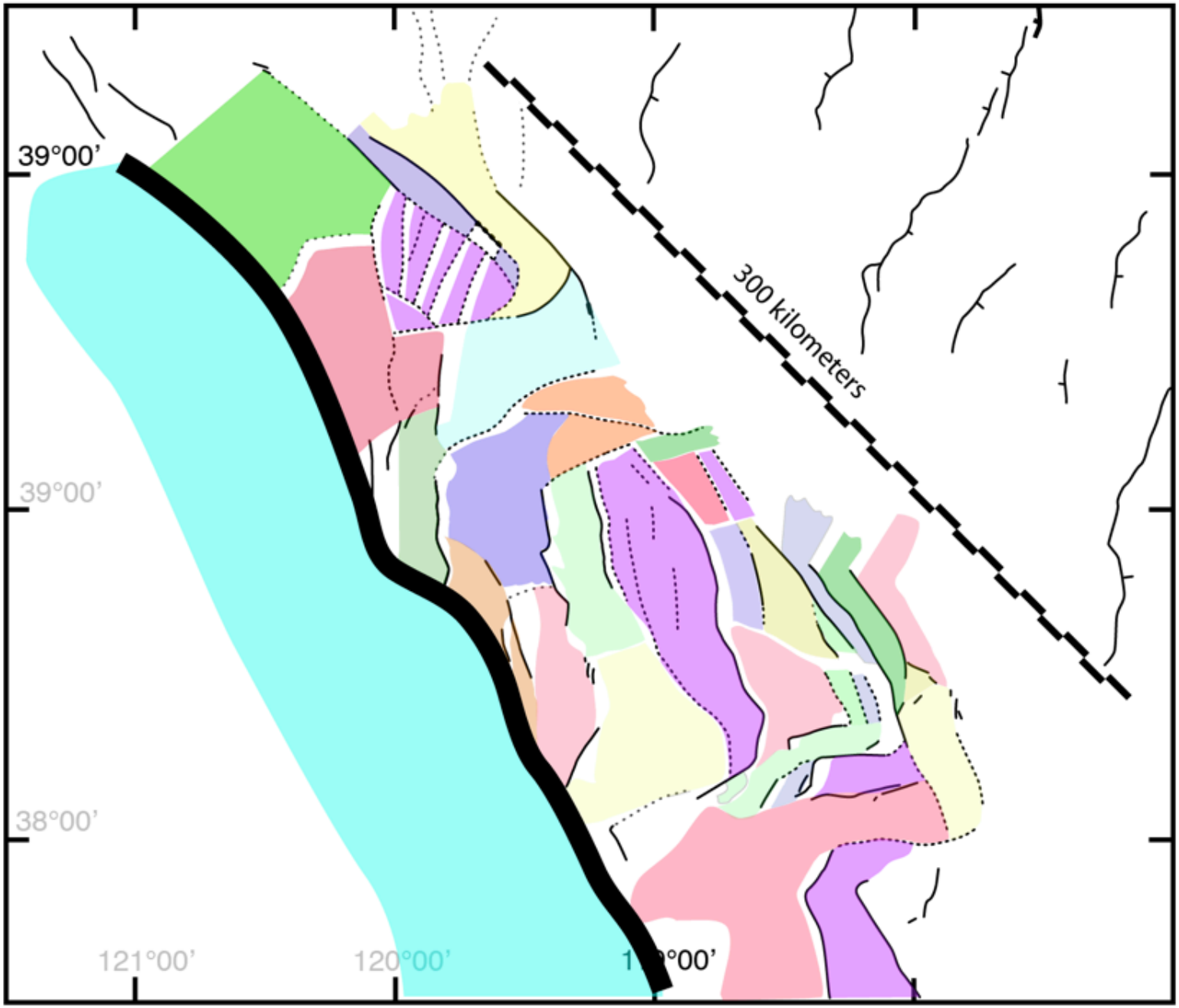
bservations of
evious slide placed
n
ysiogrpahic map



