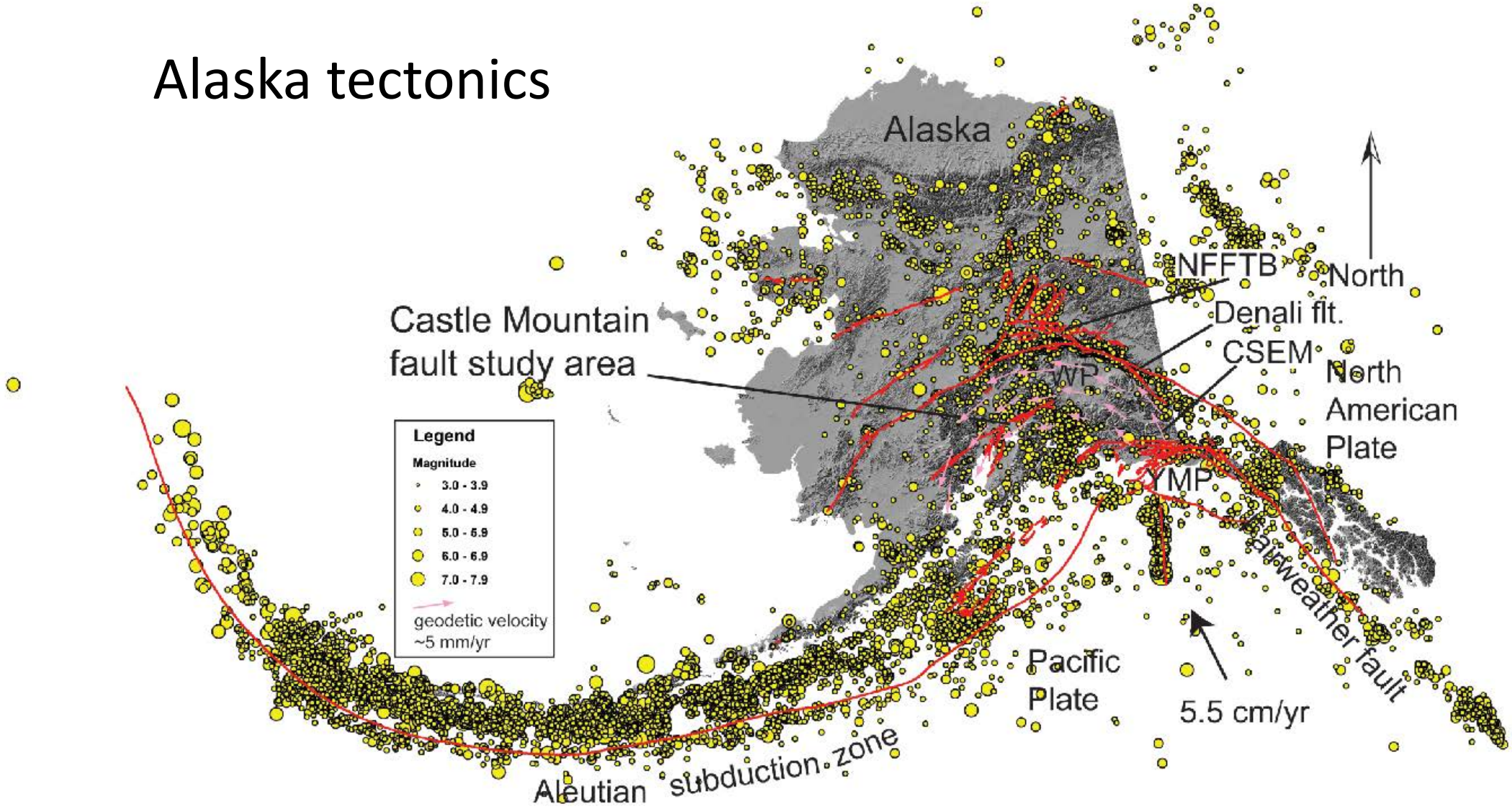
GLG494/598 (ASU) and GEOL 701J (UNR):
Mapping tectonic faults from geomorphology

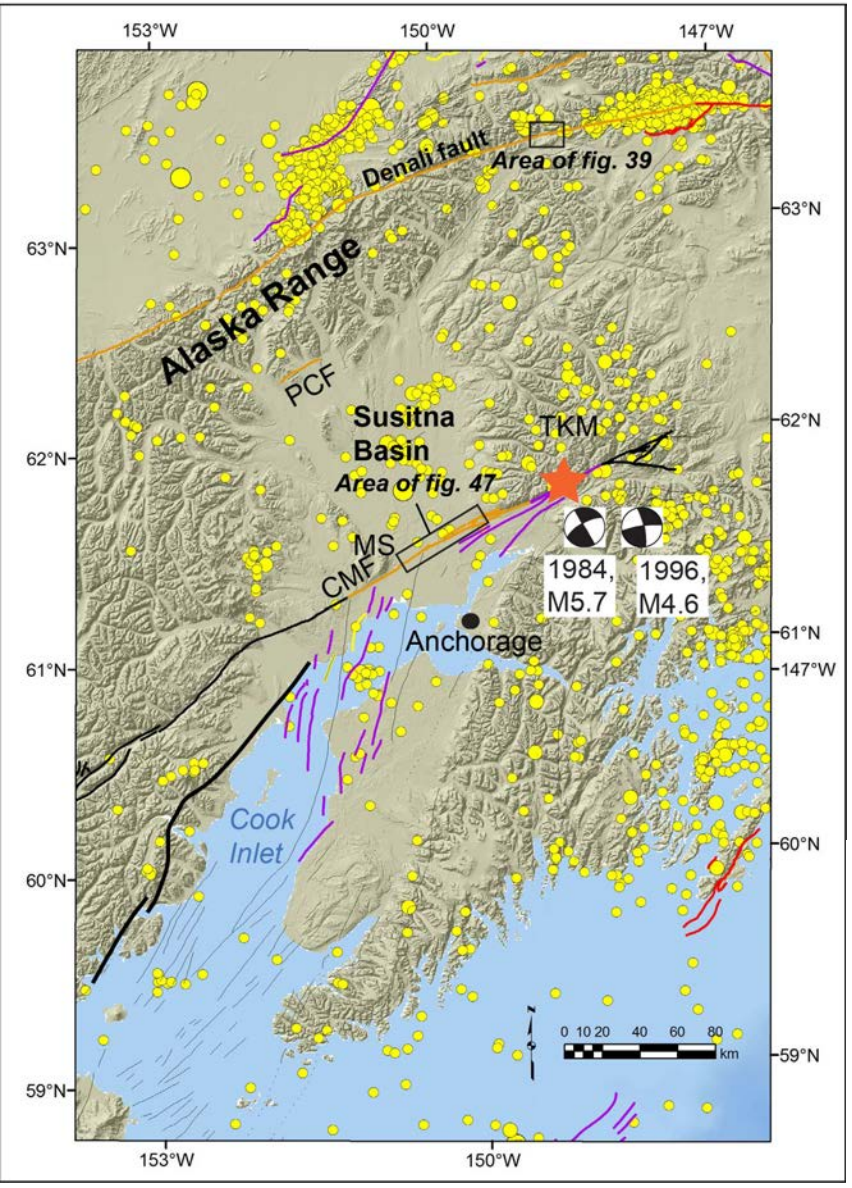
Reverse/Thrust faults in Alaska:
Geomorphic evidence for active deformation

