Graphics for core-complex morphology and geologic continuous casting

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Arizona Geological Survey
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version 1.0

Some relevant citations:

Spencer, J.E., 1999, Geologic continuous casting below continental and deep-sea detachment faults and at the striated extrusion of Sacsayhuamán, Peru: Geology, v. 27, p. 327-330.

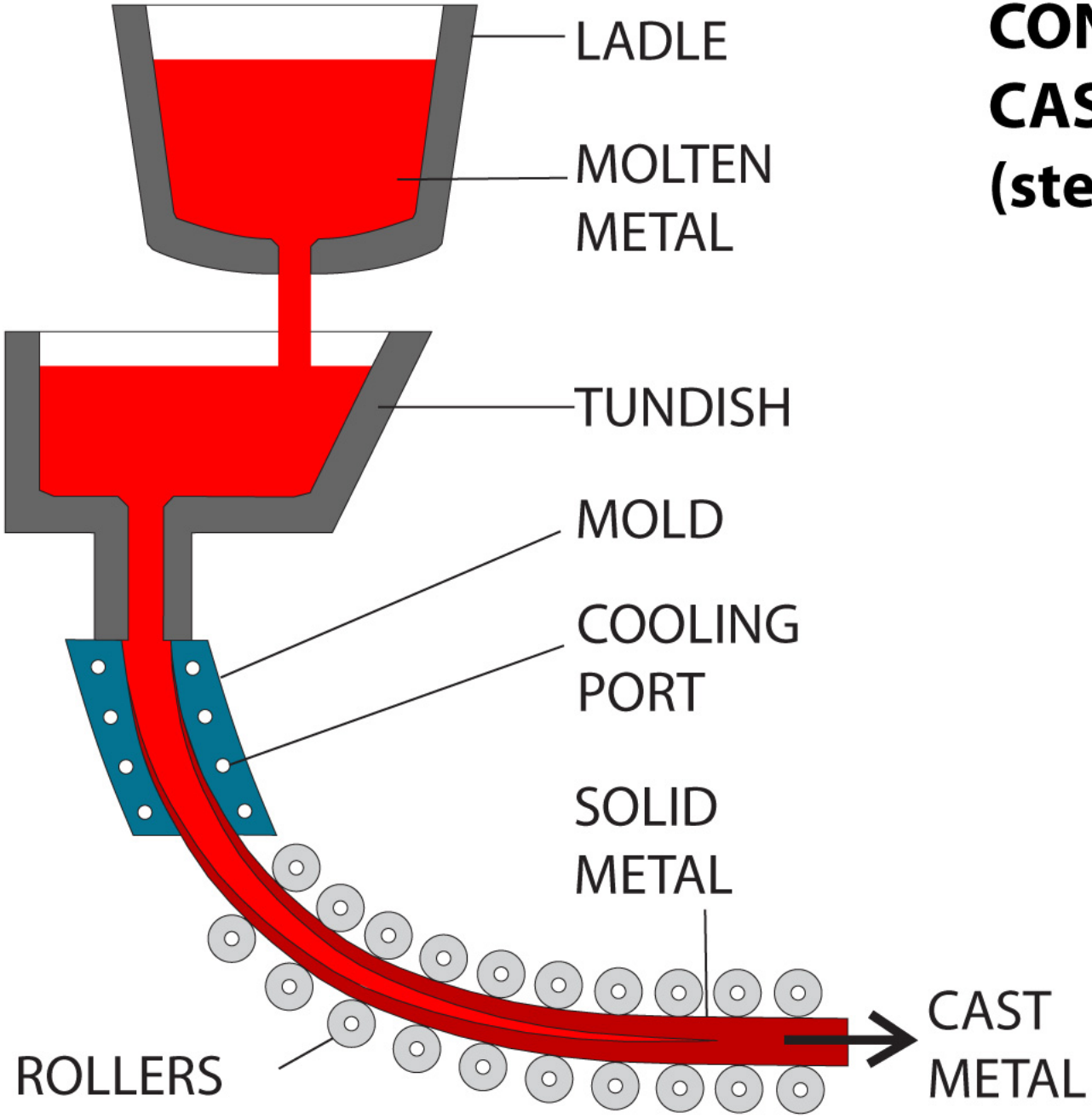
Spencer, J.E., 2000, Possible origin and significance of extension-parallel drainages in Arizona's metamorphic core complexes: Geological Society of America Bulletin, v. 112, p. 727-735.

Spencer, J.E., 2001, Possible giant metamorphic core complex at the center of Artemis Corona, Venus: Geological Society of America Bulletin, v. 113, p. 333-345.

Spencer, J.E., and Ohara, Y., 2008, Magmatic and tectonic continuous casting in the circum-Pacific region, *in* Spencer, J.E., and Titley, S.R., eds., Ores and orogenesis: Circum-Pacific tectonics, geologic evolution, and ore deposits: Arizona Geological Society Digest 22, p. 31-53.

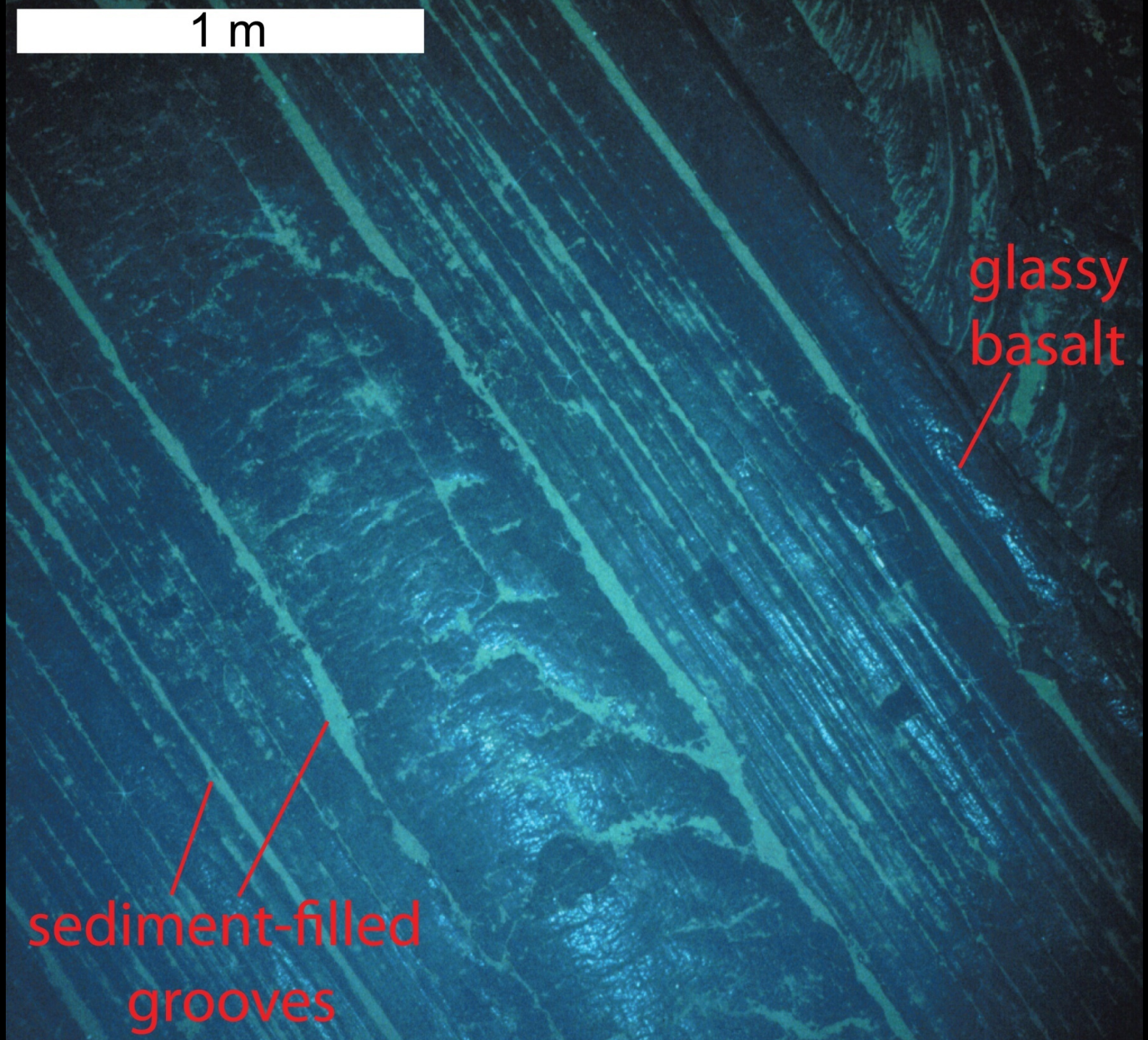
The essential process in continuous casting is cooling and solidification of the cast medium during heat loss across a slip surface followed by extrusion from a mold.

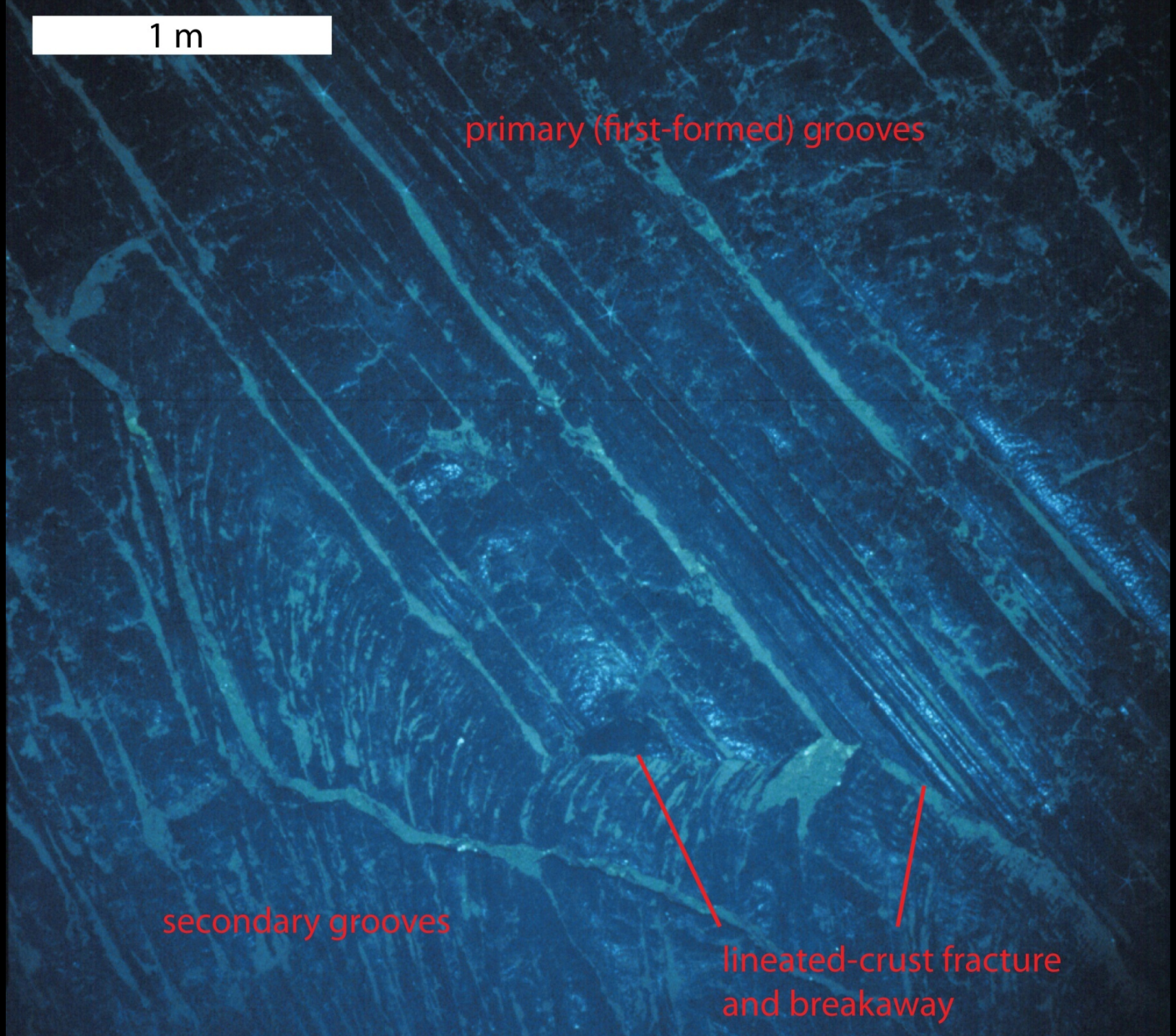
CONTINUOUS CASTER (steel)