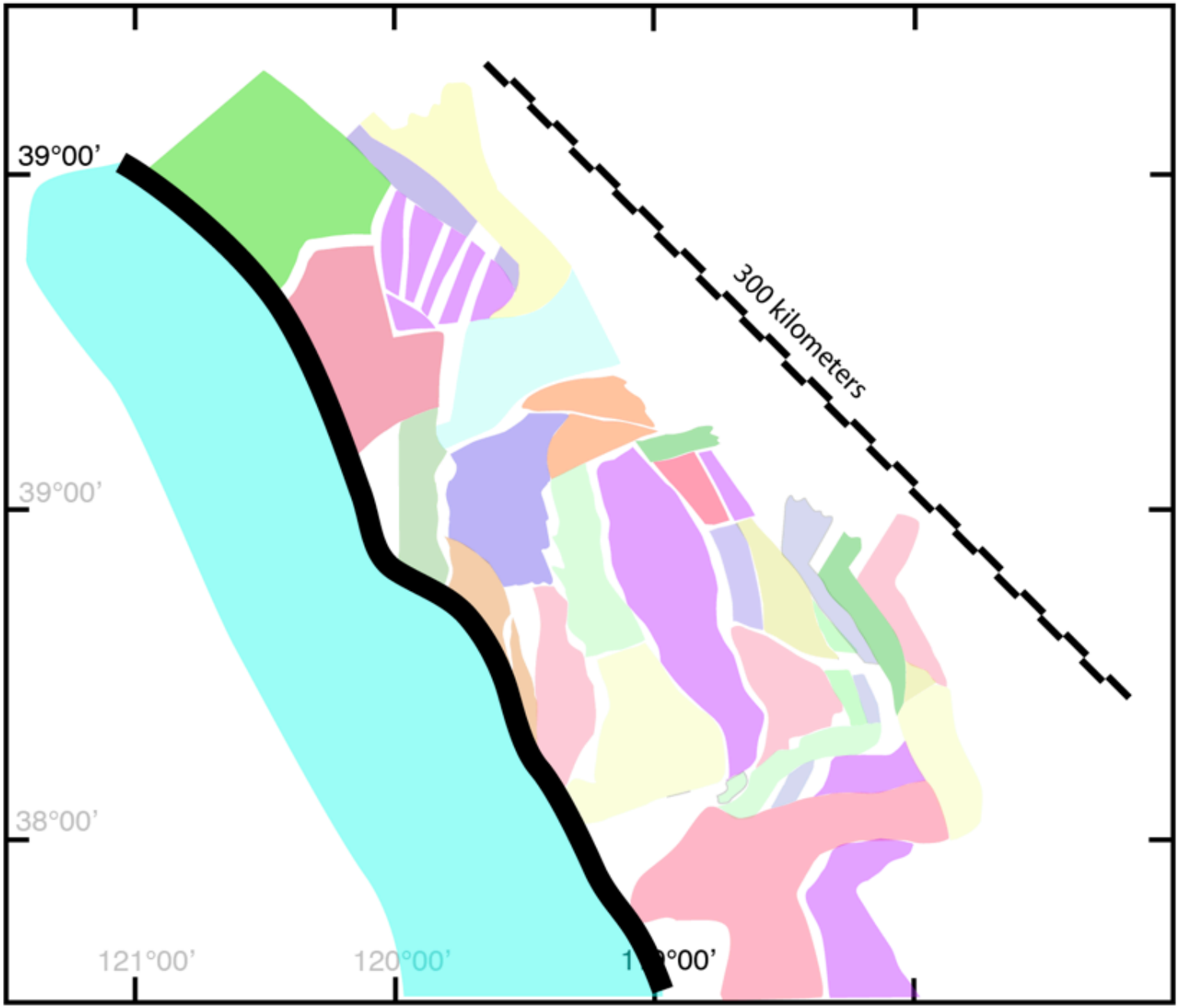
Faults added



physiography now removed...