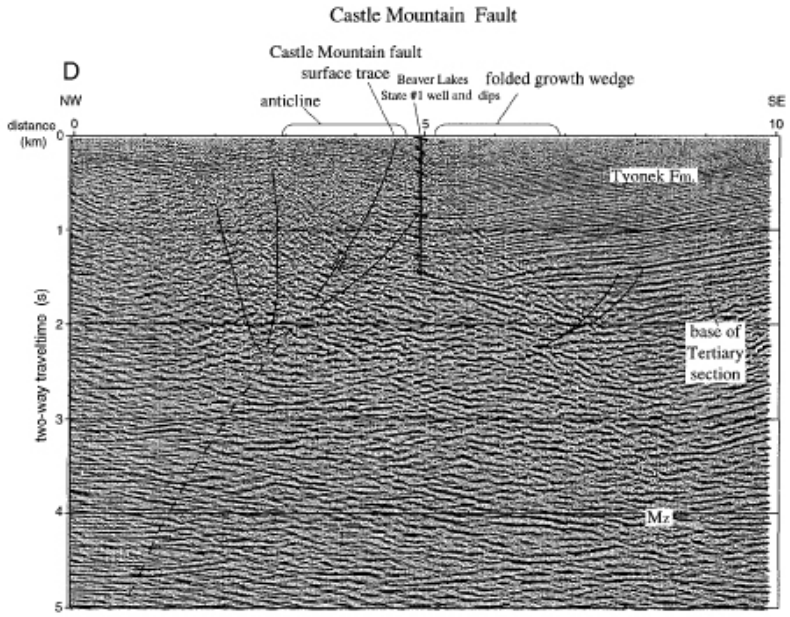
Professor Rich D. Koehler

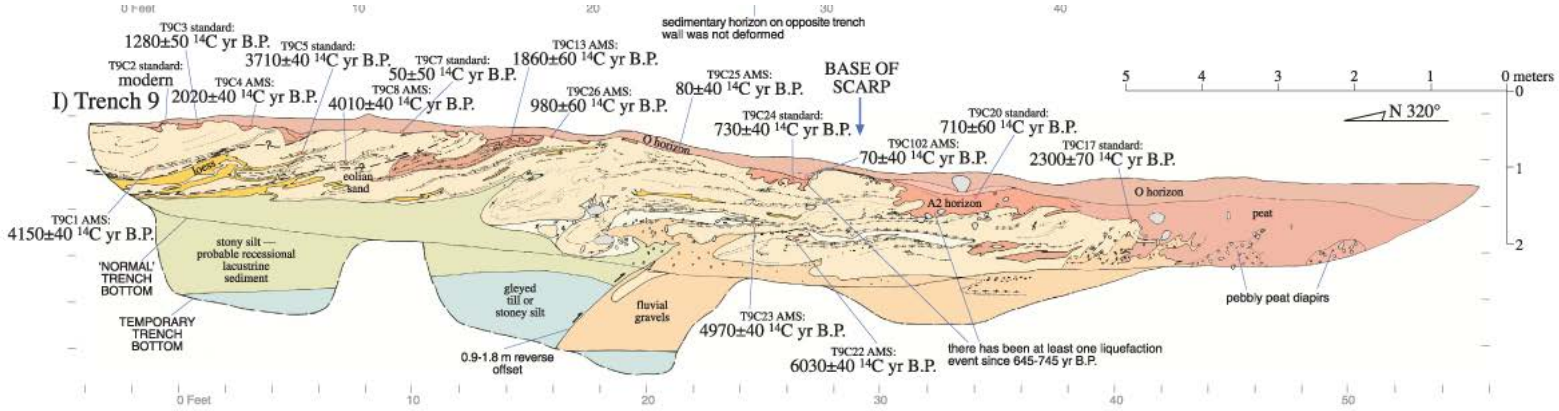
Alaska tectonics



Castle Mountain fault

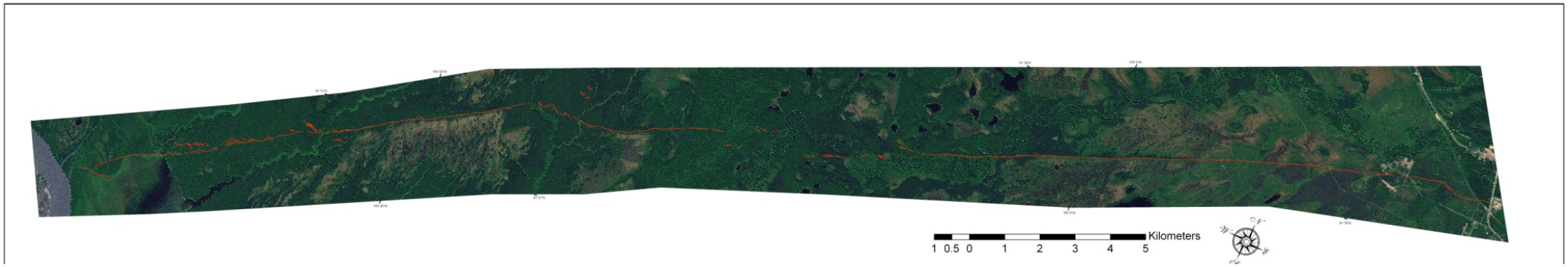


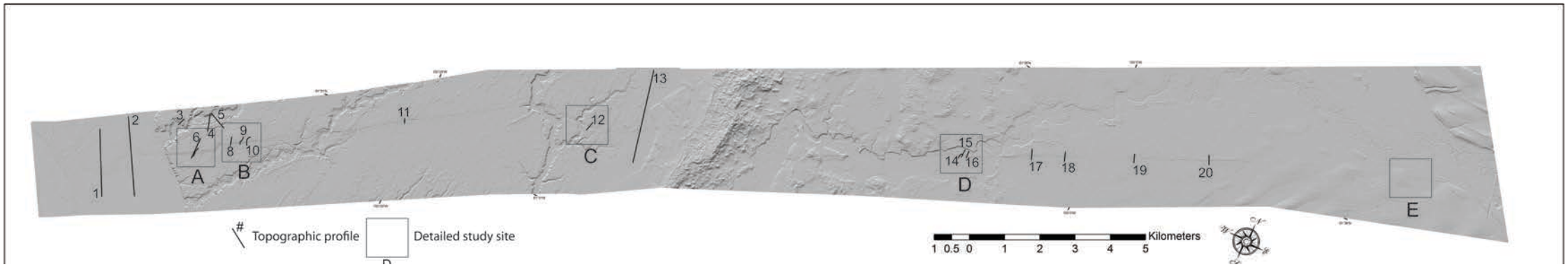


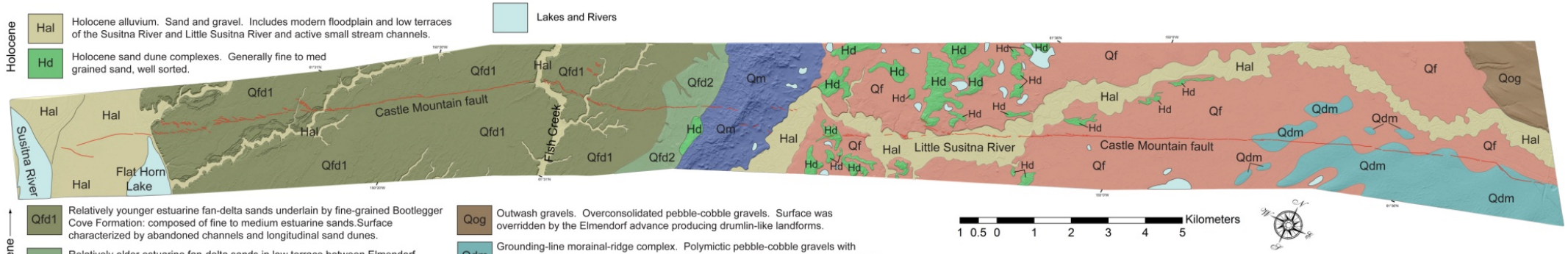


Haeussler et al., 2002

Castle Mountain fault



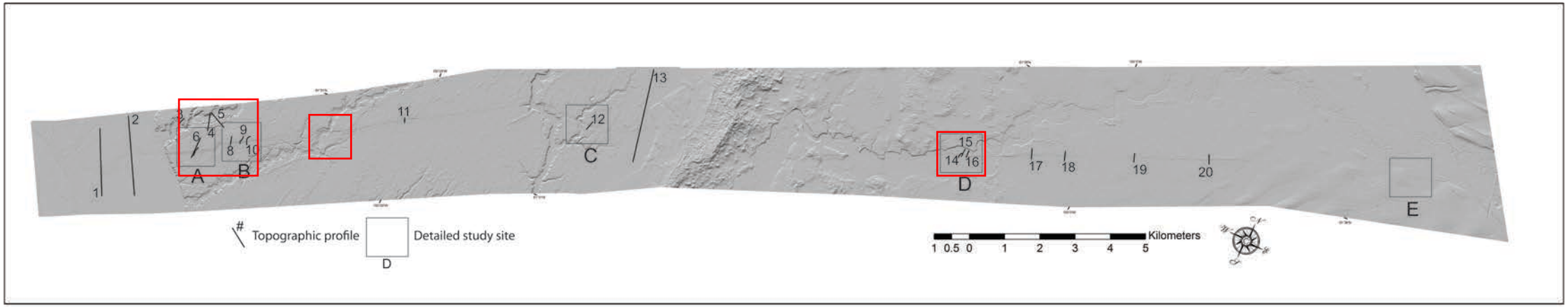


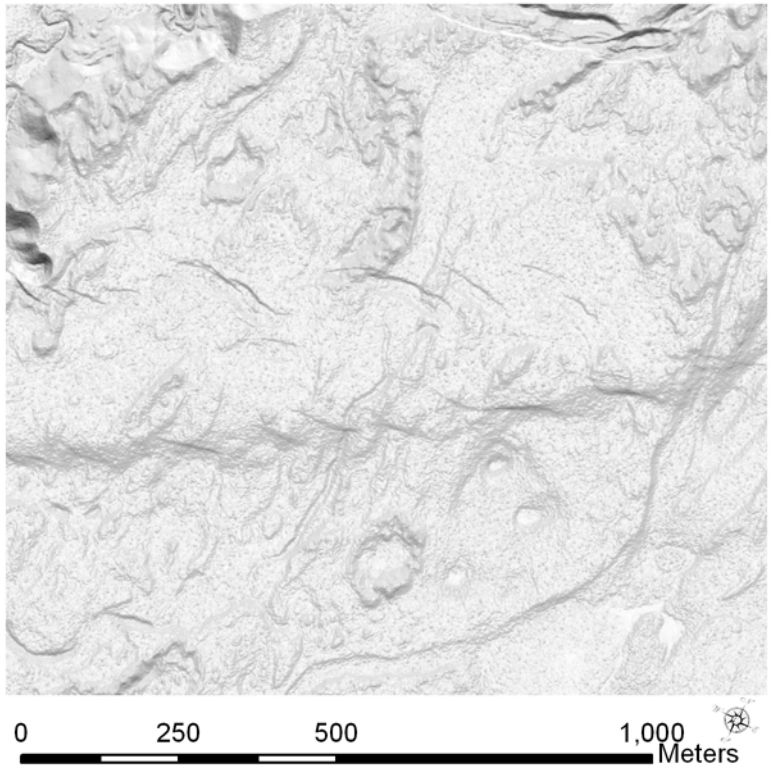


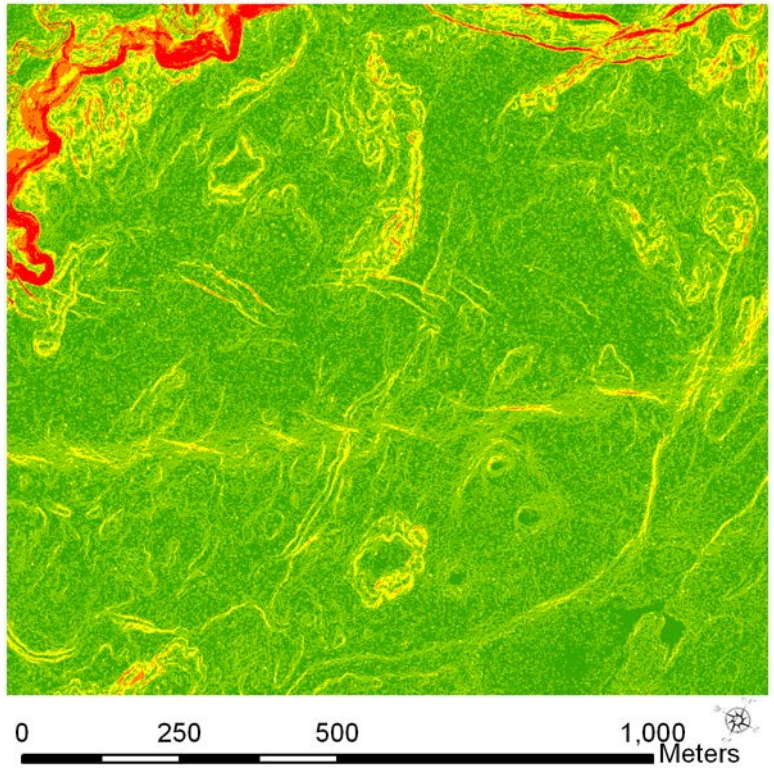
Koehler et al., 2016

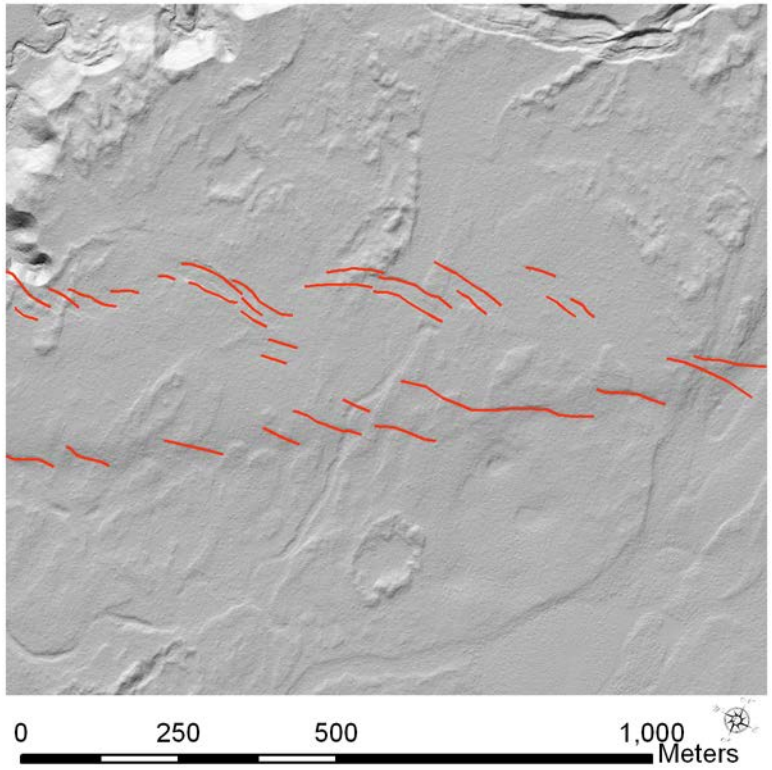
Castle Mountain fault scarps in the field