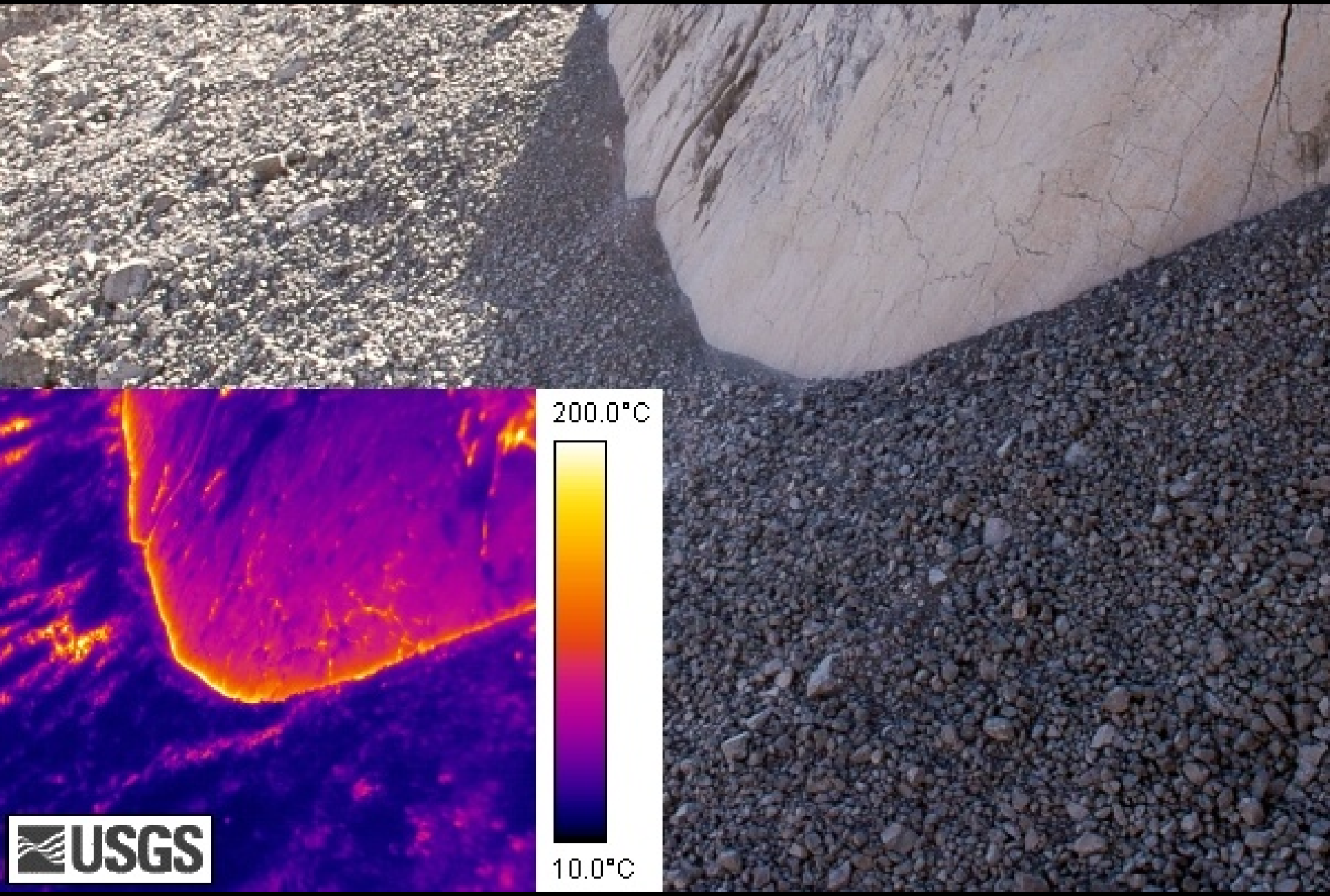


AZGS

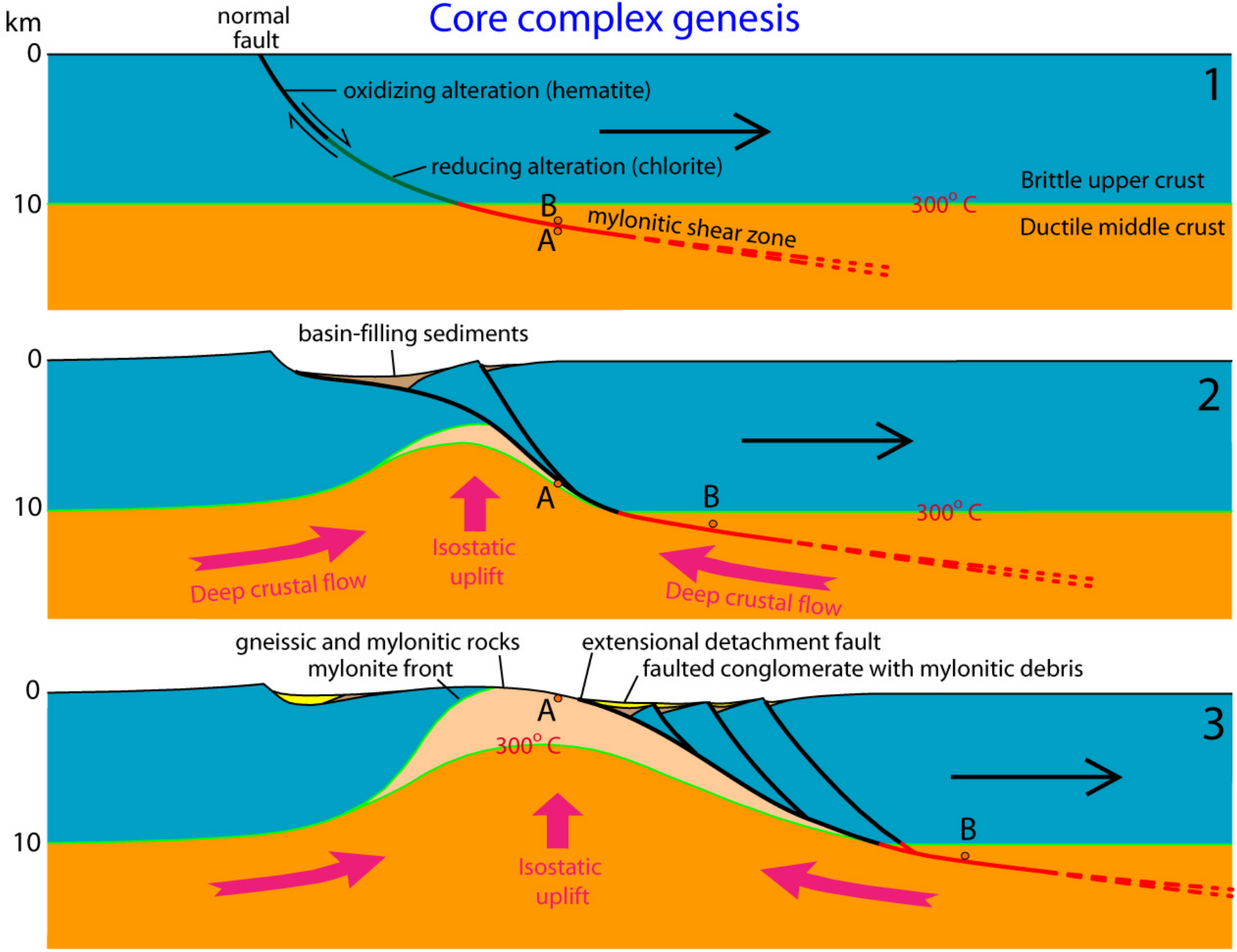
1 cm

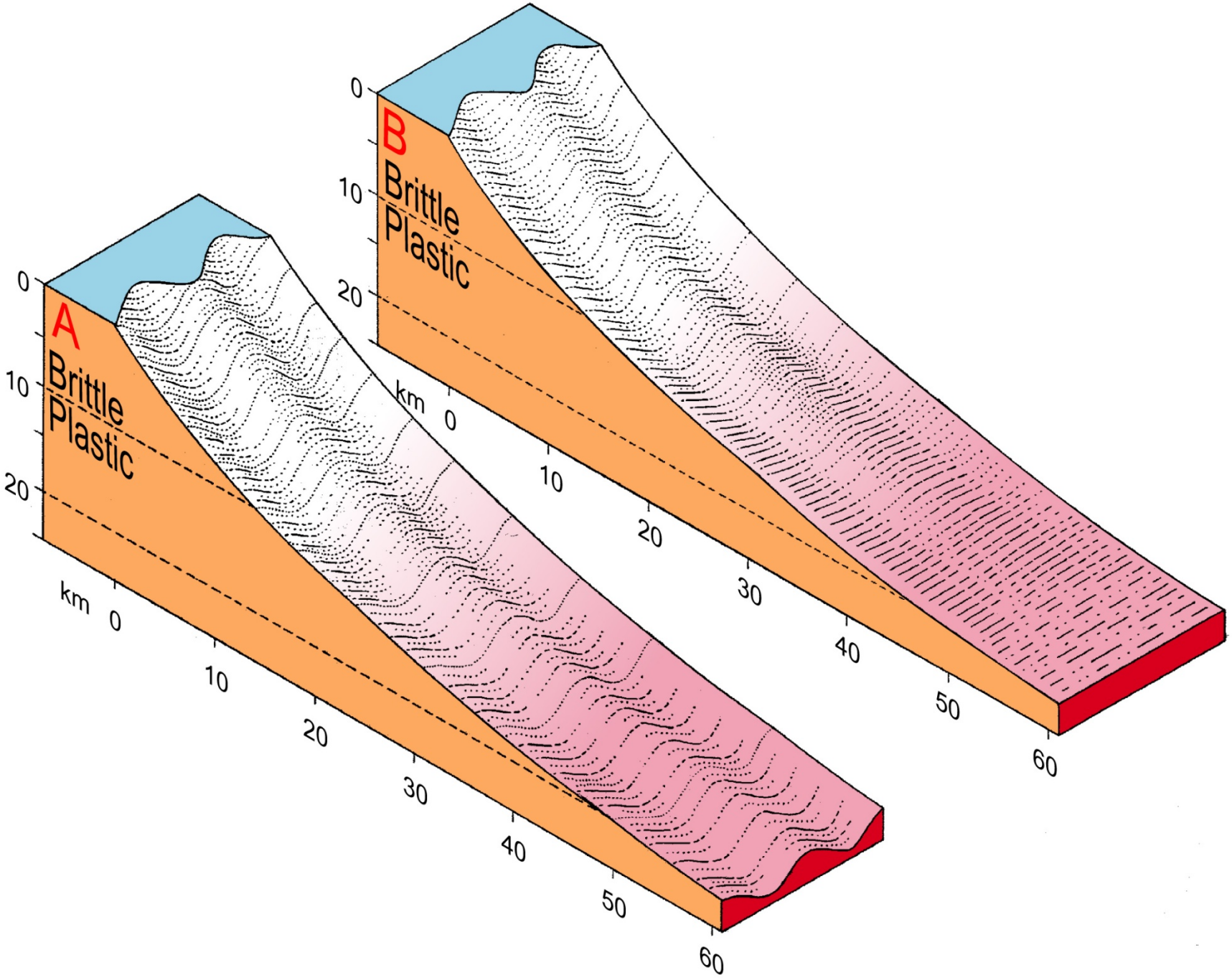

1 m
glassy basalt
sediment-filled grooves

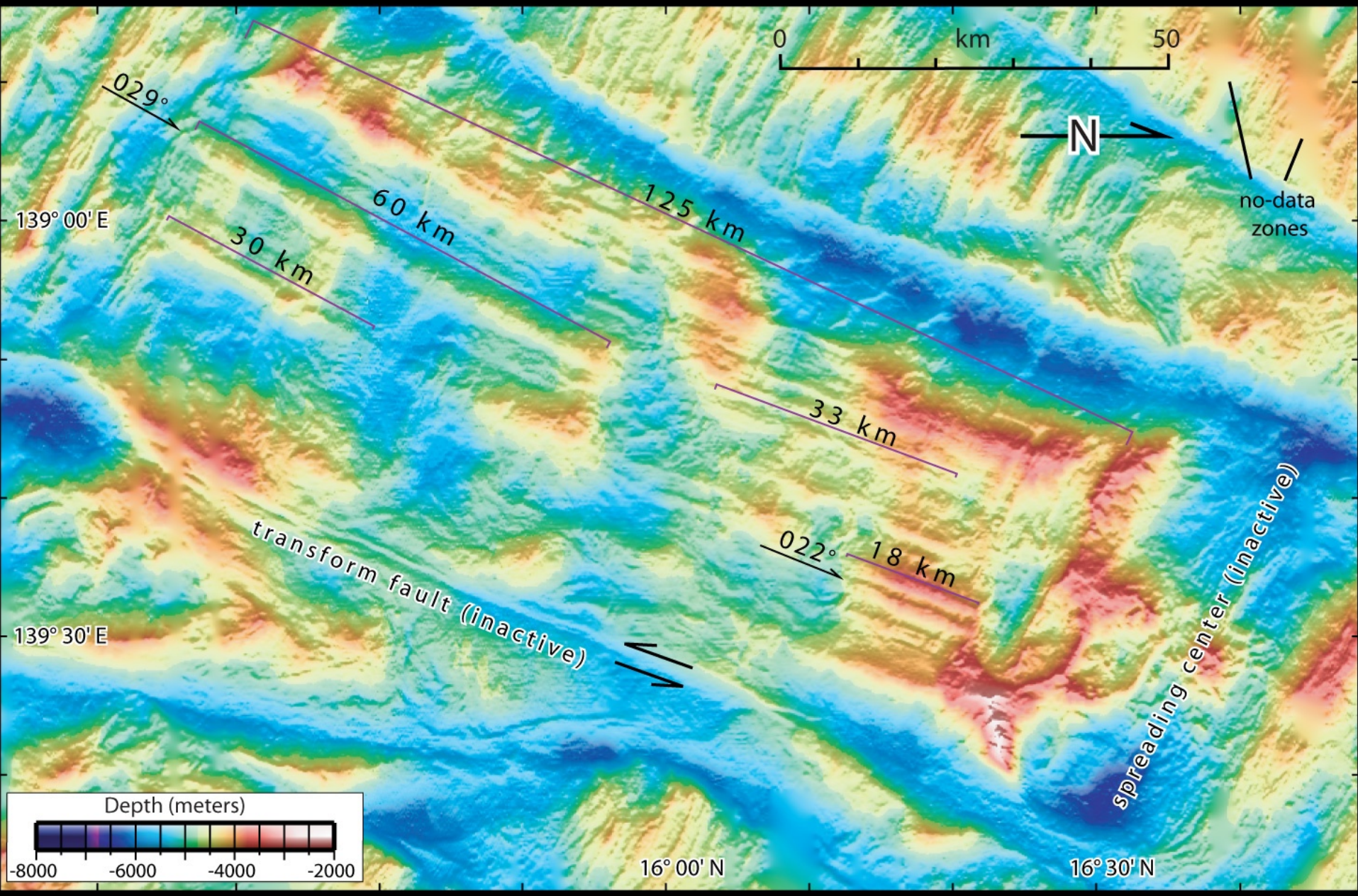

1 m
primary (first-formed) grooves
secondary grooves
lineated-crust fracture
and breakaway