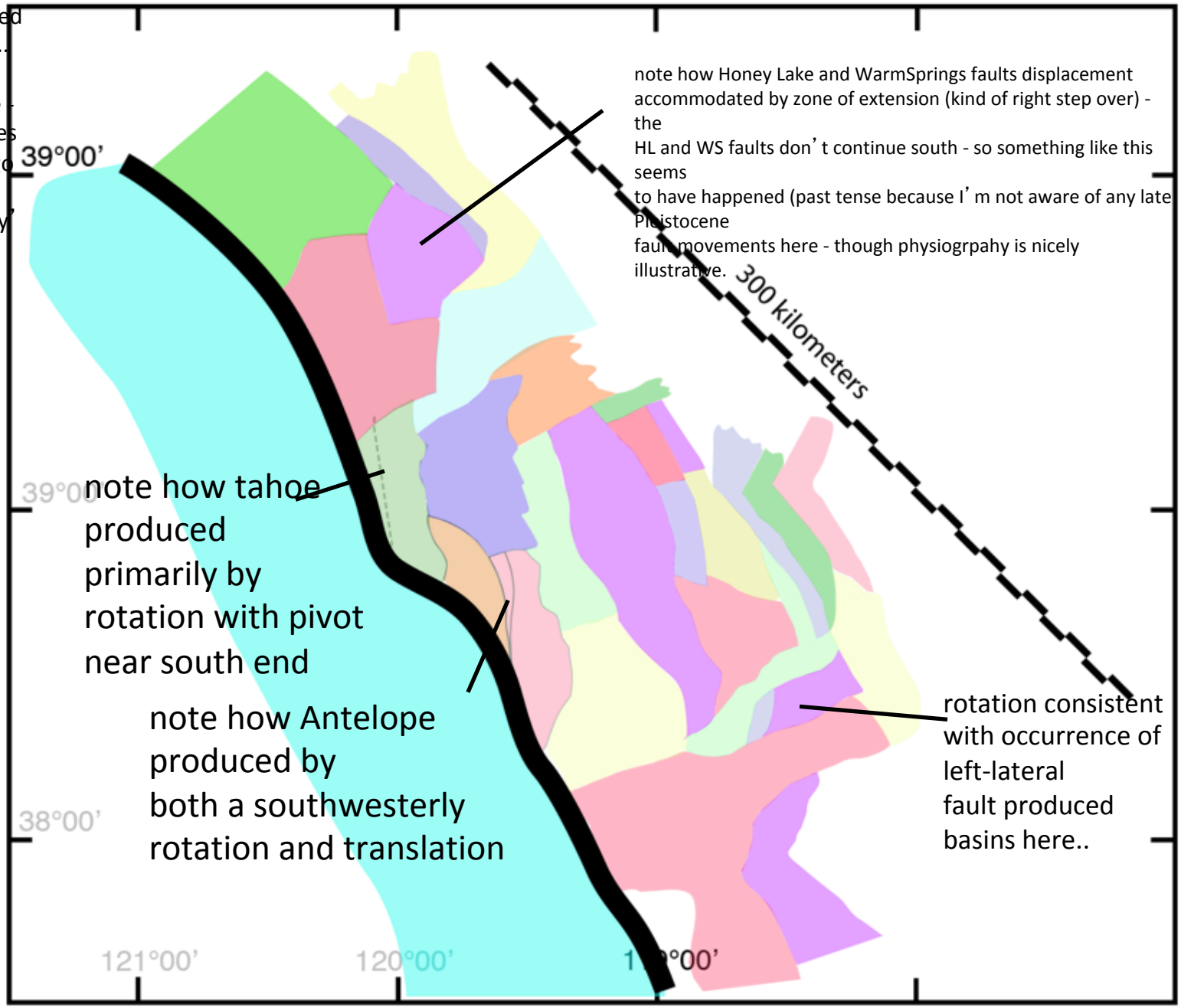


faults removed

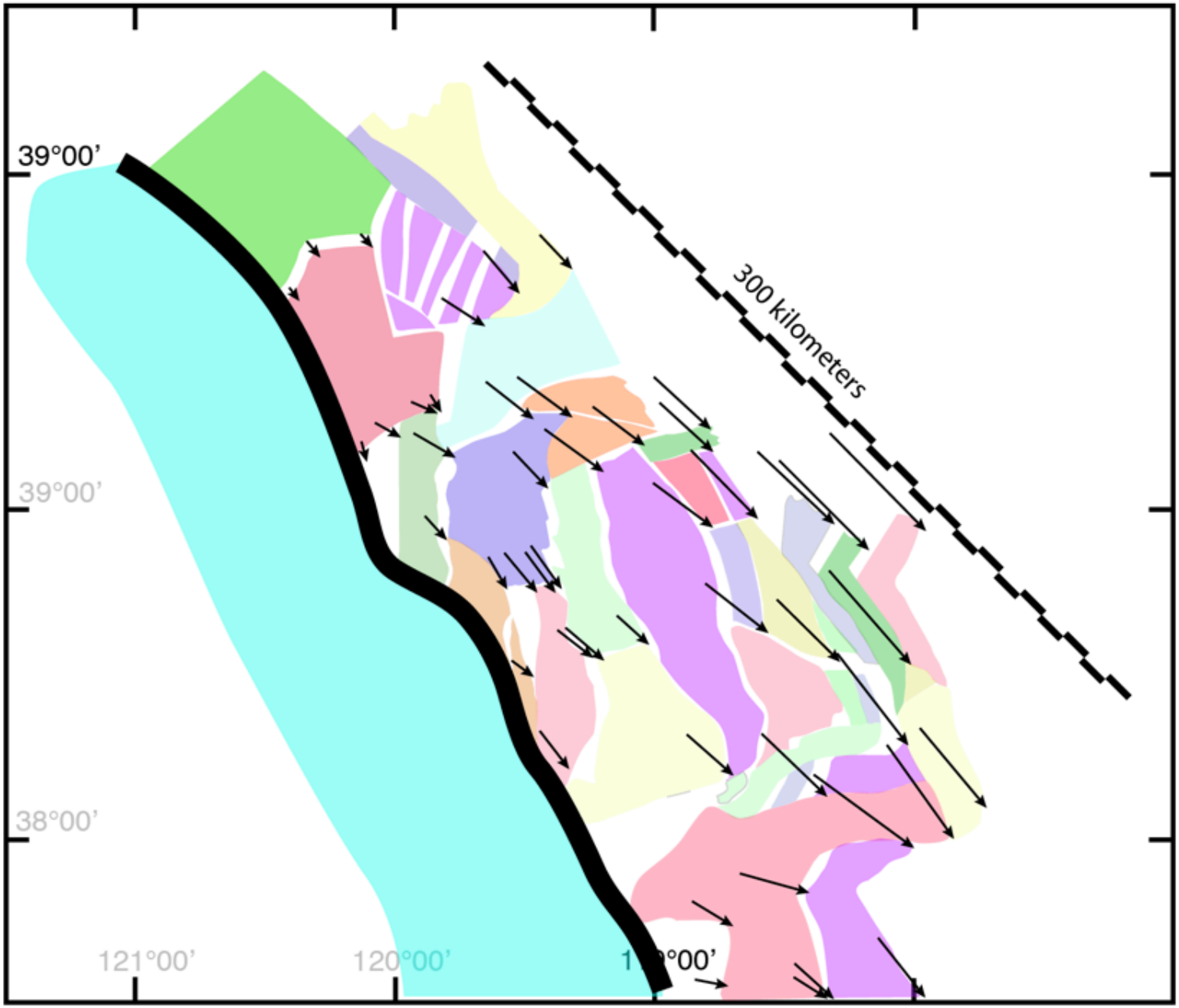


and blocks placed back together....

why this is here - because it makes convenient to go toggle between 'today' (next slide) and 'original' view (this slide).