Castle Mountain fault

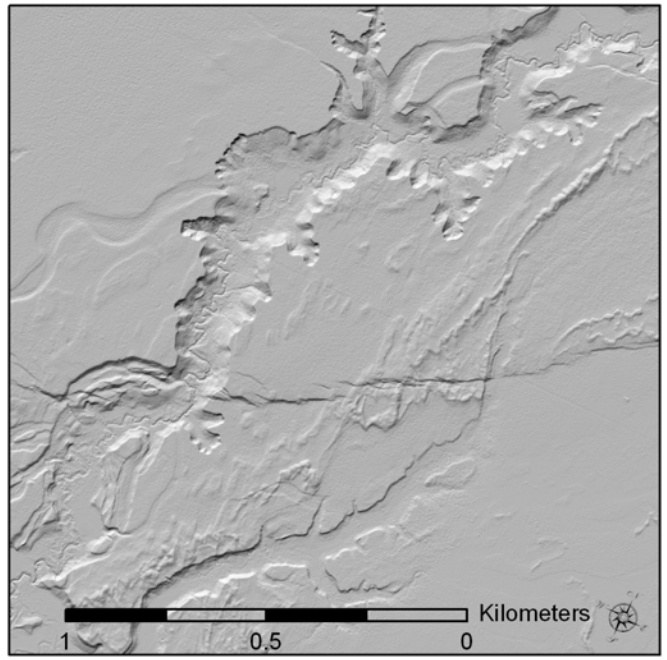








Koehler et al., 2016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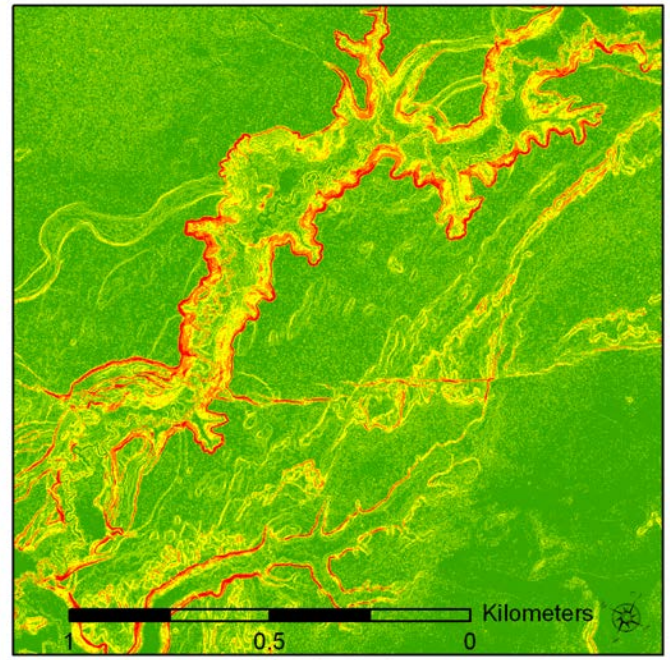
1
0,5
0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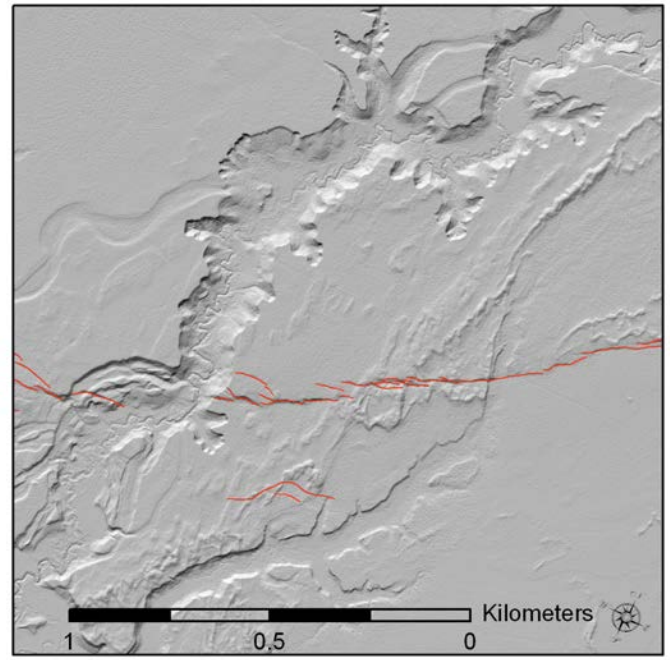
Kilometers
1
0,5
0


Kilometers
1
0.5
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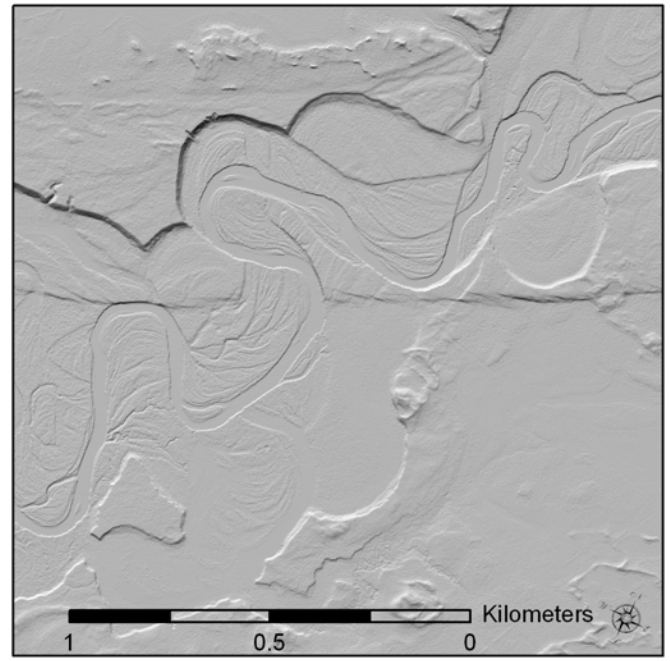
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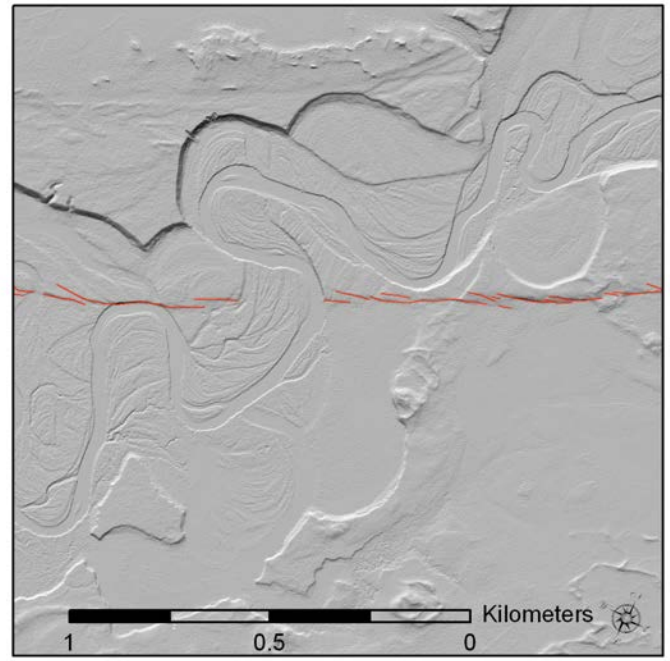
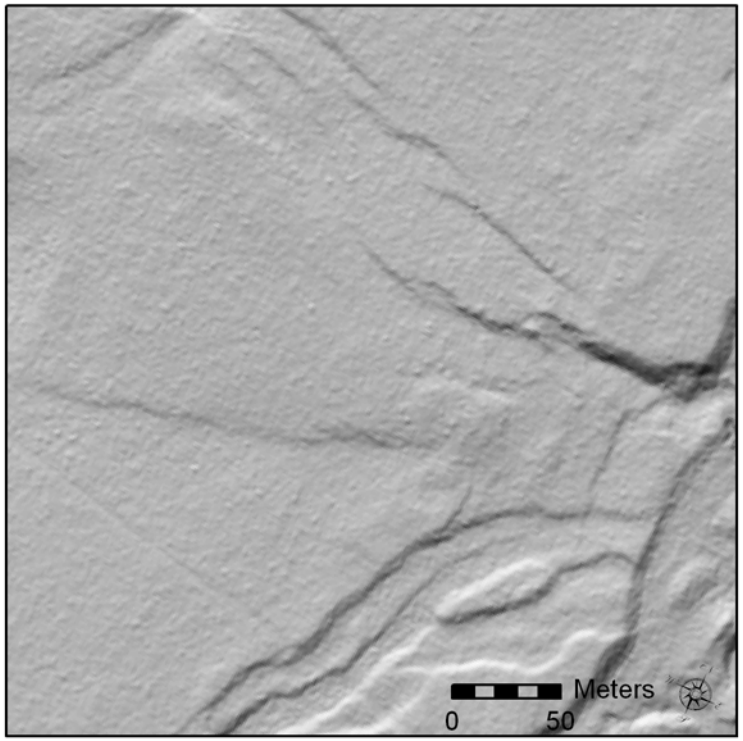
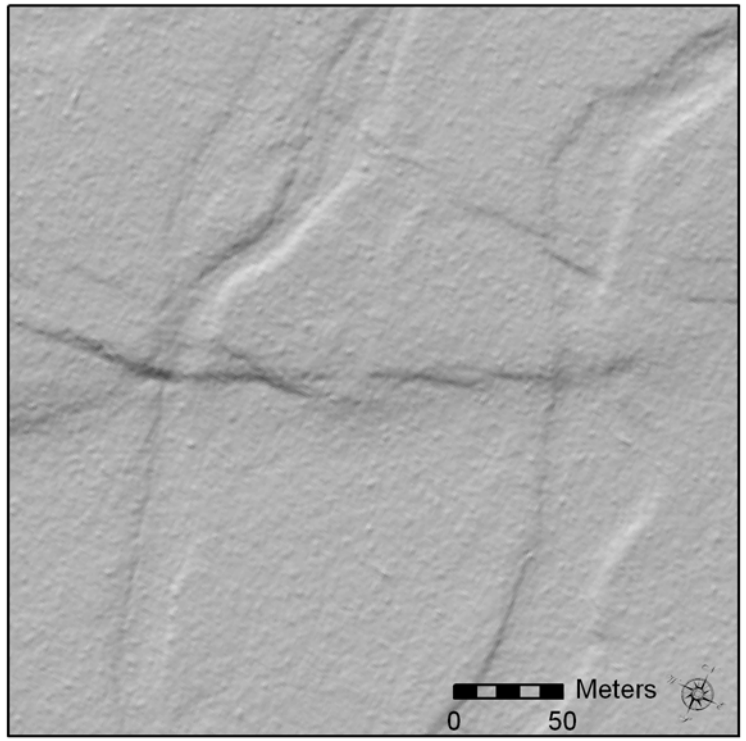
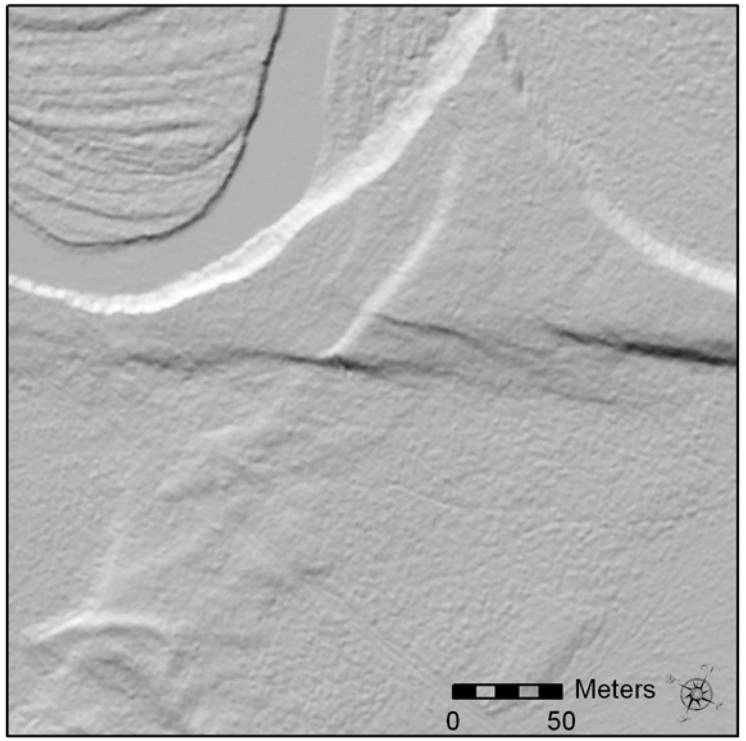

Kilometers
1
0.5
0

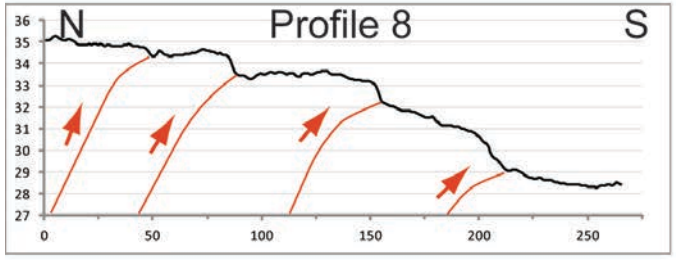
Large scale (1:3000) images of Castle Mountain fault scarps