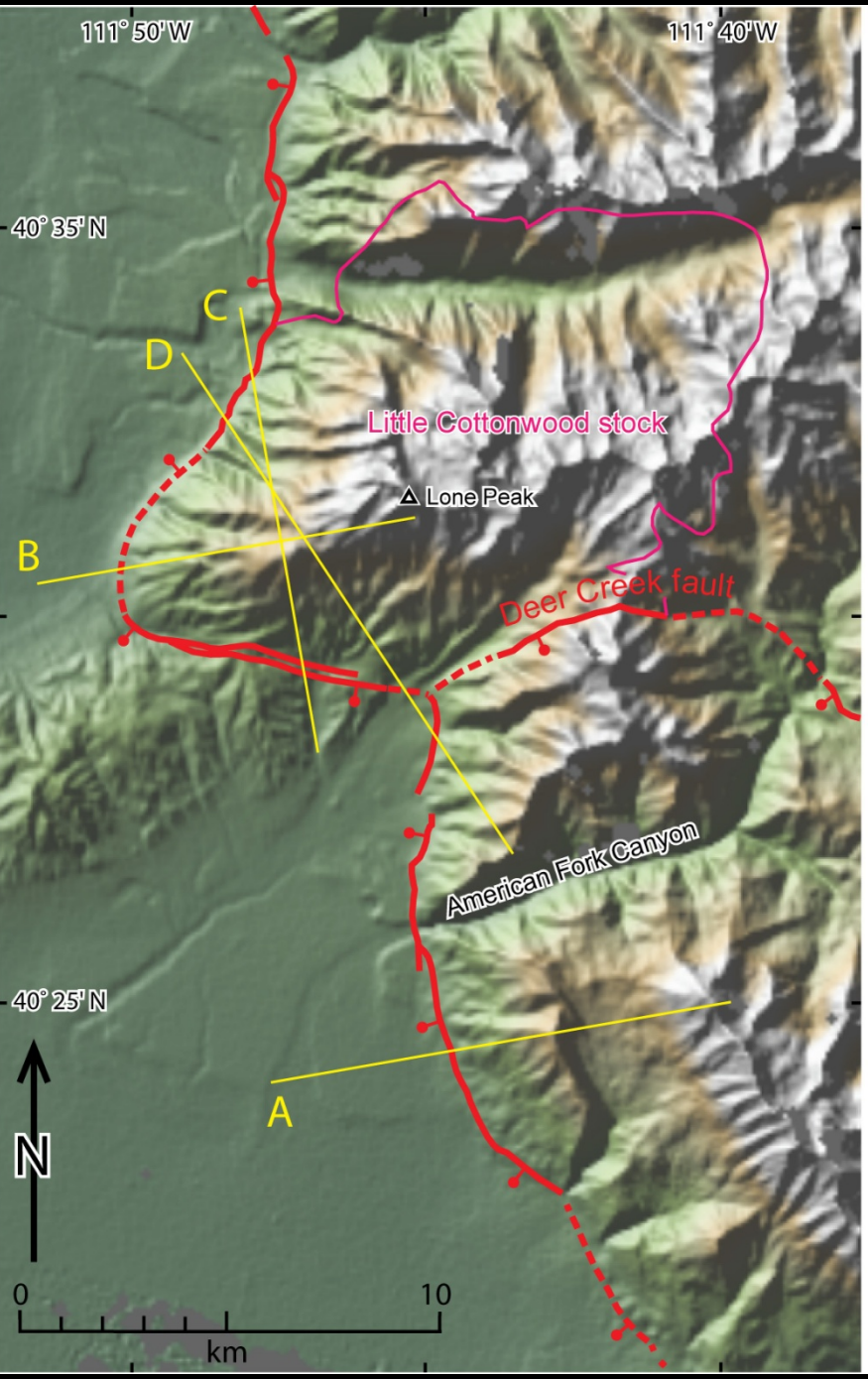

200.0°C
10.0°C
USGS

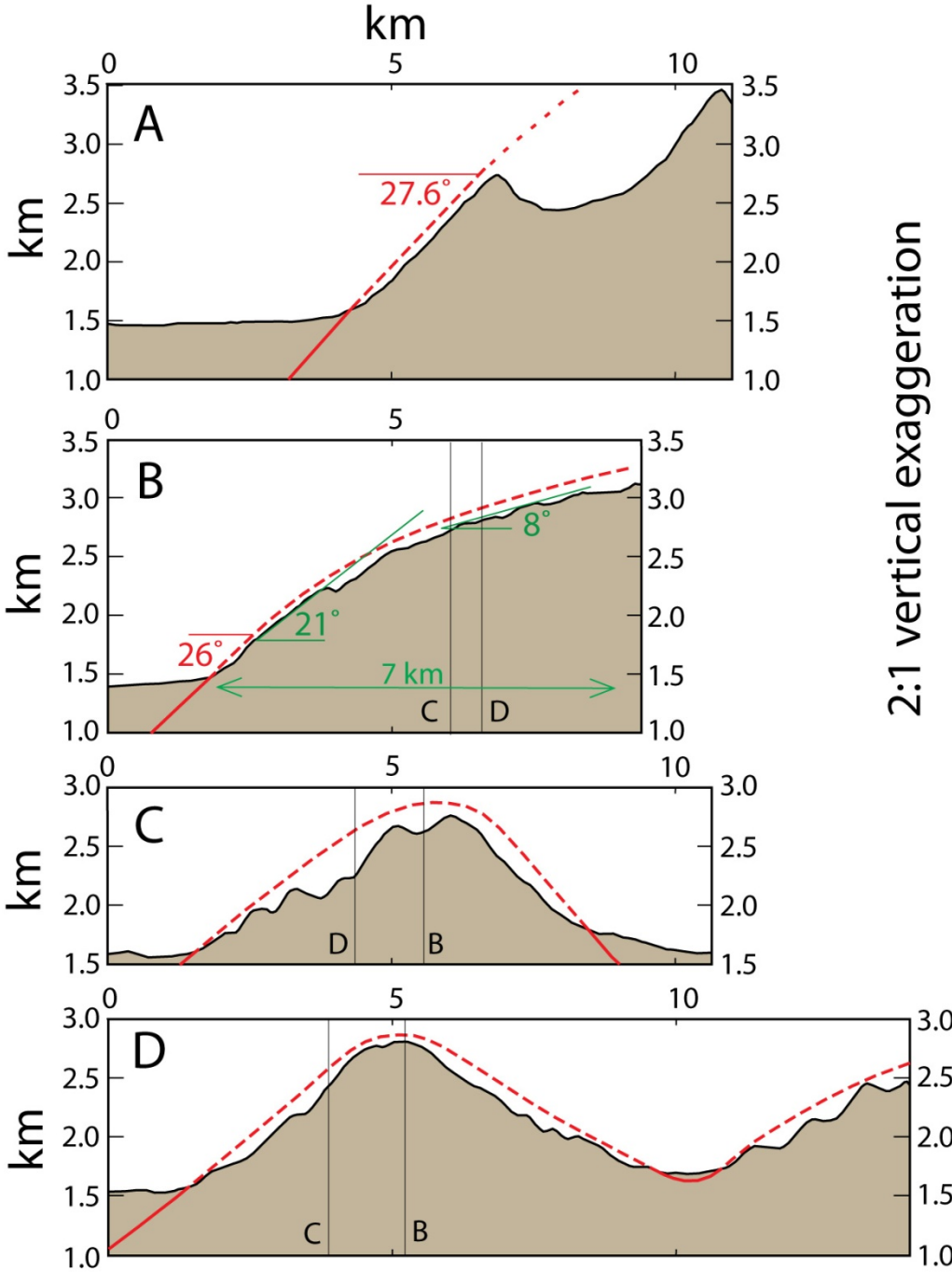
Core complex genesis

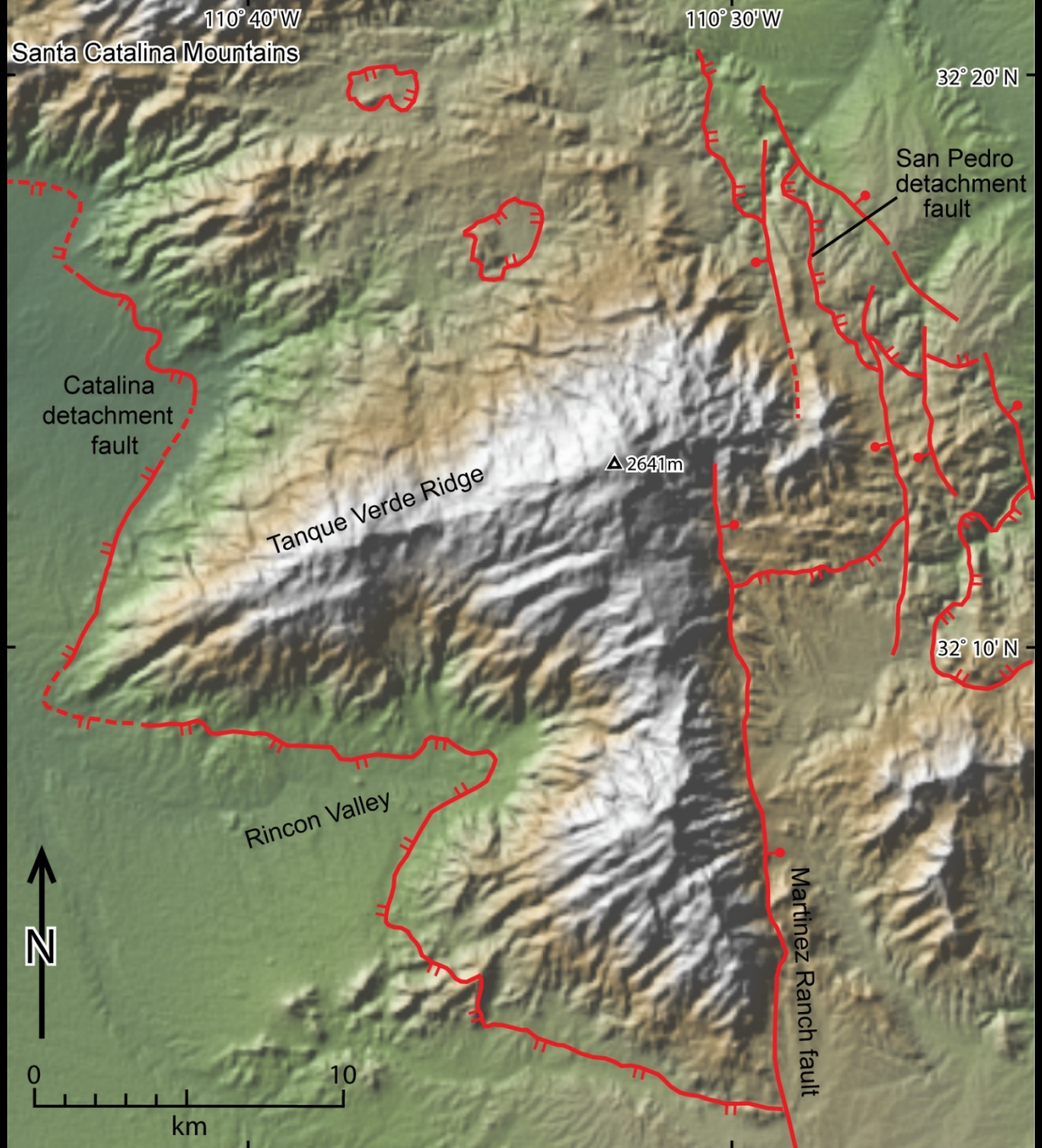


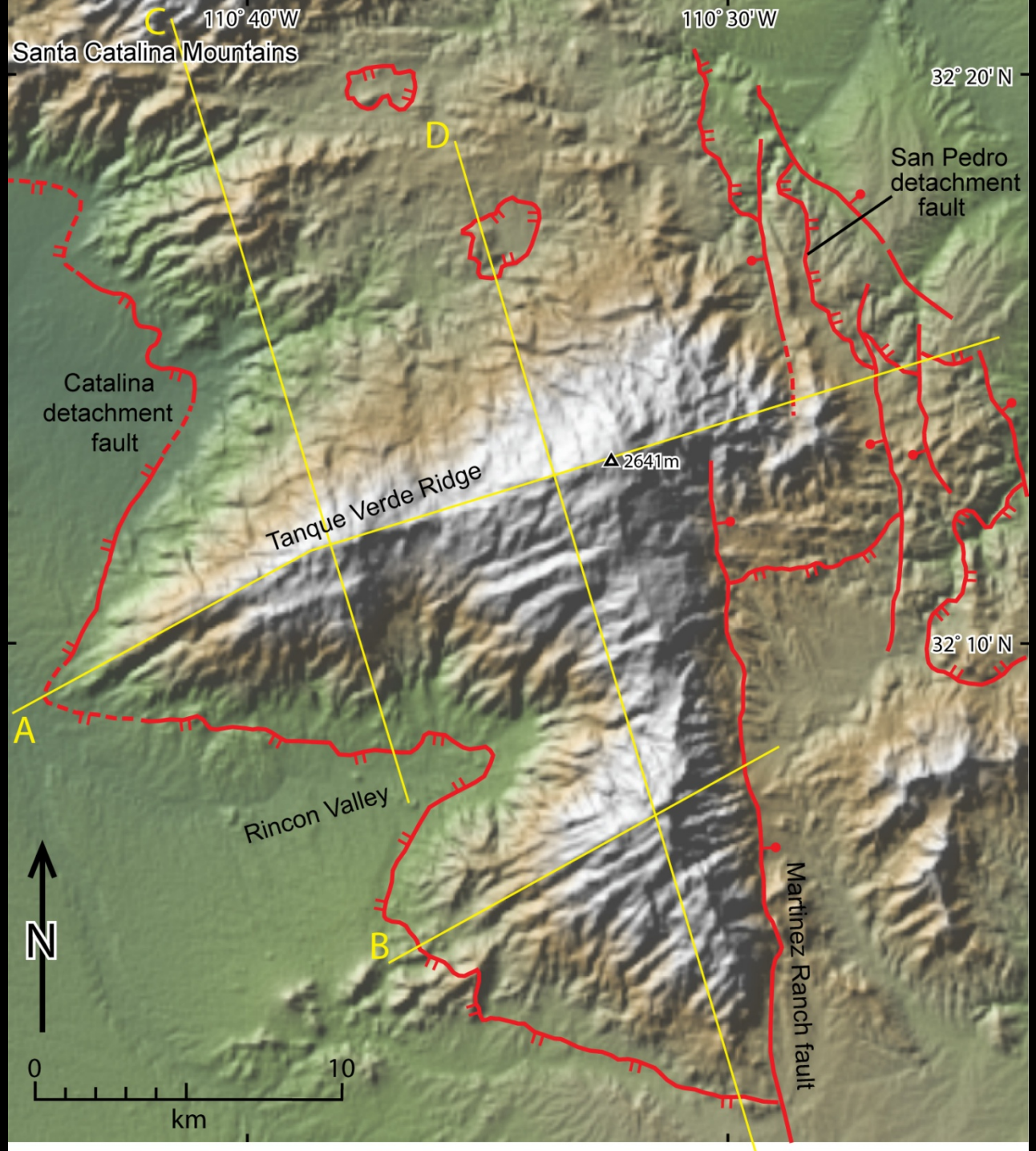

A
Brittle
Plastic
0
10
20
km
0
10
20
30
40
50
60
B
Brittle
Plastic
0
10
20
km
0
10
20
30
40
50
60