‘today’
view



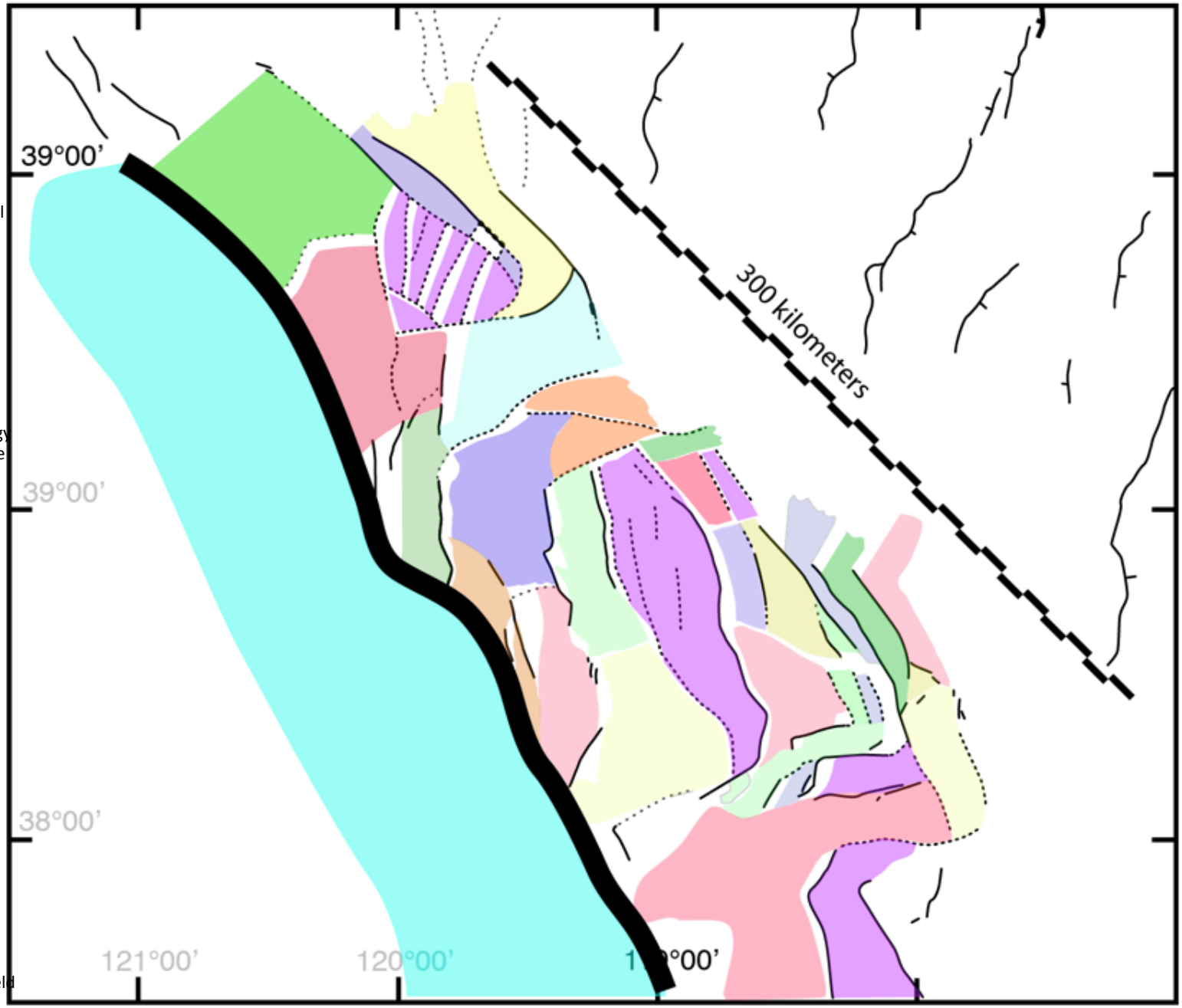
‘today’ view again but with faults this time

in sum seems quite hard or next to impossible to get cumulative deformation field to share directional characteristics of geodetic field without requiring some oblique slip on the major range bounding normal faults....