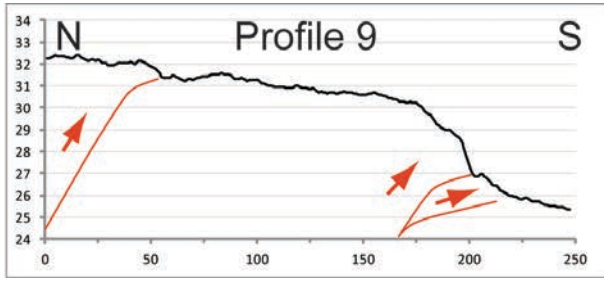


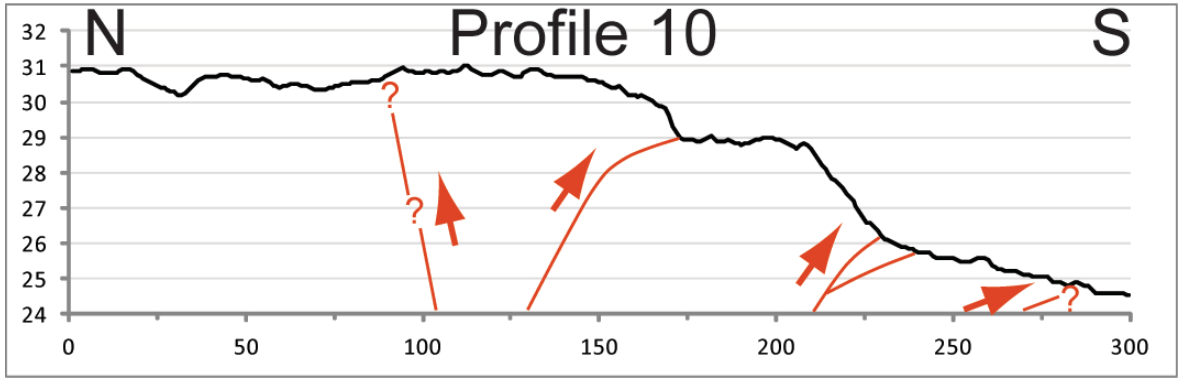


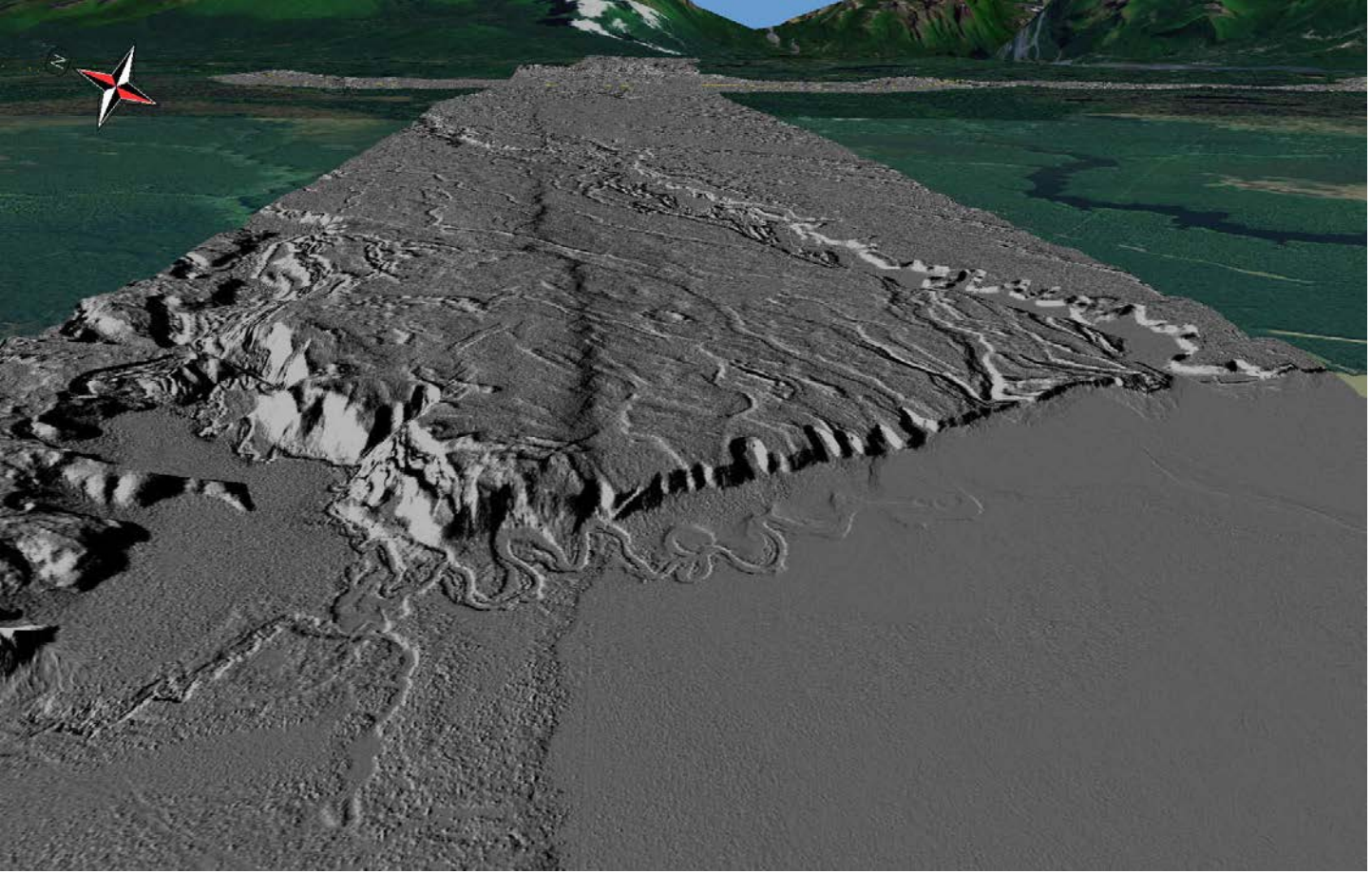


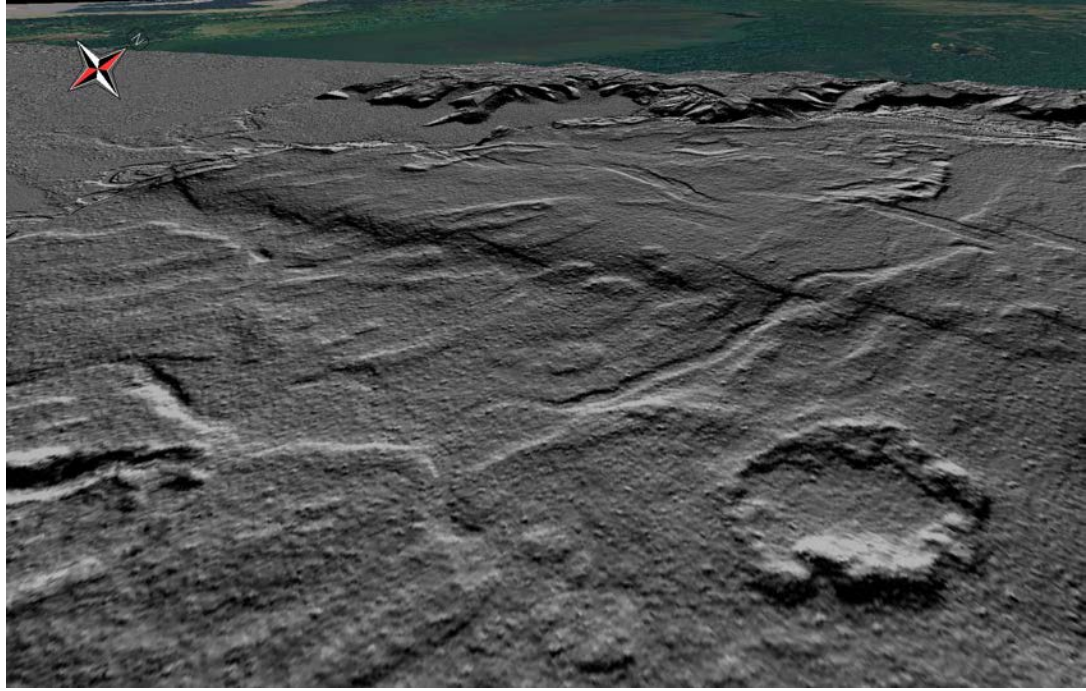
Typical topographic profiles across the Castle Mountain fault