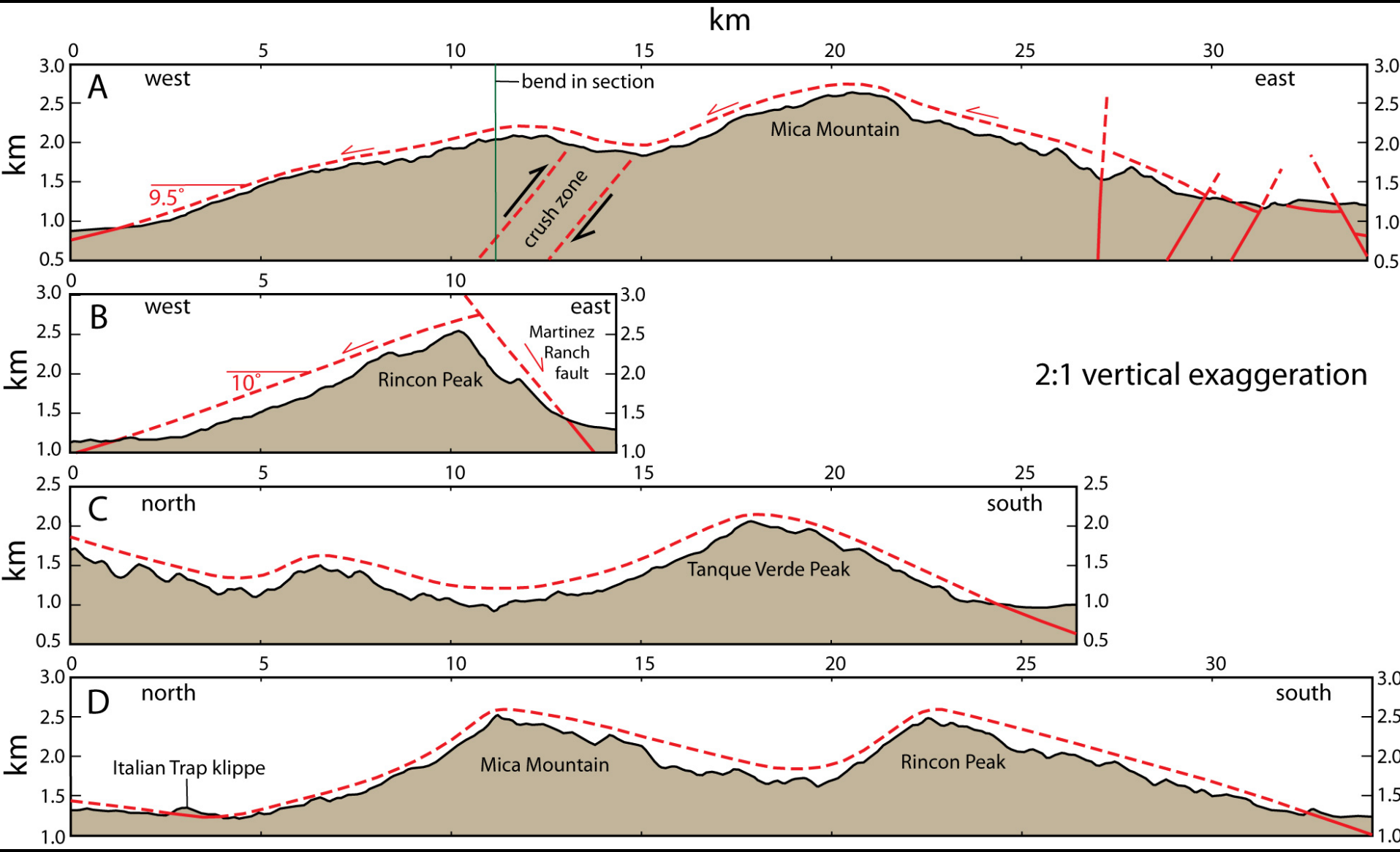

0
km
50
N
no-data
zones
029°
125 km
60 km
30 km
33 km
022°
18 km
transform fault (inactive)
spreading center (inactive)
139° 00' E
139° 30' E
16° 00' N
16° 30' N
Depth (meters)
-8000
-6000
-4000
-2000

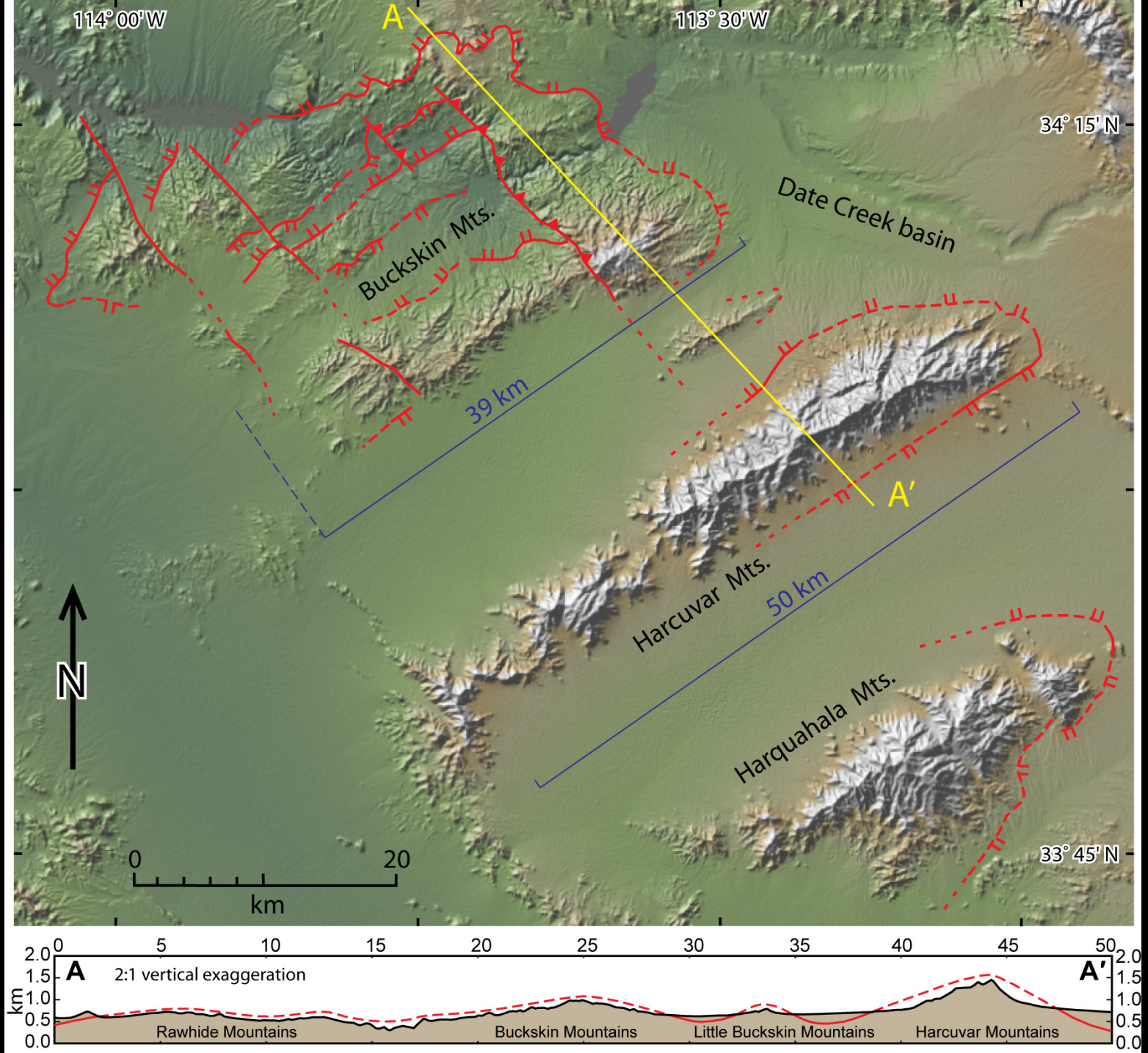

111° 50' W
111° 40' W
40° 35' N
40° 25' N
C
D
B
A
Little Cottonwood stock
Lone Peak
Deer Creek fault
American Fork Canyon
N
0
10
km