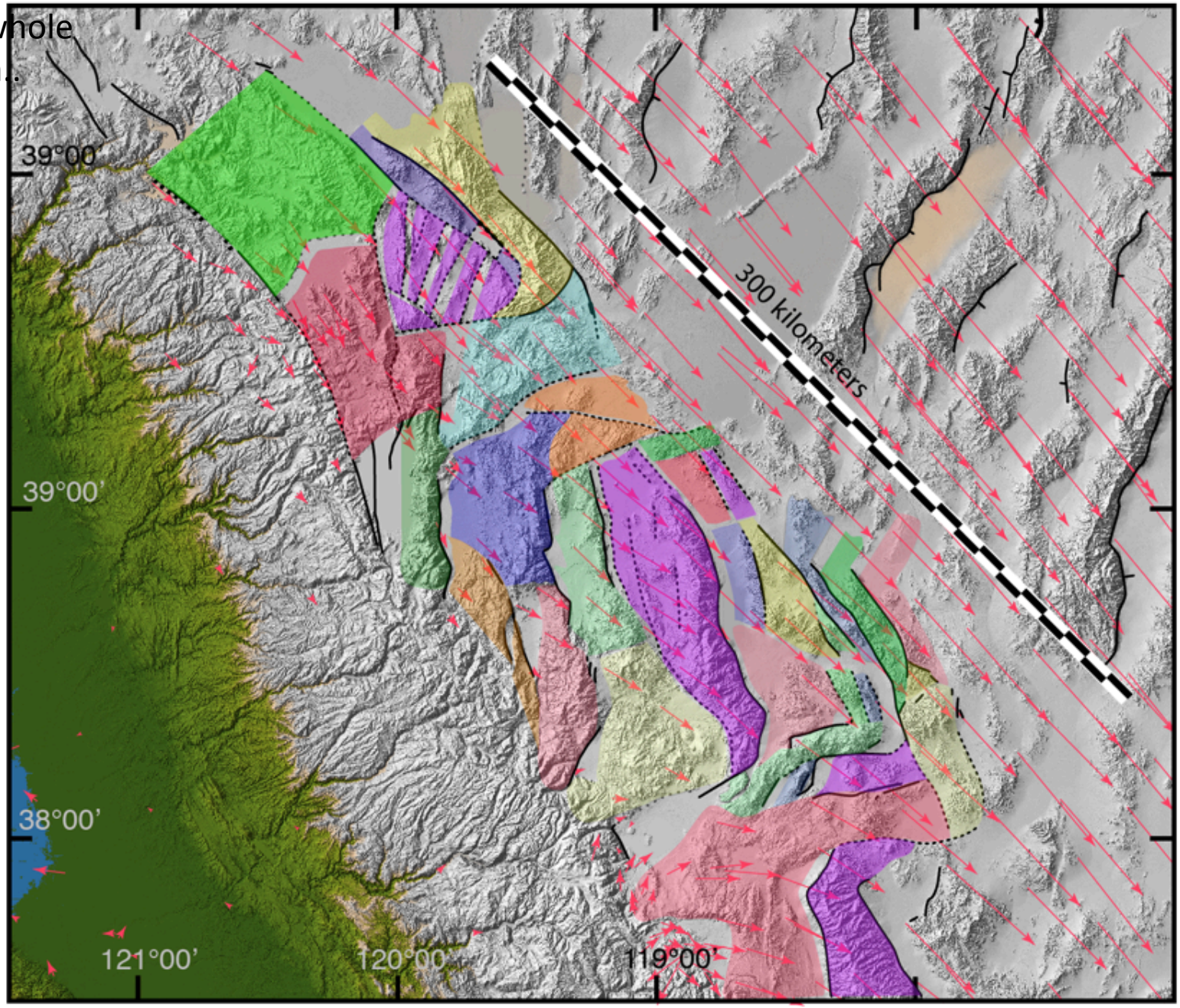
so we are missing it in the morphology and trenches of the faults or it is being accommodated by distributed deformation or something out in the basins --- the 1954 Fairview Peak earthquake showed 50-50 strike-slip but it would not be recognized but for the earthquake itself (though bedrock mapping suggests so) -

Nonetheless, I think the previous idea that a transect across the Lane cannot account for the geodetic field by faulting alone -