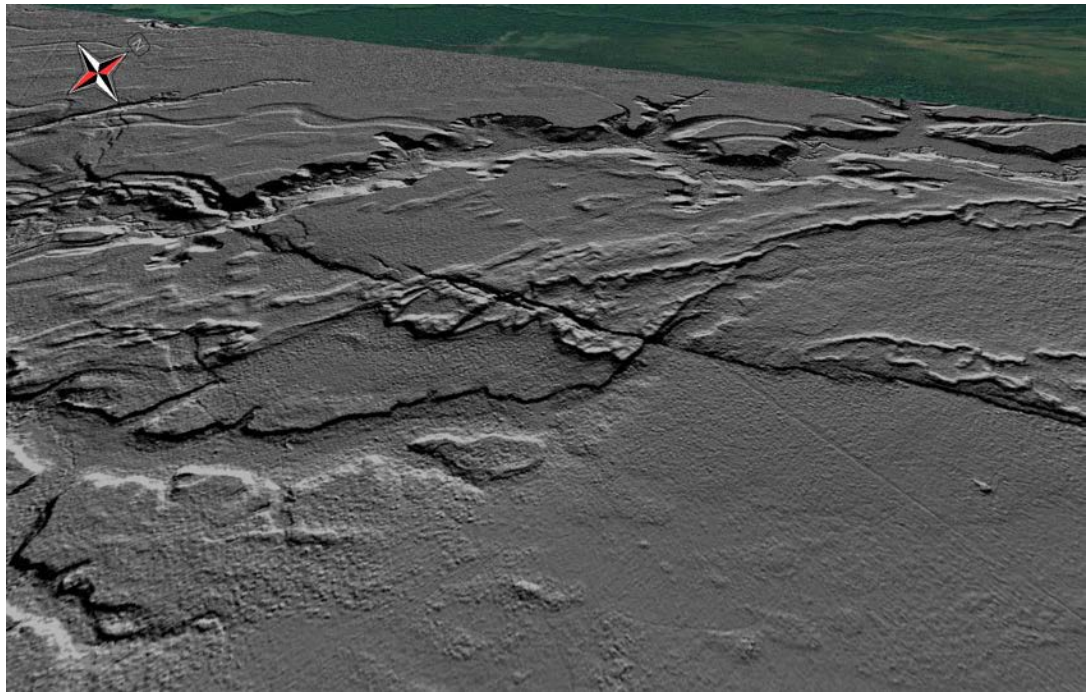






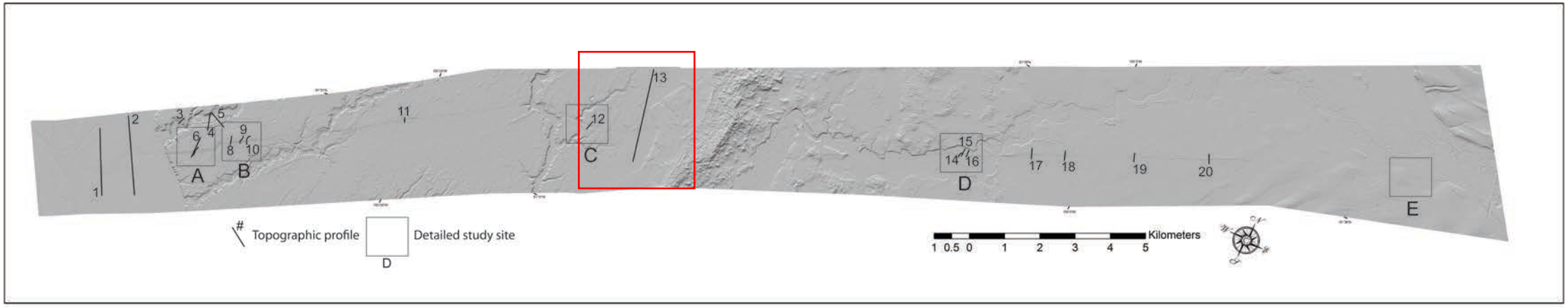


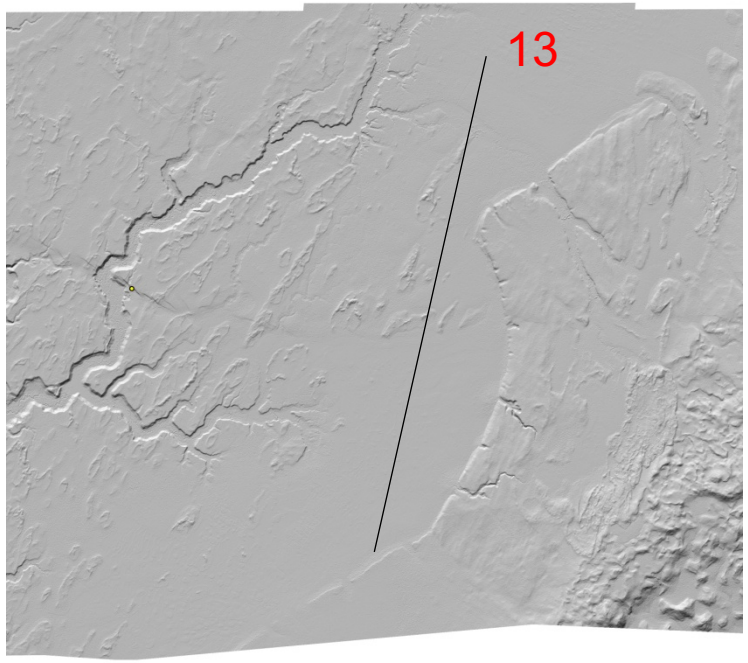


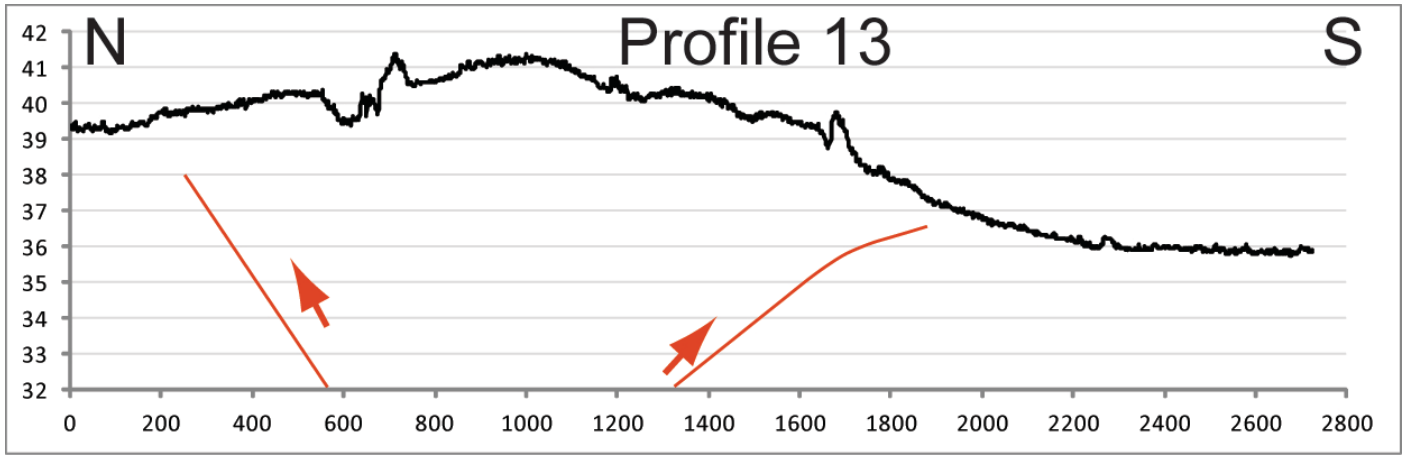


Oblique views of the Castle Mountain fault

Castle Mountain fault

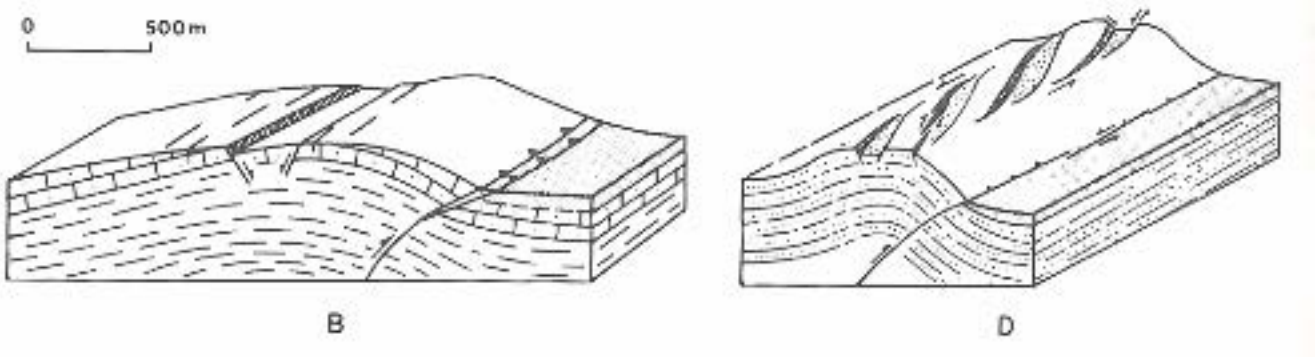




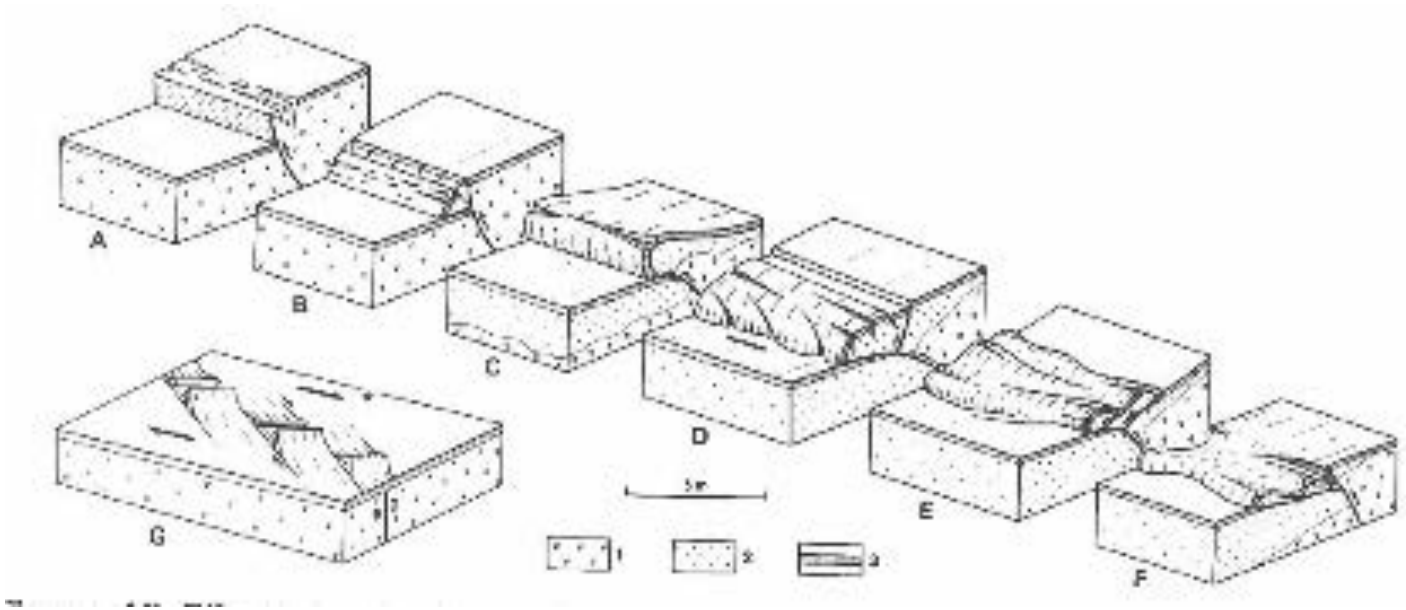


Broad fold within a step in the fault

Koehler et al., 2016



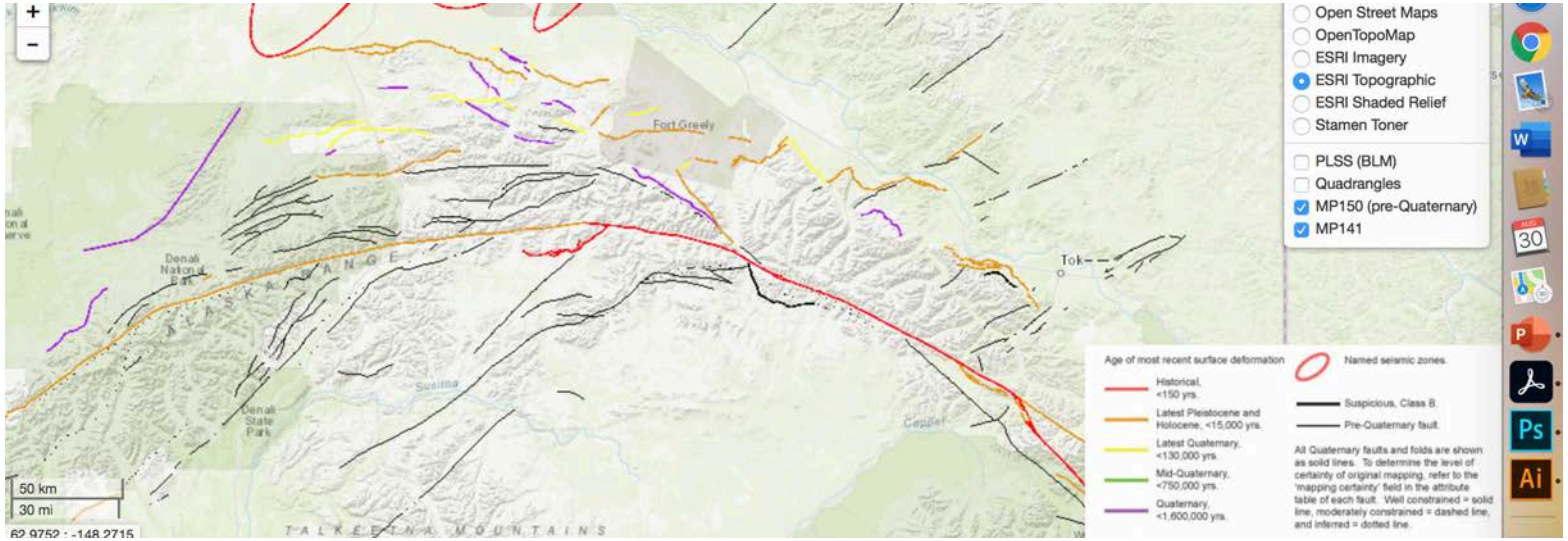
1980 El Asnam, Algeria
(Philip and Megharaoui, 1983)