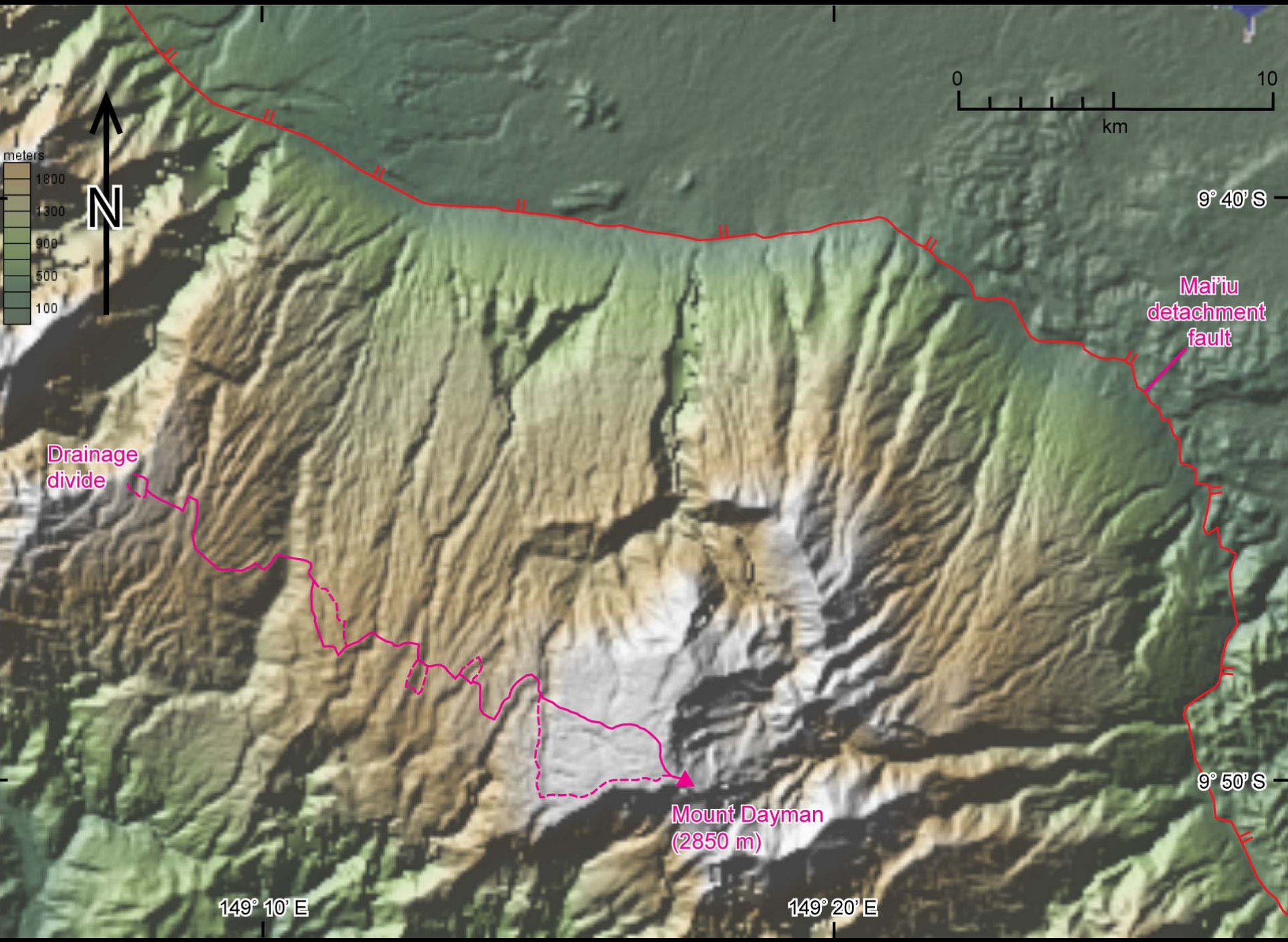

km
A
27.6°
B
8°
21°
26°
7 km
C
D
2:1 vertical exaggeration

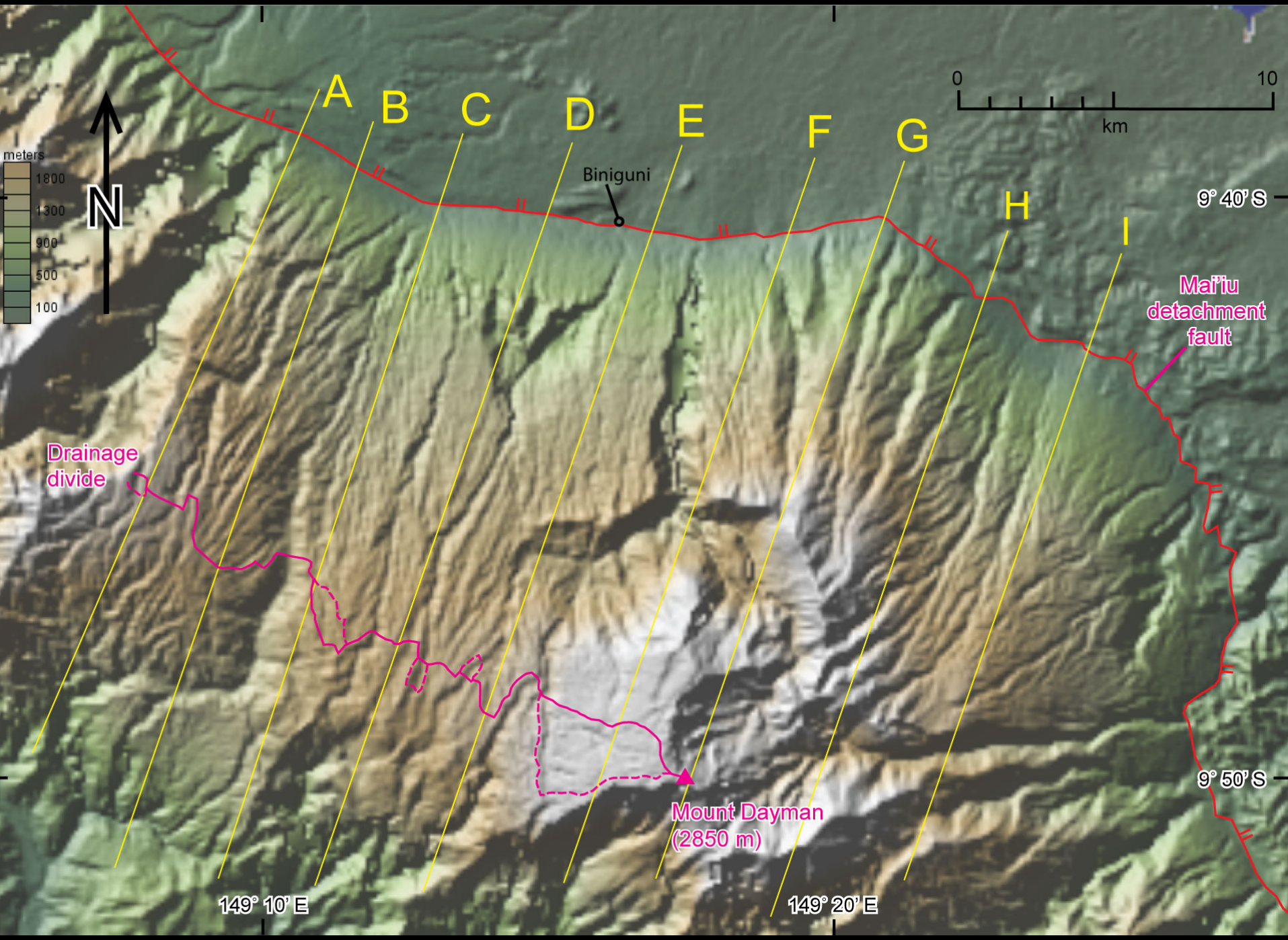

110° 40' W
110° 30' W
Santa Catalina Mountains
32° 20' N
San Pedro
detachment
fault
Catalina
detachment
fault
2641m
Tanque Verde Ridge
32° 10' N
Rincon Valley
Martinez Ranch fault
N
0
10
km

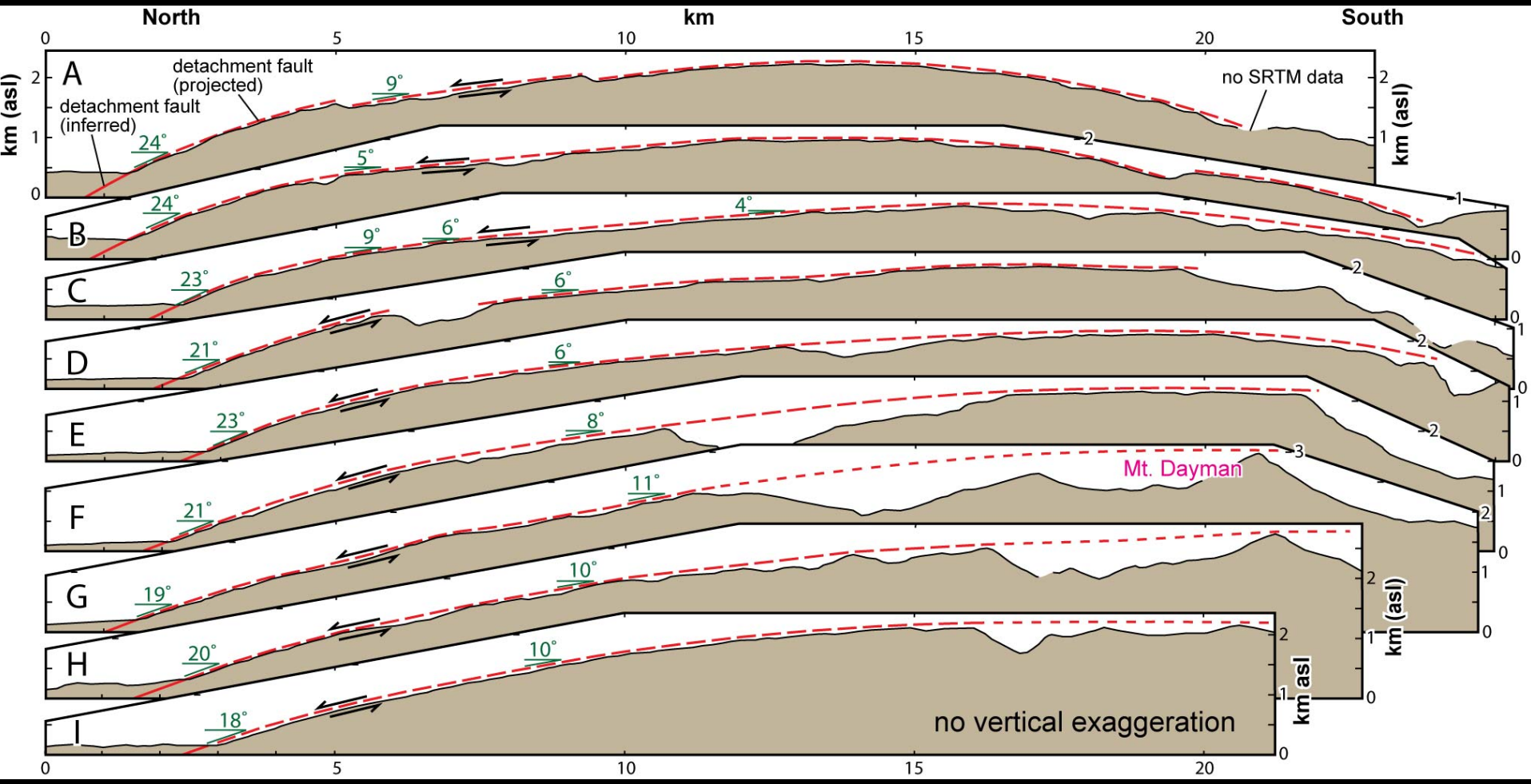

C
110° 40' W
110° 30' W
Santa Catalina Mountains
32° 20' N
D
San Pedro
detachment
fault
Catalina
detachment
fault
2641m
Tanque Verde Ridge
32° 10' N
A
Rincon Valley
N
B
Martinez Ranch fault
0
10
km

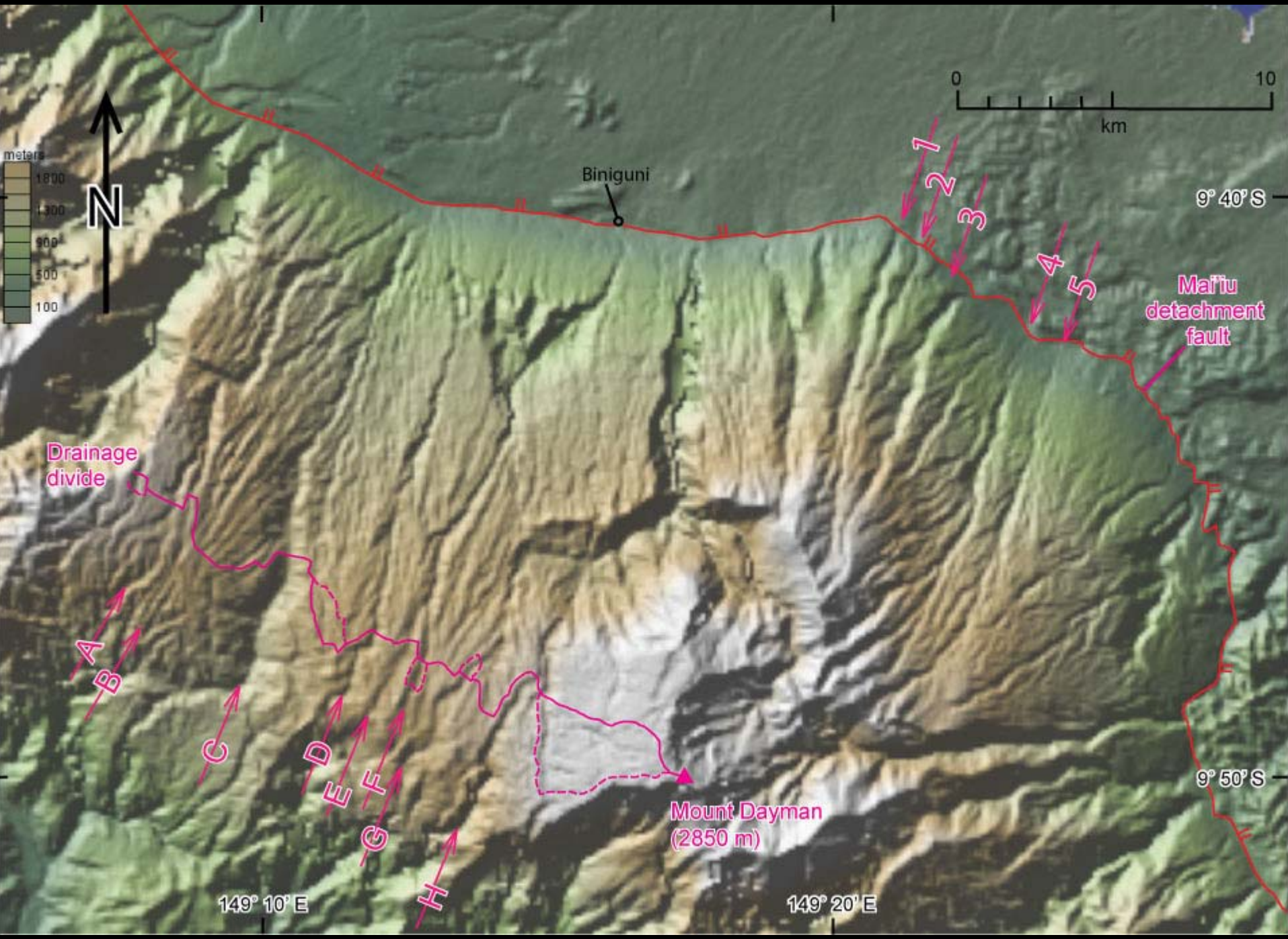

km
A
west
east
bend in section
Mica Mountain
crush zone
9.5°
B
west
east
Martinez
Ranch
fault
Rincon Peak
10°
2:1 vertical exaggeration
C
north
south
Tanque Verde Peak
D
north
south
Italian Trap klippe
Mica Mountain
Rincon Peak