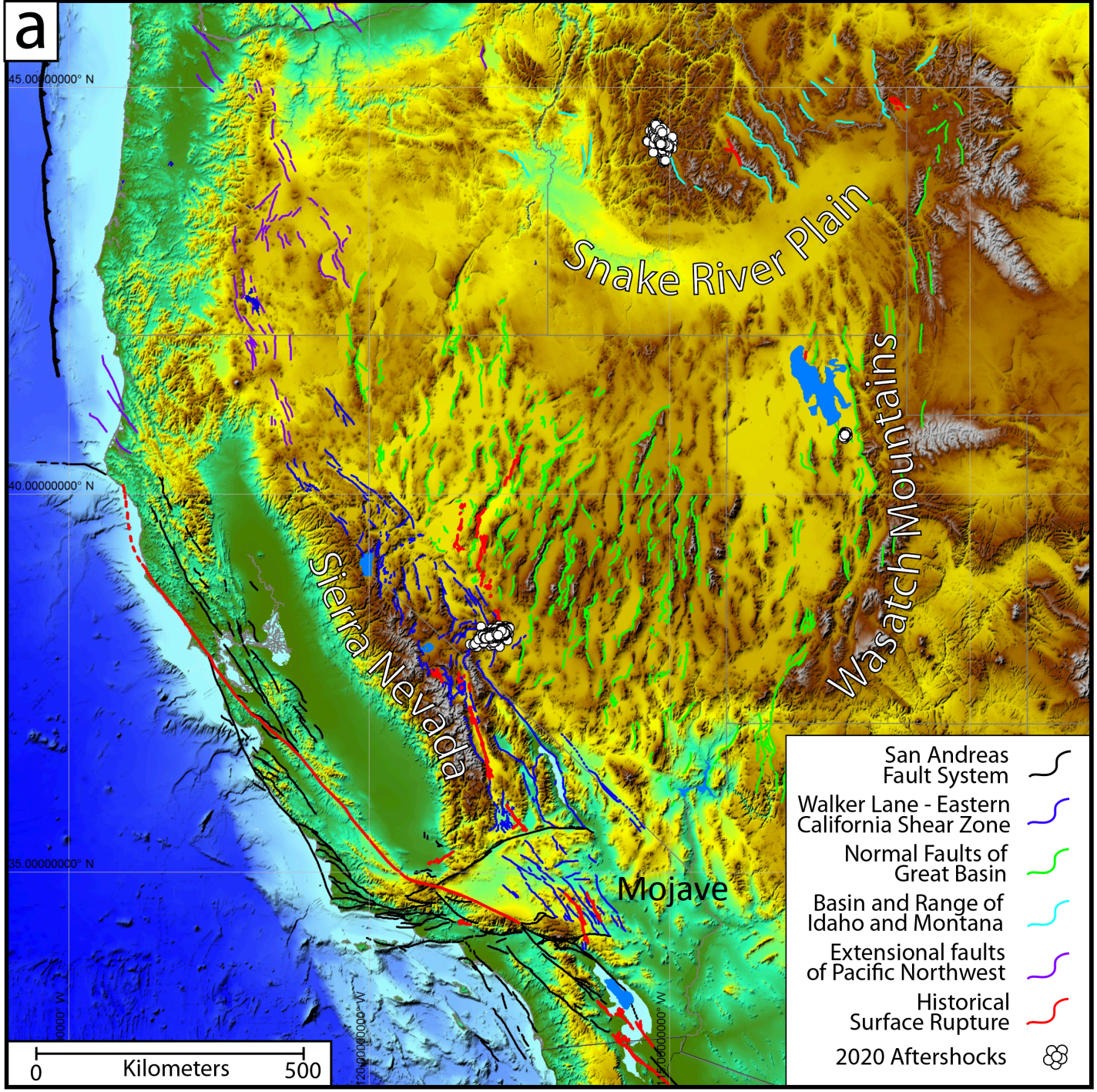
the ‘stretching and



and the whole enchilada.



all based on phsiography and faults - not checking geology someone should.



So now, how did it get this way and when