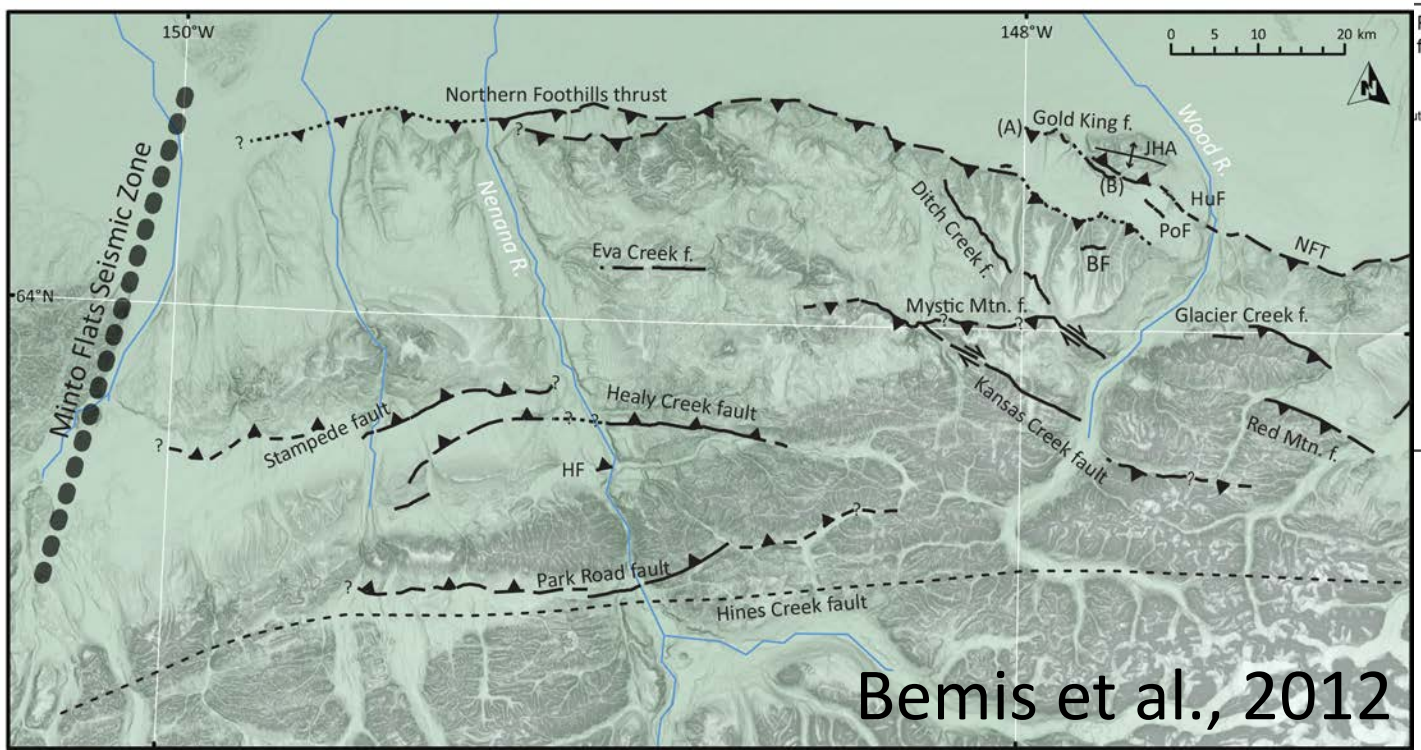


1988 Spitak fault, Armenia earthquake (Philip et al., 1992)

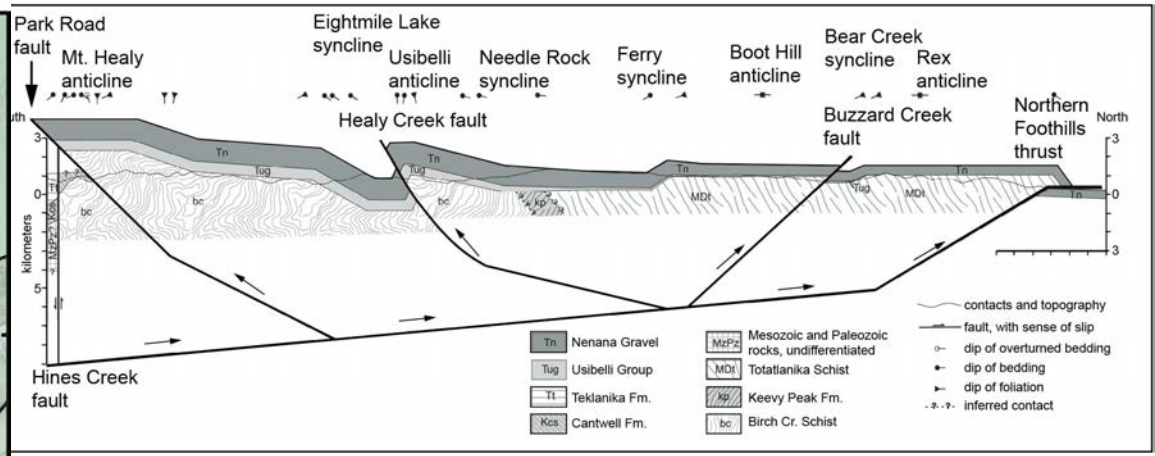
Ostler fault, New Zealand (NZ geological survey). Similarities include scarp morphology, hanging wall extension and folding, wrinkles in front of scarp, and occurrence of one late Holocene earthquake.