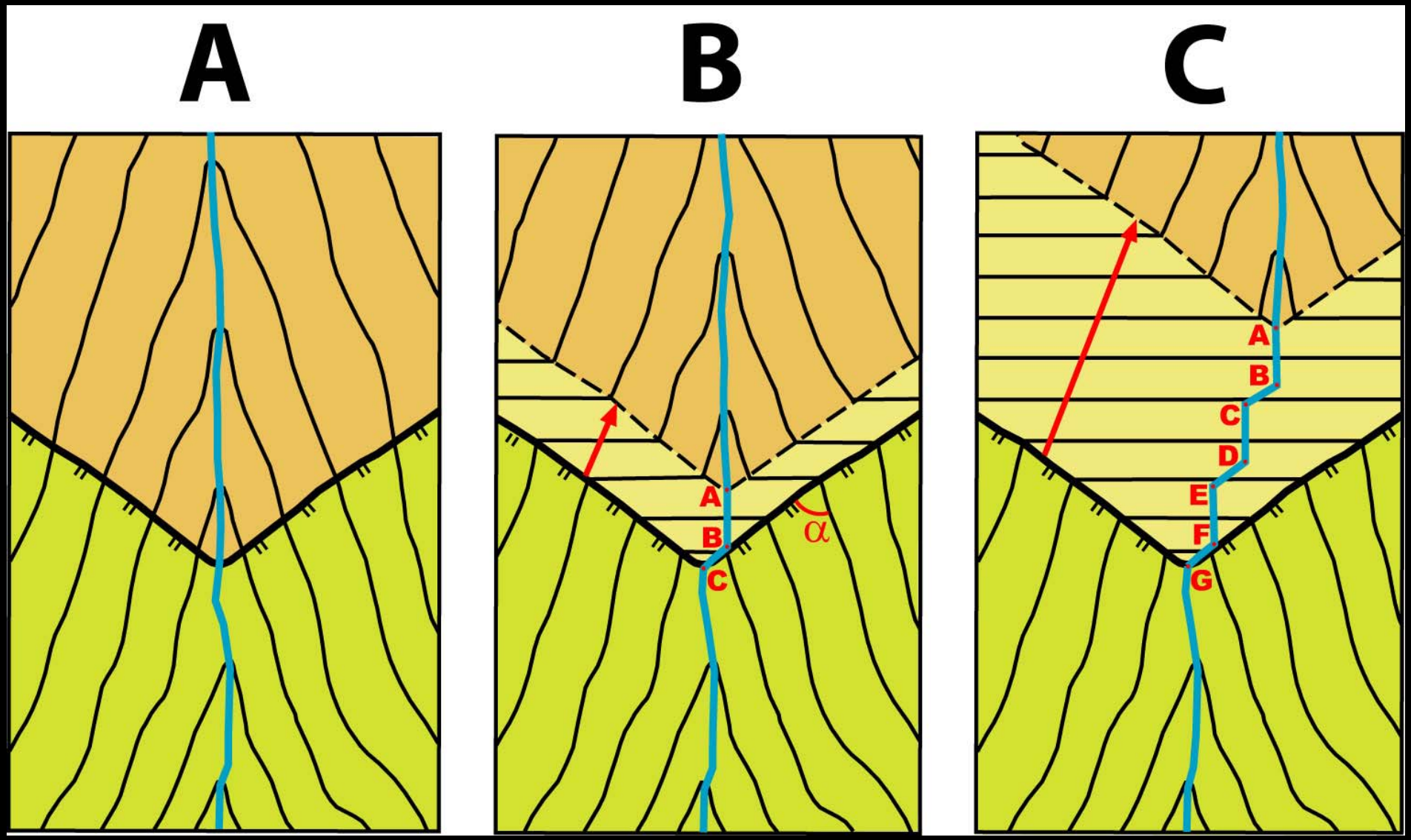

114° 00' W
113° 30' W
34° 15' N
33° 45' N
A
A′
Date Creek basin
Buckskin Mts.
Harcuvar Mts.
Harquahala Mts.
39 km
50 km
N
0
20
km
0
5
10
15
20
25
30
35
40
45
50
2.0
1.5
1.0
0.5
0.0
km
A
A′
2:1 vertical exaggeration
Rawhide Mountains
Buckskin Mountains
Little Buckskin Mountains
Harcuvar Mountains

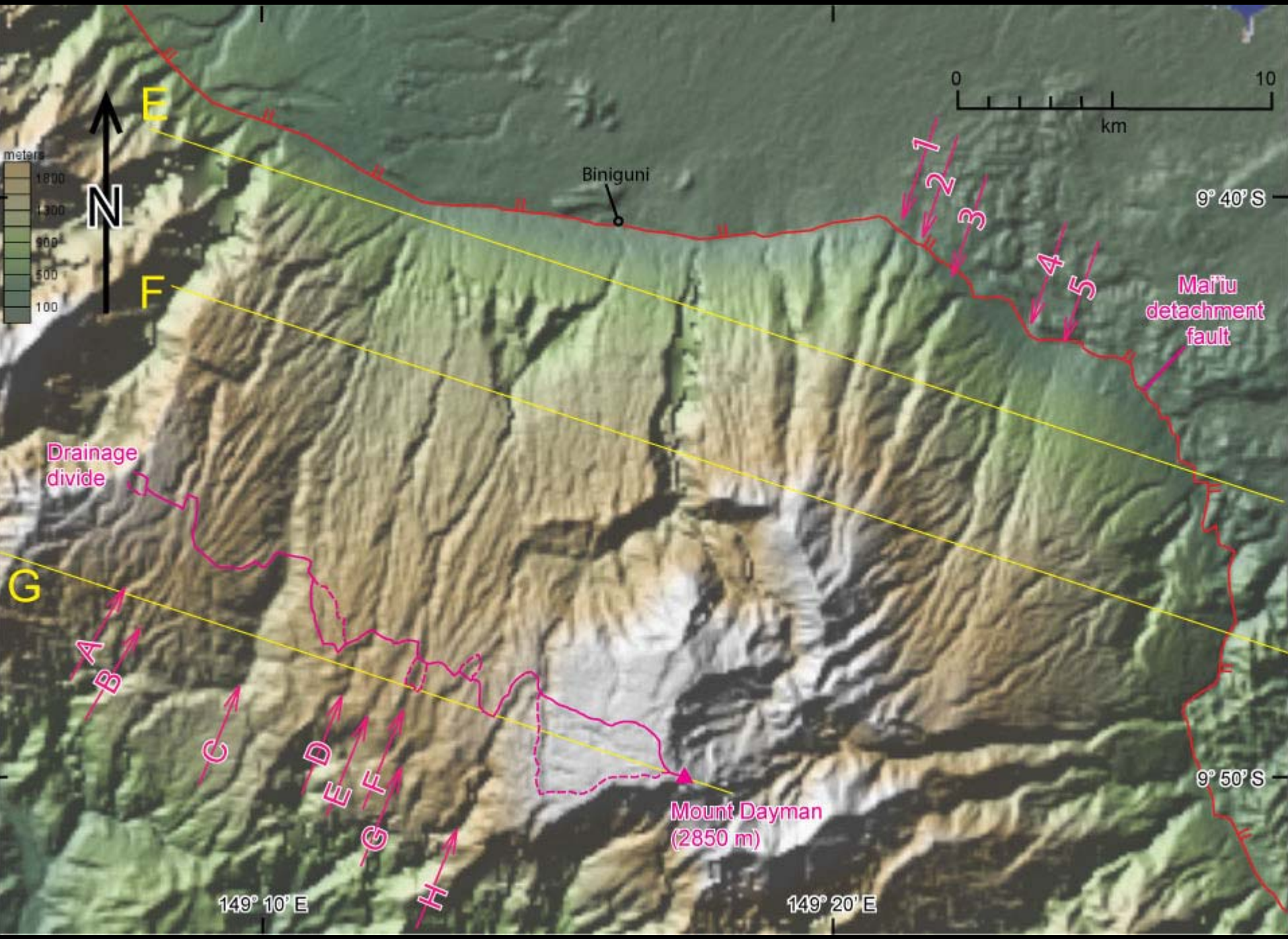

meters
1800
1300
900
500
100
N
0
10
km
9° 40' S
9° 50' S
149° 10' E
149° 20' E
Mai'iu
detachment
fault
Drainage
divide
Mount Dayman
(2850 m)

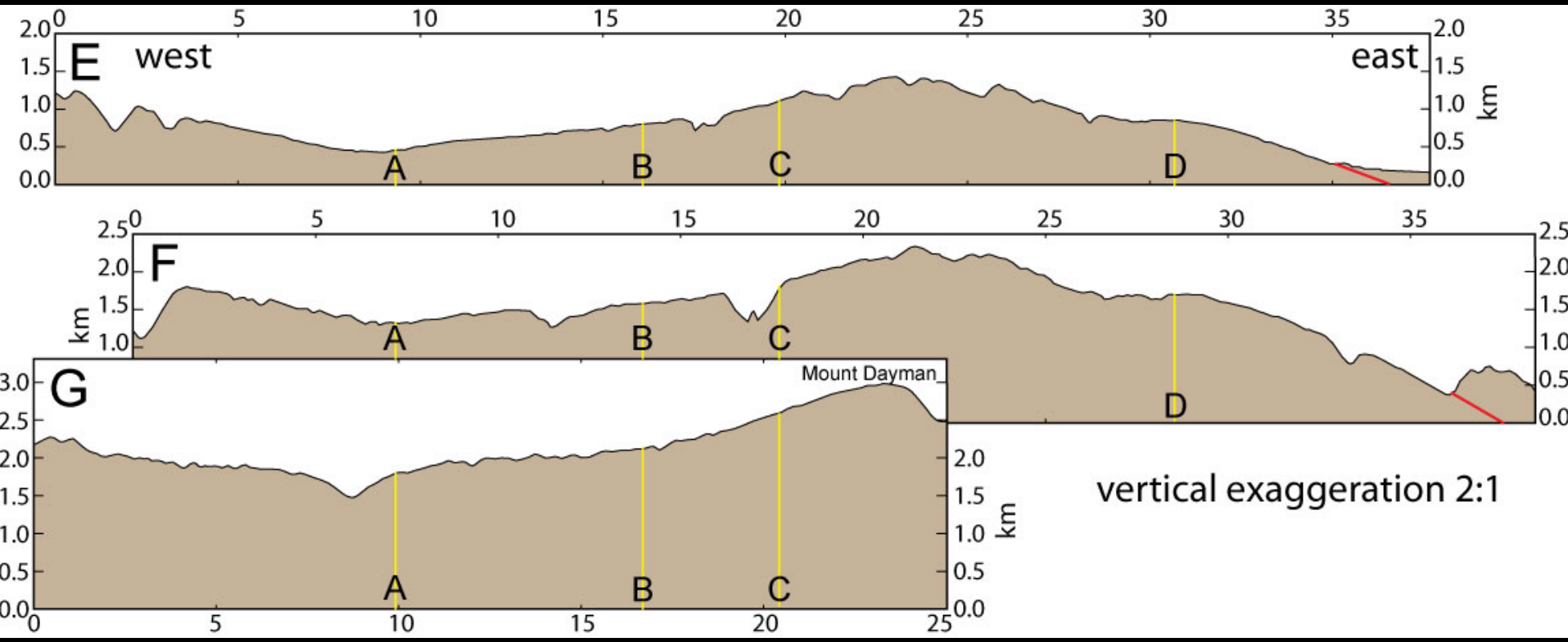

A
B
C
D
E
F
G
H
I
N
meters
1800
1300
900
500
100
0
10
km
Biniguni
9° 40' S
9° 50' S
Mai'iu
detachment
fault
Drainage
divide
Mount Dayman
(2850 m)
149° 10' E
149° 20' E

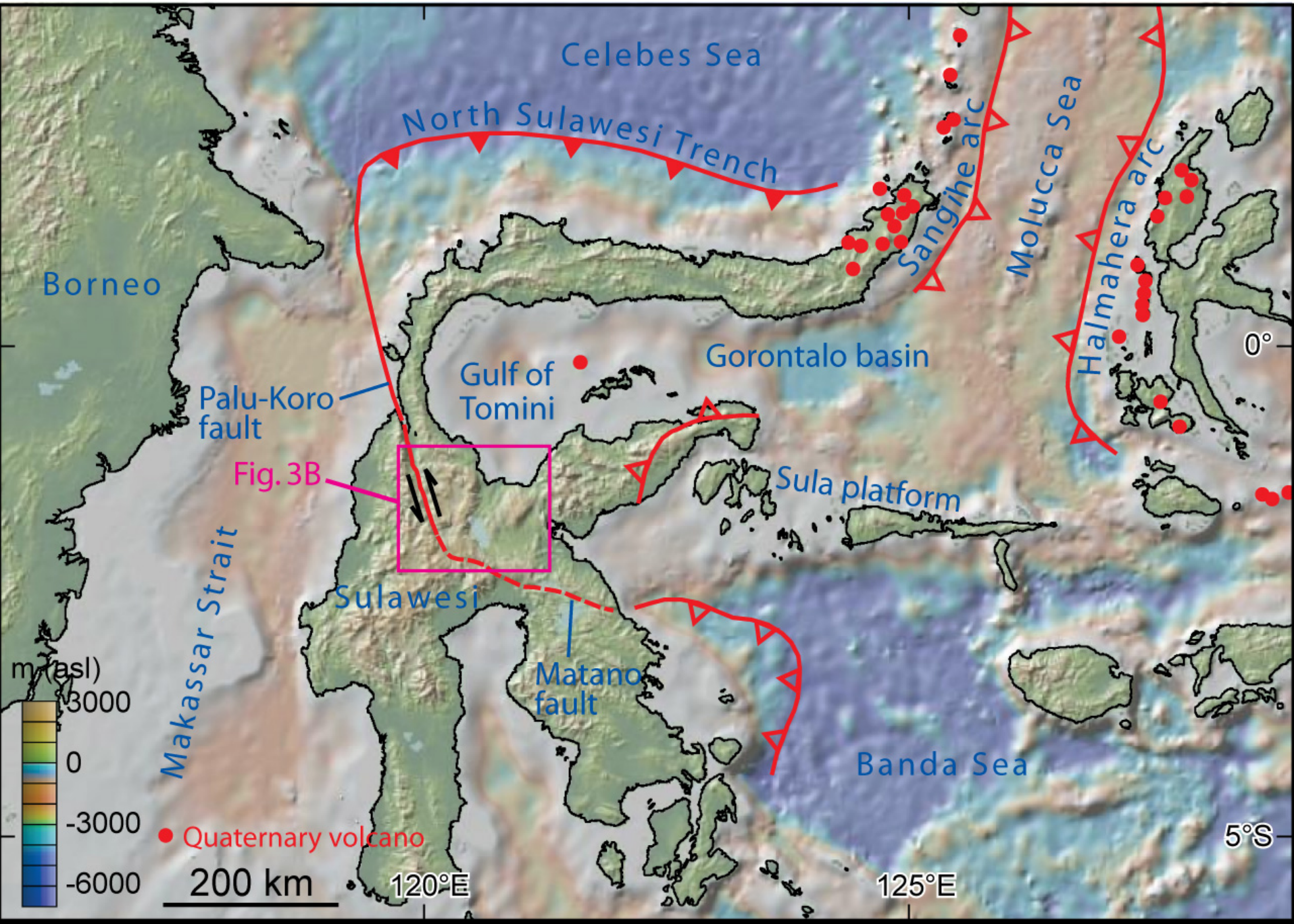

North
km
South
0
5
10
15
20
km (asl)
A
B
C
D
E
F
G
H
I
detachment fault (projected)
detachment fault (inferred)
no SRTM data
Mt. Dayman
no vertical exaggeration
9°
24°
5°
24°
4°
9°
6°
23°
6°
21°
6°
23°
8°
21°
11°
19°
10°
20°
10°
18°