Northern Foothills Fold and Thrust Belt

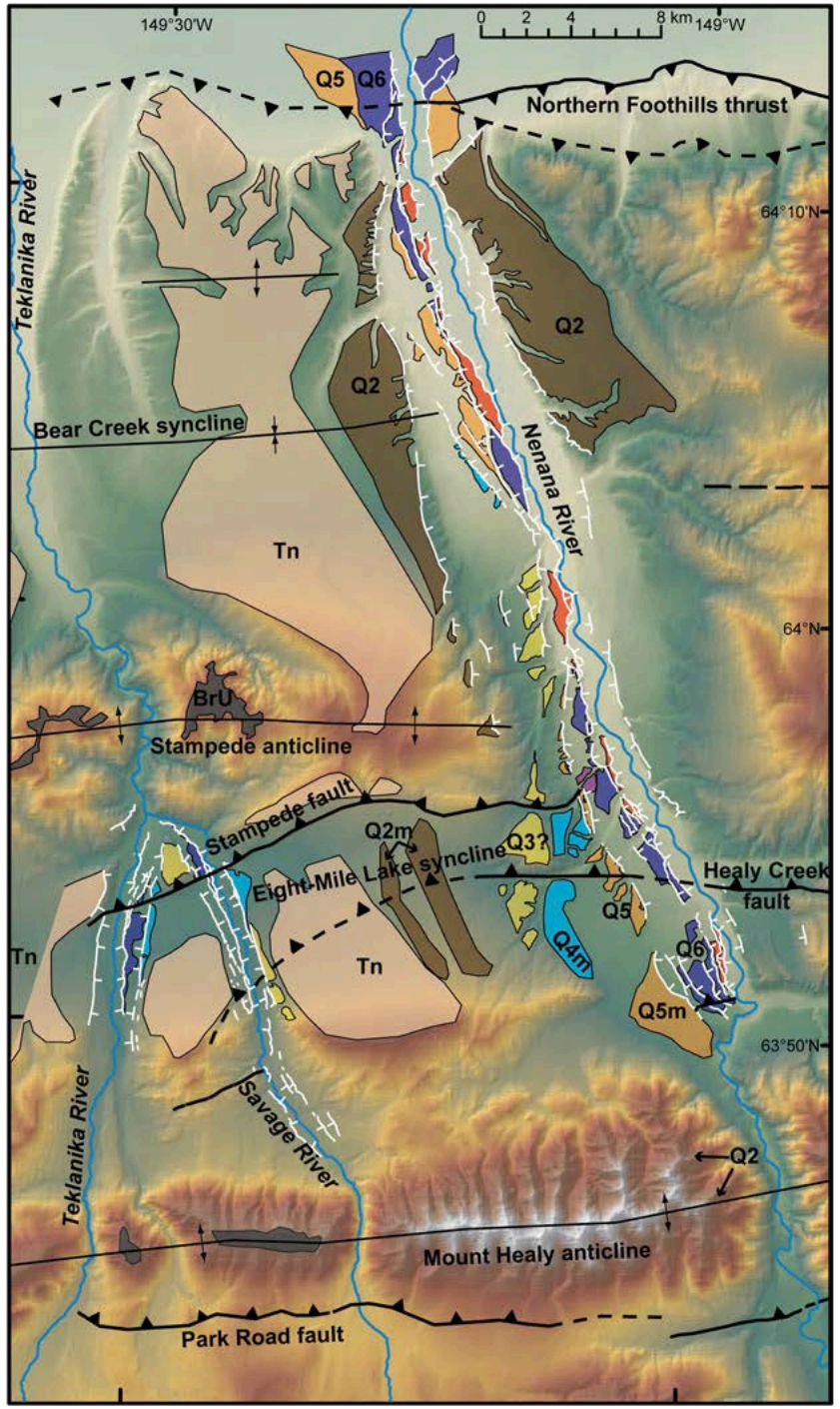


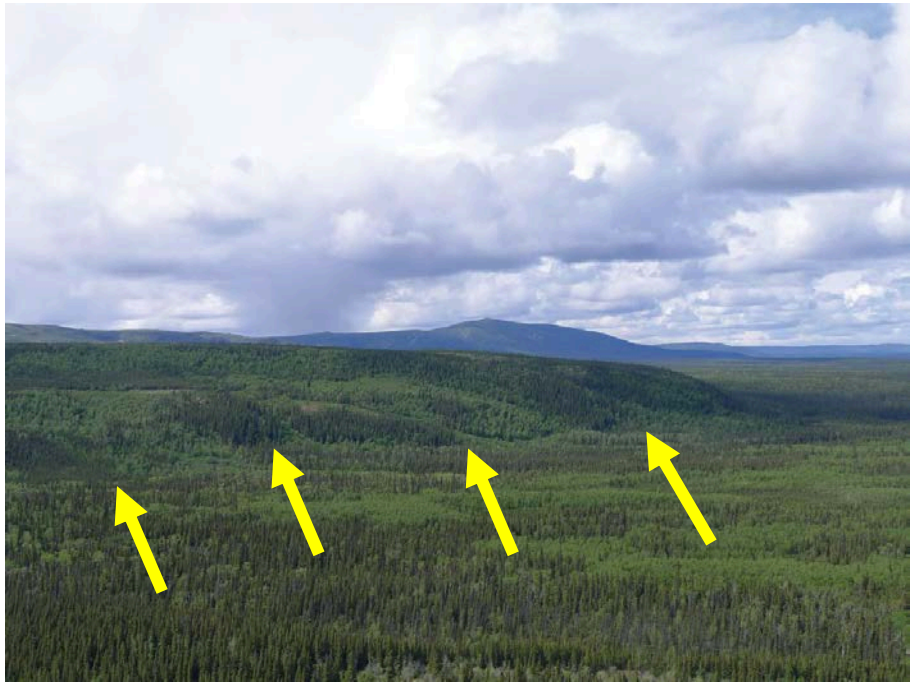


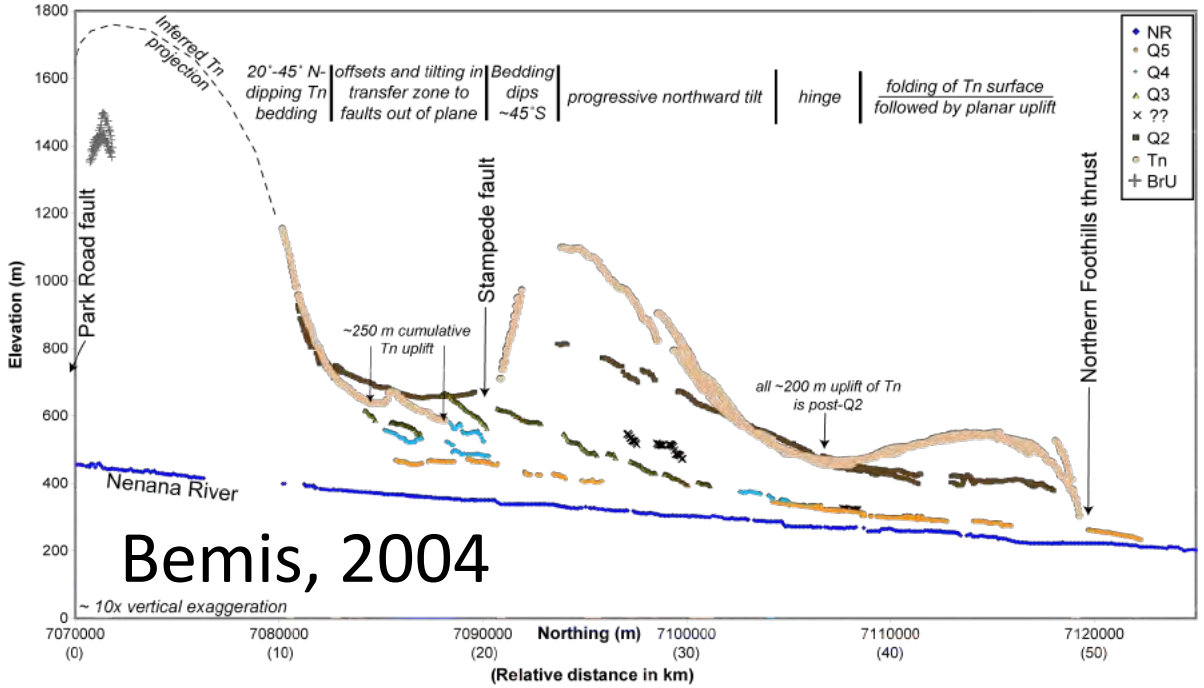
Bemis et al., 2012



Bemis and Wallace, 2007

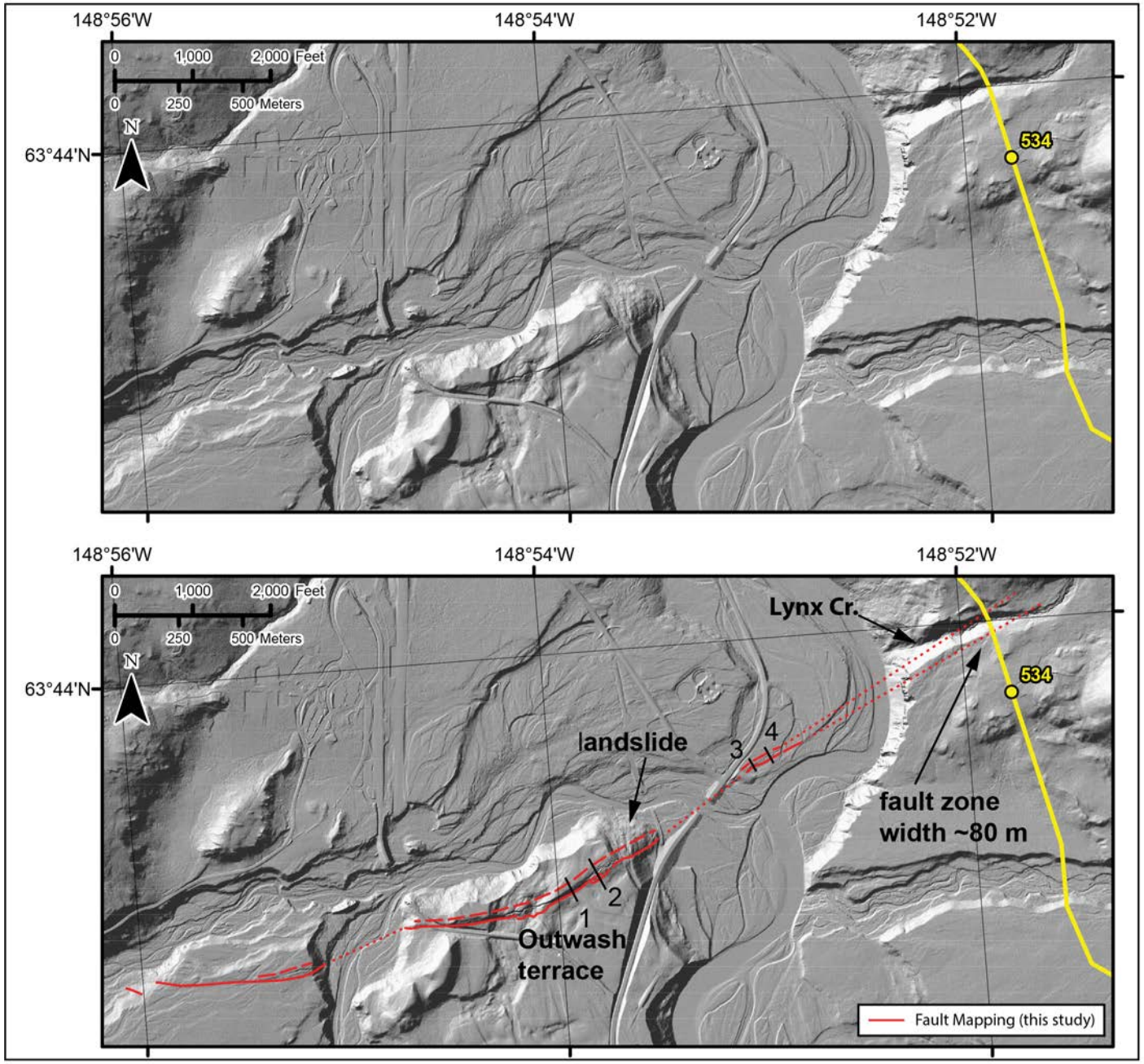

149°30'W
0 2 4 8 km
149°W
Q5
Q6
Northern Foothills thrust
Teklanika River
64°10'N
Q2
Q2
Bear Creek syncline
Nenana River
Tn
64°N
BrU
Stampede anticline
Stampede fault
Q2m
Q3?
Eight Mile Lake syncline
Healy Creek fault
Q5
Tn
Tn
Q4m
Q6
Q5m
63°50'N
Teklanika River
Savage River
Q2
Mount Healy anticline
Park Road fault

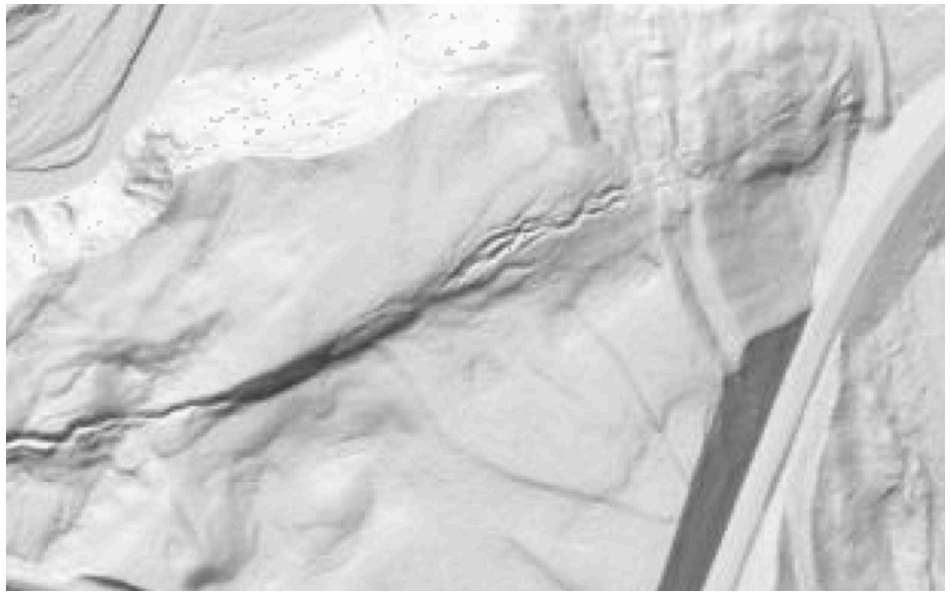



Inferred Tn projection
20°-45° N-dipping Tn bedding
offsets and tilting in transfer zone to faults out of plane
Bedding dips ~45°S
progressive northward tilt
hinge
folding of Tn surface followed by planar uplift
NR
Q5
Q4
Q3
??
Q2
Tn
BrU
Park Road fault
Stampede fault
Northern Foothills thrust
~250 m cumulative Tn uplift
all ~200 m uplift of Tn is post-Q2
Nenana River
~ 10x vertical exaggeration
Elevation (m)
1800
1600
1400
1200
1000
800
600
400
200
0
7070000 (0)
7080000 (10)
7090000 (20)
Northing (m)
7100000 (30)
7110000 (40)
7120000 (50)
(Relative distance in km)

Bemis, 2004

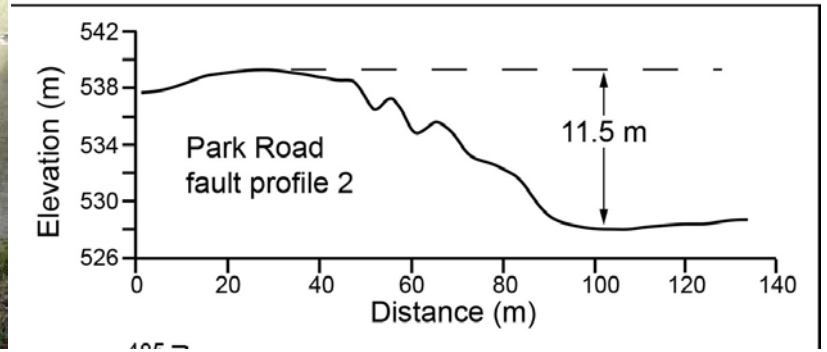
Park Road fault

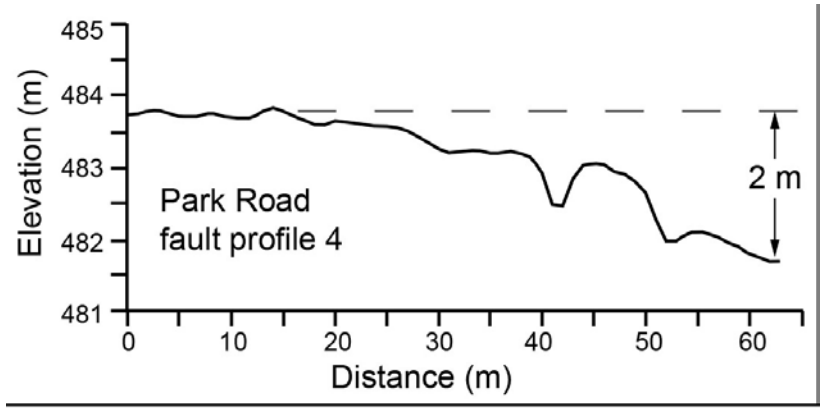


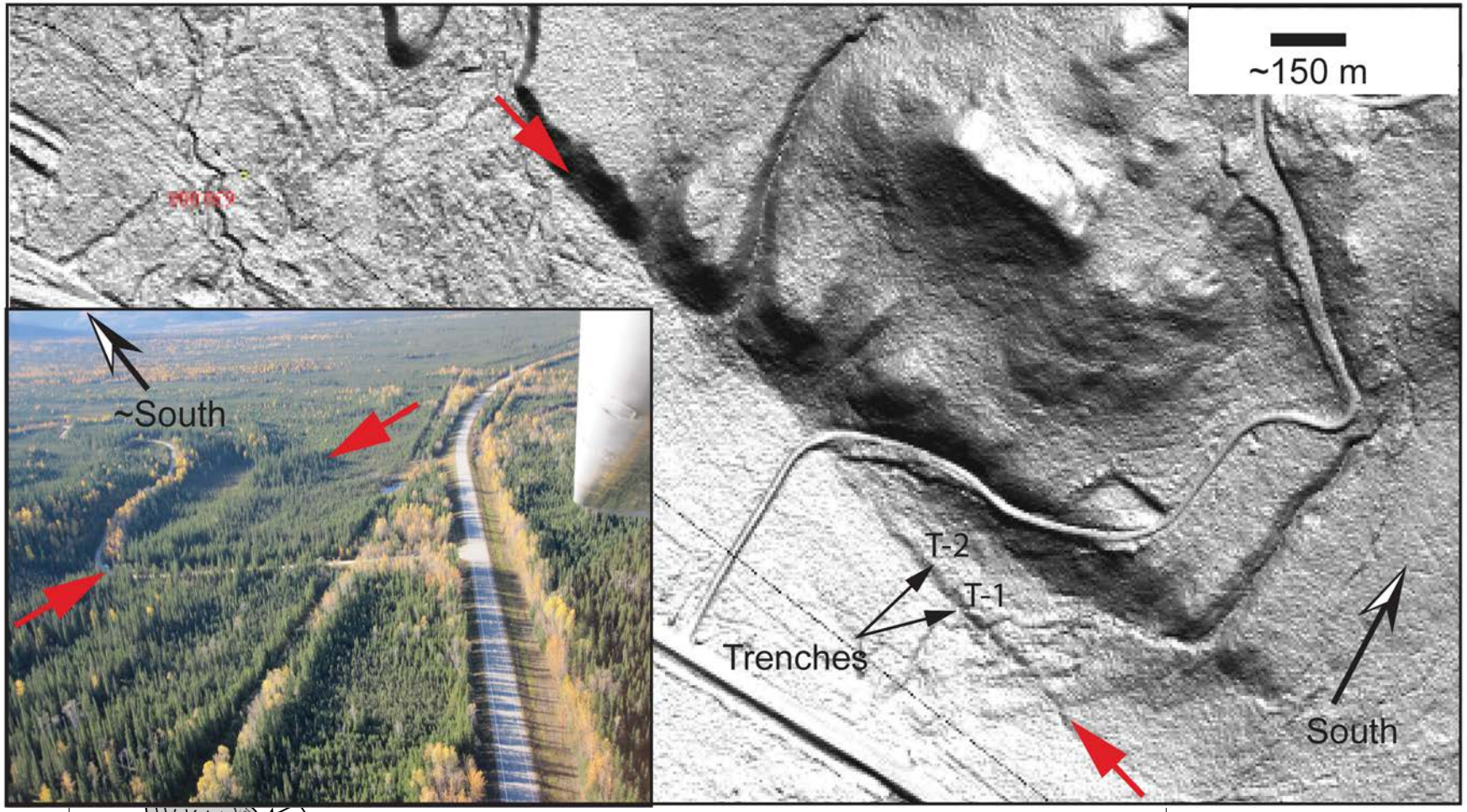


Koehler et al., 2016

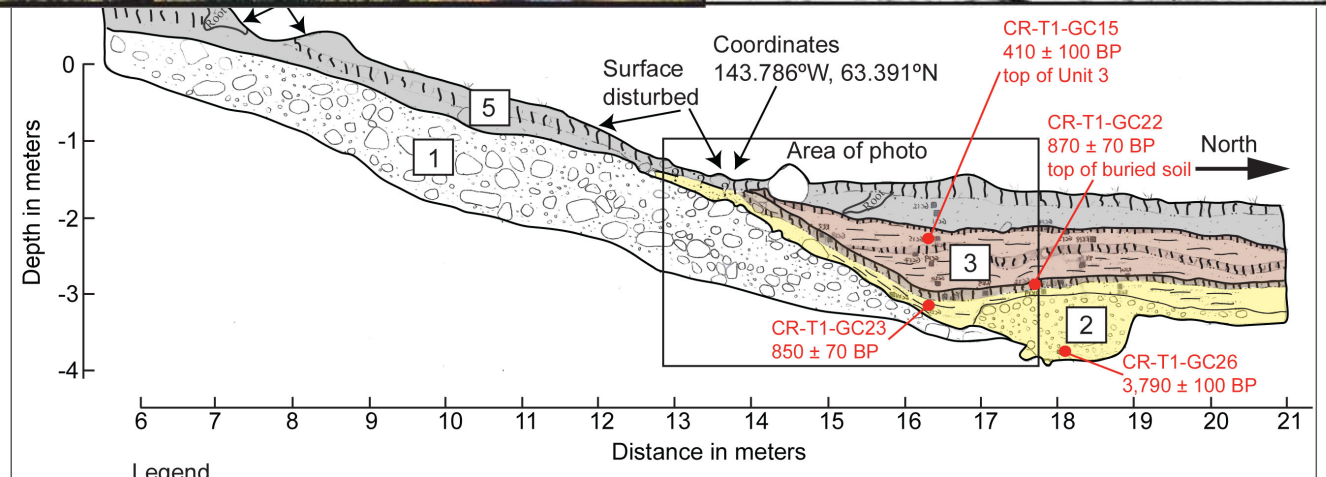
Field photos and profiles, Park Road fault



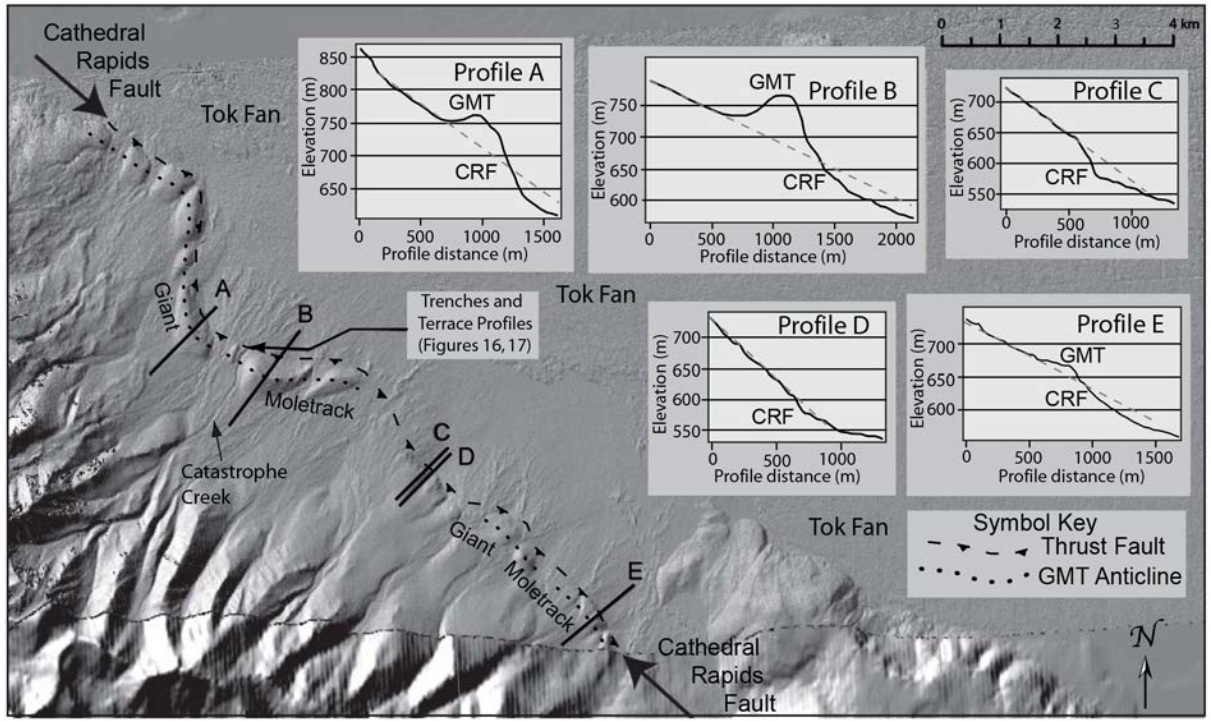


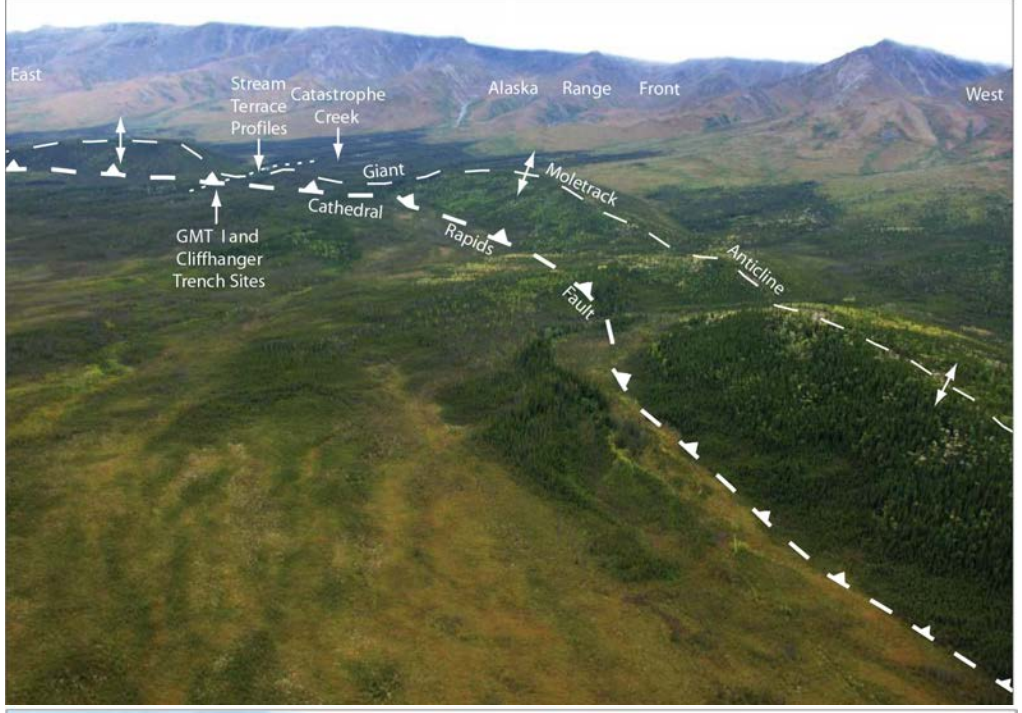


Cathedral Rapids fault

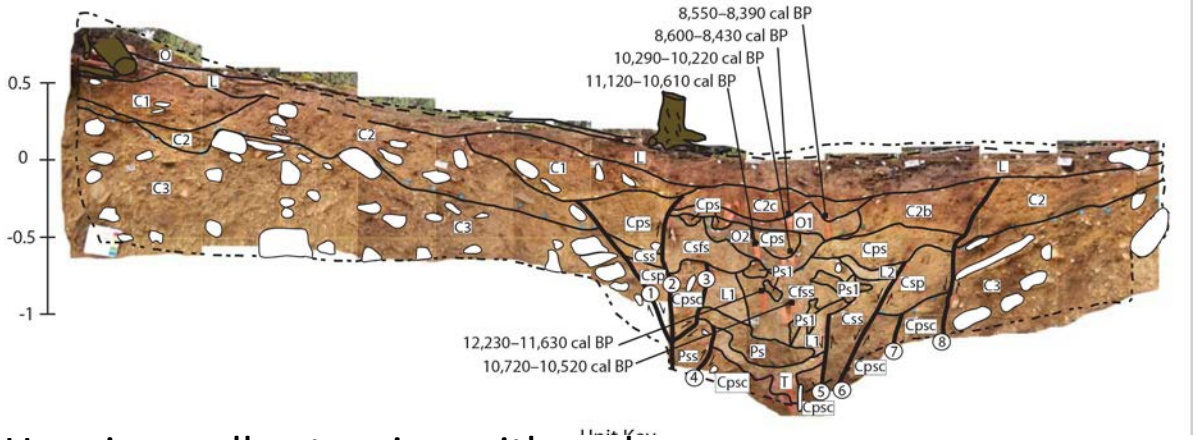


Koehler and Woods, 2013





Cathedral Rapids fault



Hanging wall extension with graben

Carver et al., 2010