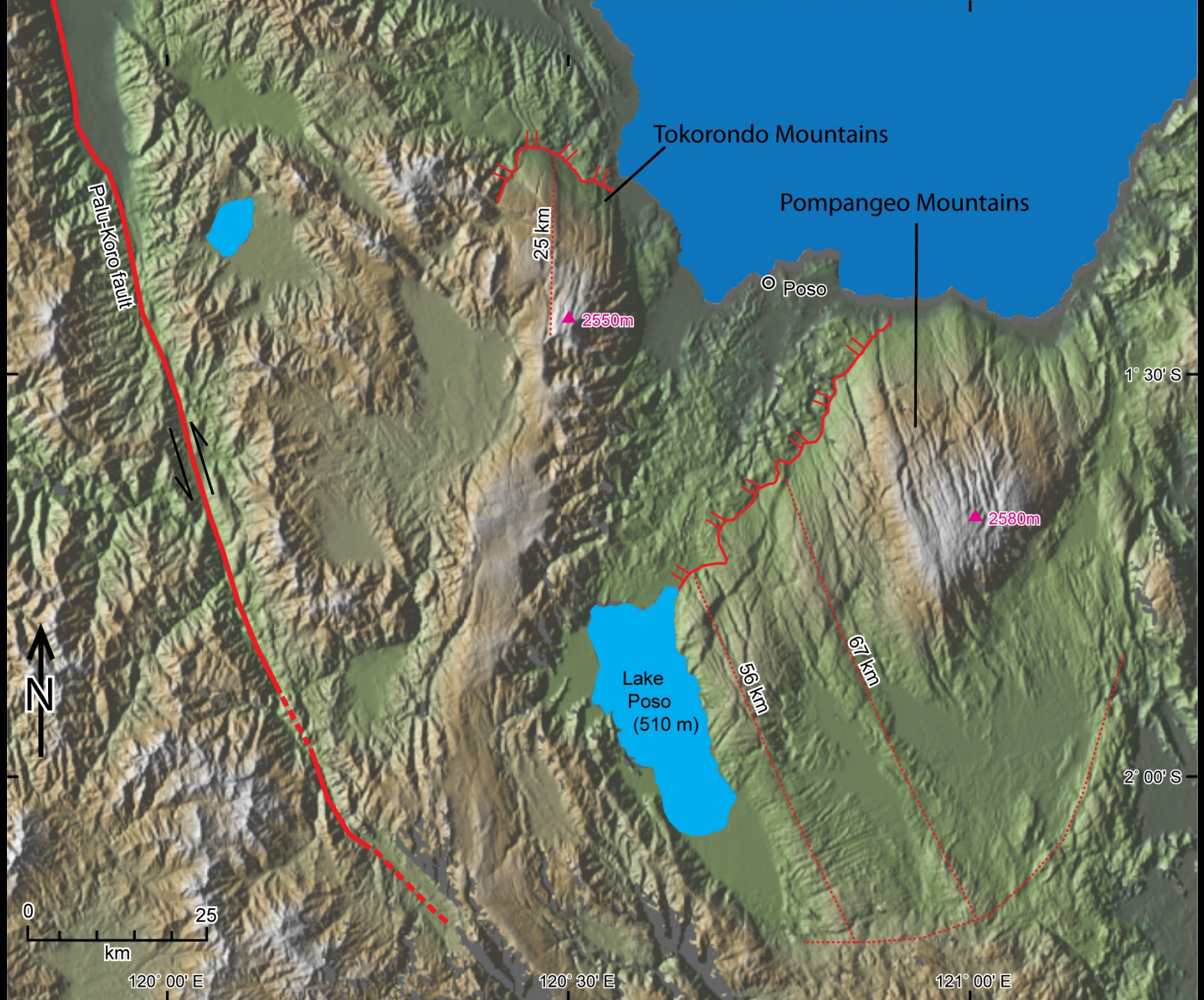

0
10
km
N
meters
1800
1300
900
500
100
Biniguni
9° 40' S
9° 50' S
149° 10' E
149° 20' E
1
2
3
4
5
Mai'iu
detachment
fault
Drainage
divide
A
B
C
D
E
F
G
H
Mount Dayman
(2850 m)

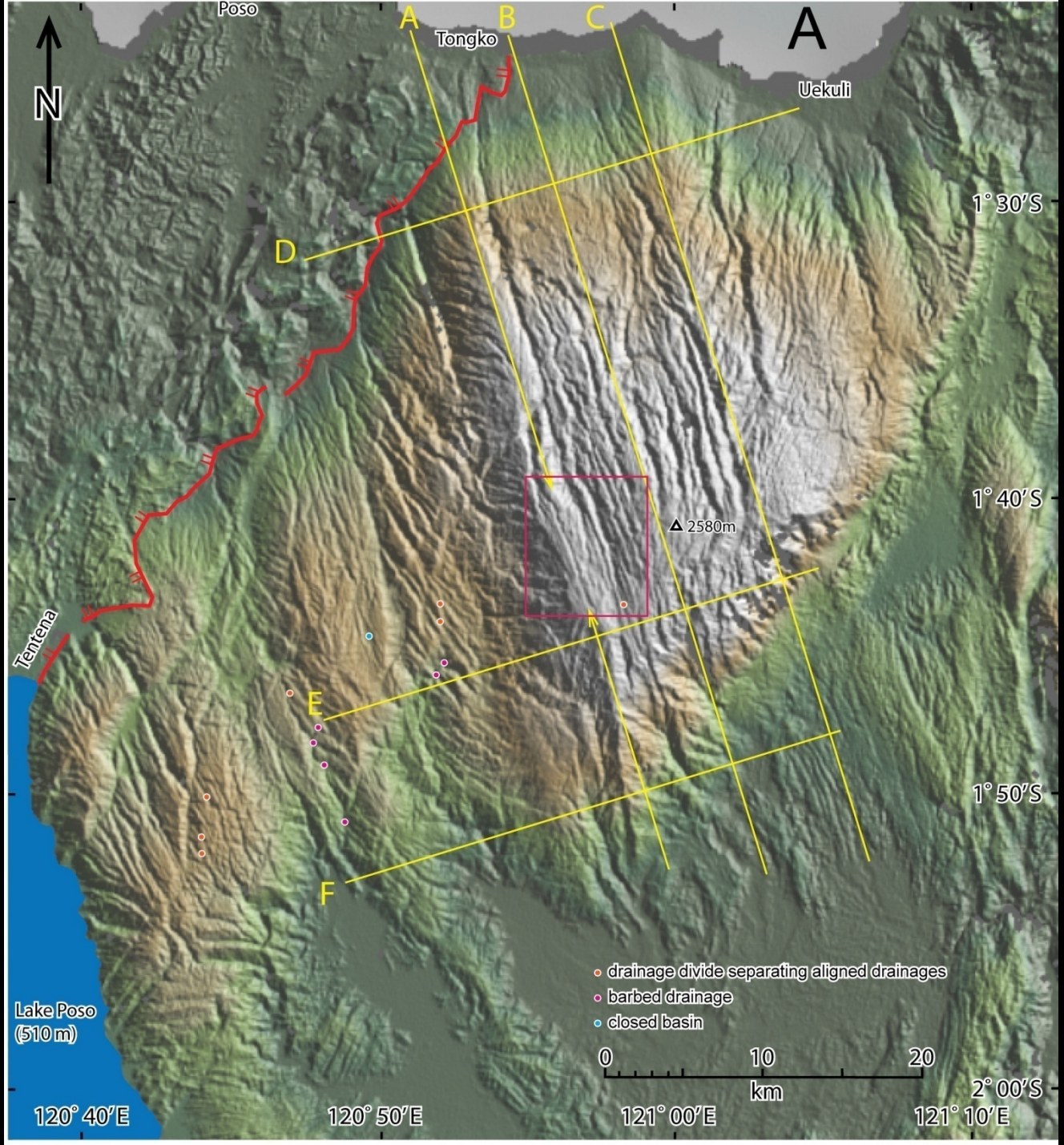

A
B
C
A
B
C
α
A
B
C
D
E
F
G

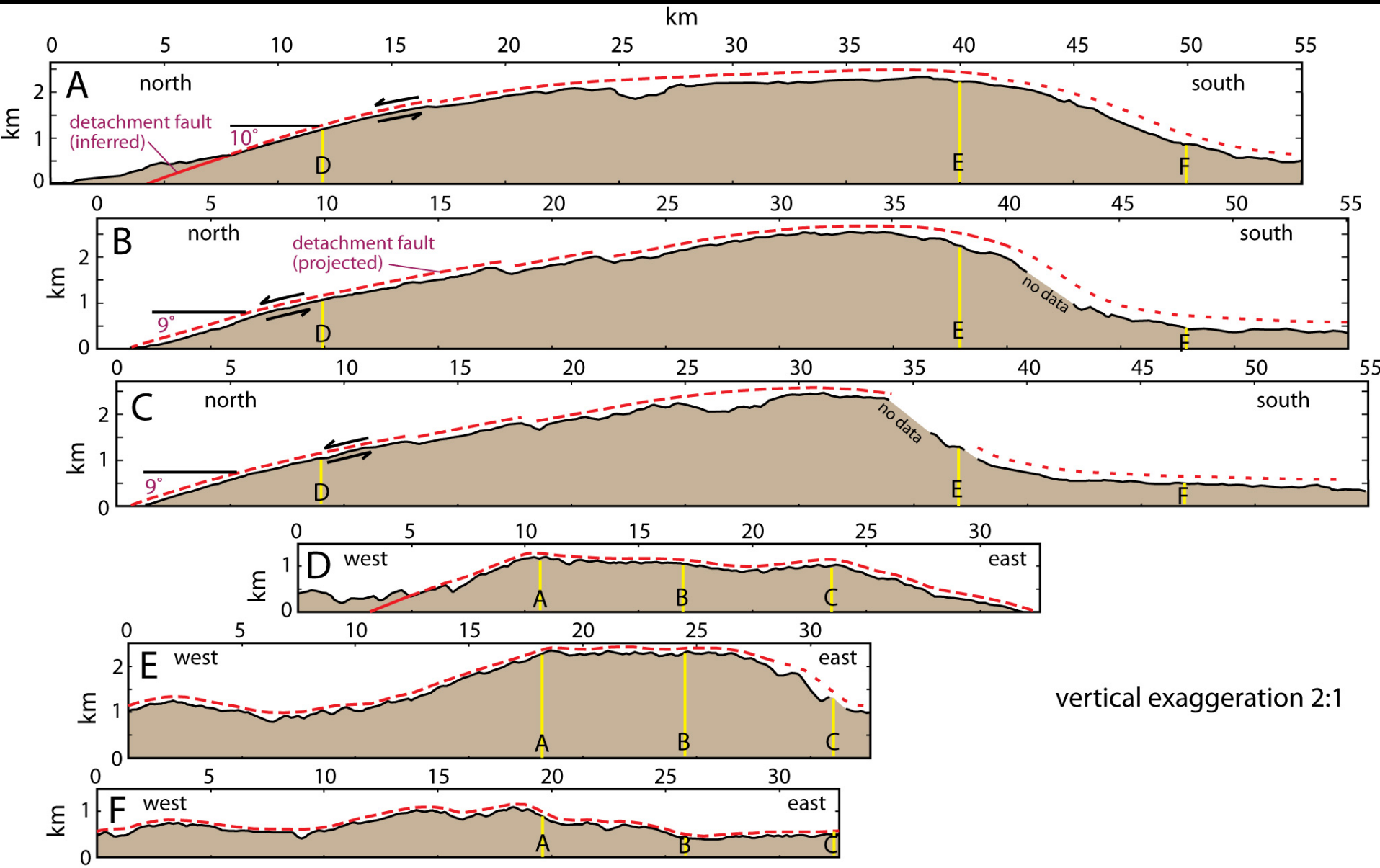

N
meters
1800
1300
900
500
100
E
F
G
Biniguni
0
10
km
1
2
3
4
5
Mai'iu
detachment
fault
9° 40' S
Drainage
divide
A
B
C
D
E
F
G
H
Mount Dayman
(2850 m)
9° 50' S
149° 10' E
149° 20' E

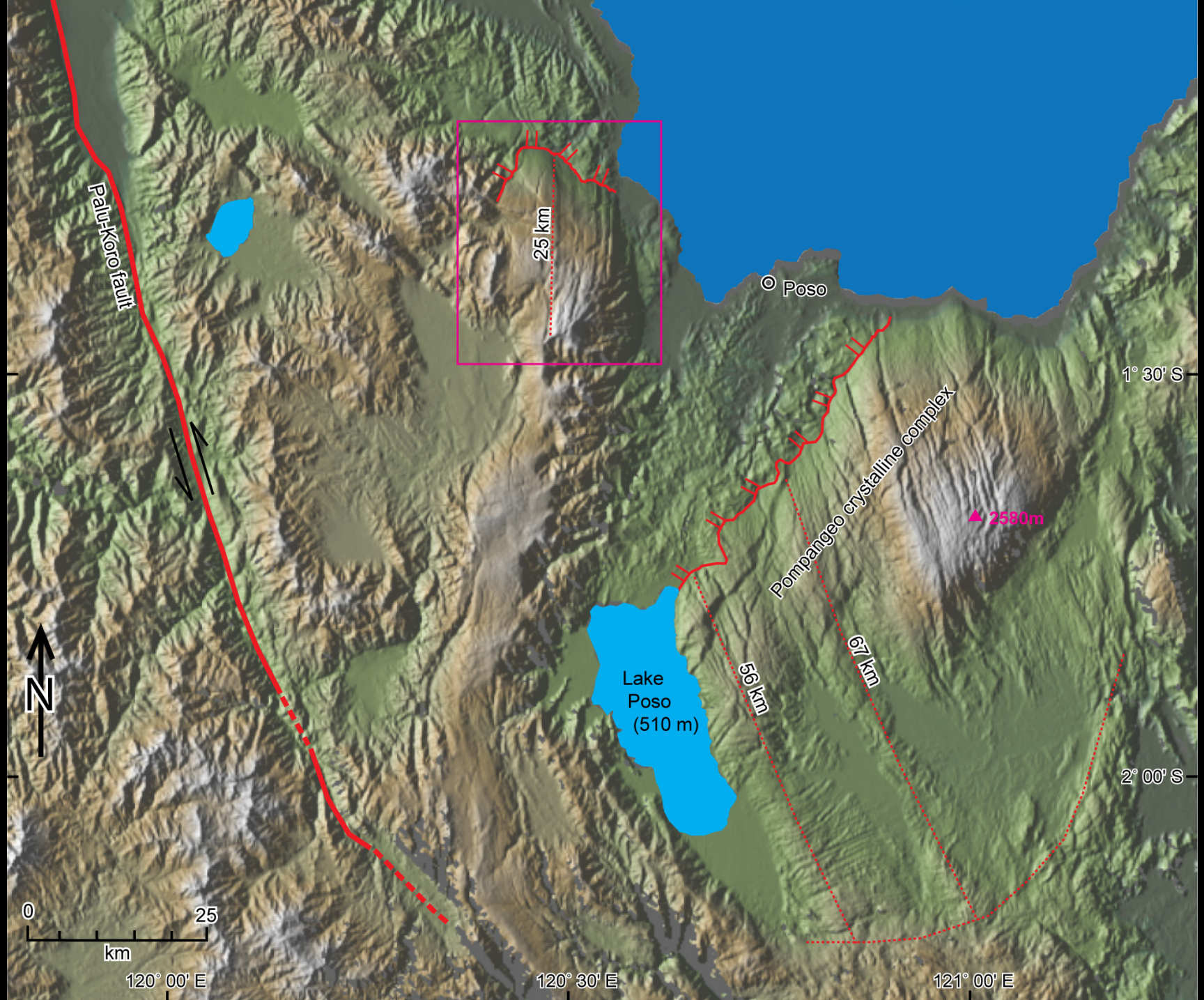

E
west
east
km
A
B
C
D
F
km
A
B
C
D
G
Mount Dayman
km
A
B
C
vertical exaggeration 2:1

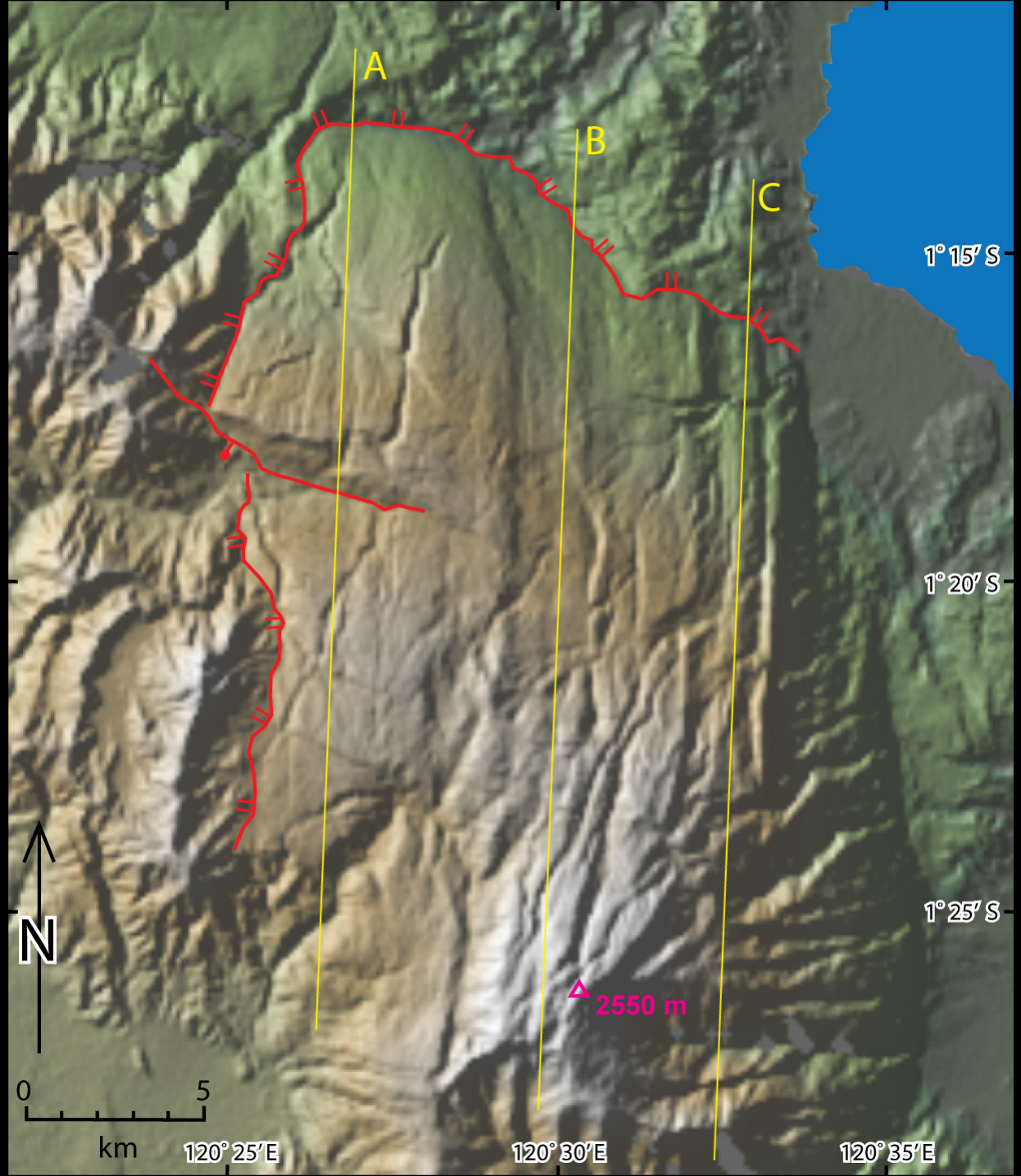

Celebes Sea
North Sulawesi Trench
Sangihe arc
Molucca Sea
Halmahera arc
Borneo
Gorontalo basin
Gulf of Tomini
Palu-Koro fault
Fig. 3B
Sula platform
Makassar Strait
Sulawesi
Matano fault
Banda Sea
m (asl)
3000
0
-3000
-6000
Quaternary volcano
200 km
120°E
125°E
0°
5°S

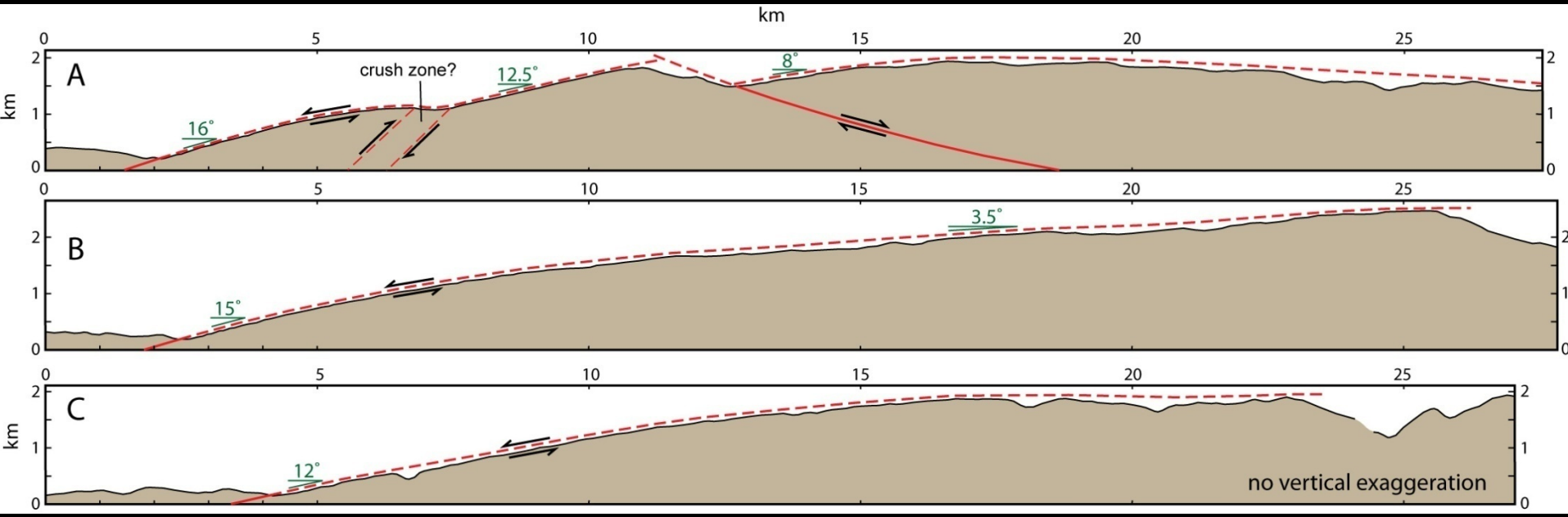

Tokorondo Mountains
Pompangeo Mountains
Poso
Palu-Koro fault
25 km
2550m
2580m
56 km
67 km
Lake
Poso
(510 m)
N
0
25
km
1° 30' S
2° 00' S
120° 00' E
120° 30' E
121° 00' E


A
N
Poso
Tongko
Uekuli
A
B
C
D
E
F
Tentena
2580m
1° 30′S
1° 40′S
1° 50′S
2° 00′S
120° 40′E
120° 50′E
121° 00′E
121° 10′E
Lake Poso
(510 m)
drainage divide separating aligned drainages
barbed drainage
closed basin
0
10
20
km

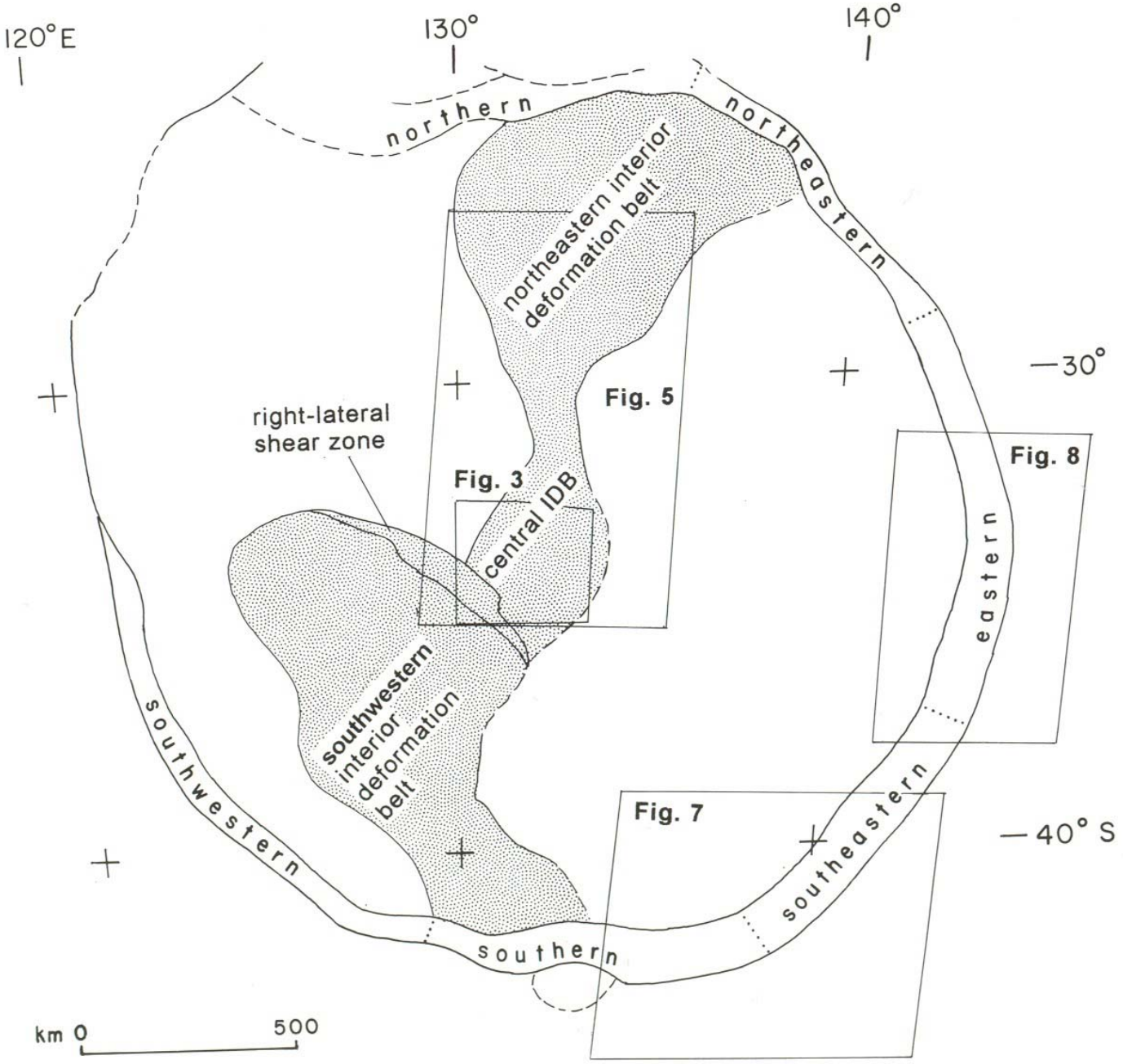

km
A
north
south
detachment fault
(inferred)
10°
D
E
F
B
north
south
detachment fault
(projected)
9°
no data
C
north
south
9°
no data
D
west
east
A
B
C
E
west
east
A
B
C
F
west
east
A
B
C
vertical exaggeration 2:1


Palu-Koro fault
25 km
Poso
1° 30' S
Pompangeo crystalline complex
2580m
67 km
56 km
Lake
Poso
(510 m)
2° 00' S
N
0
25
km
120° 00' E
120° 30' E
121° 00' E

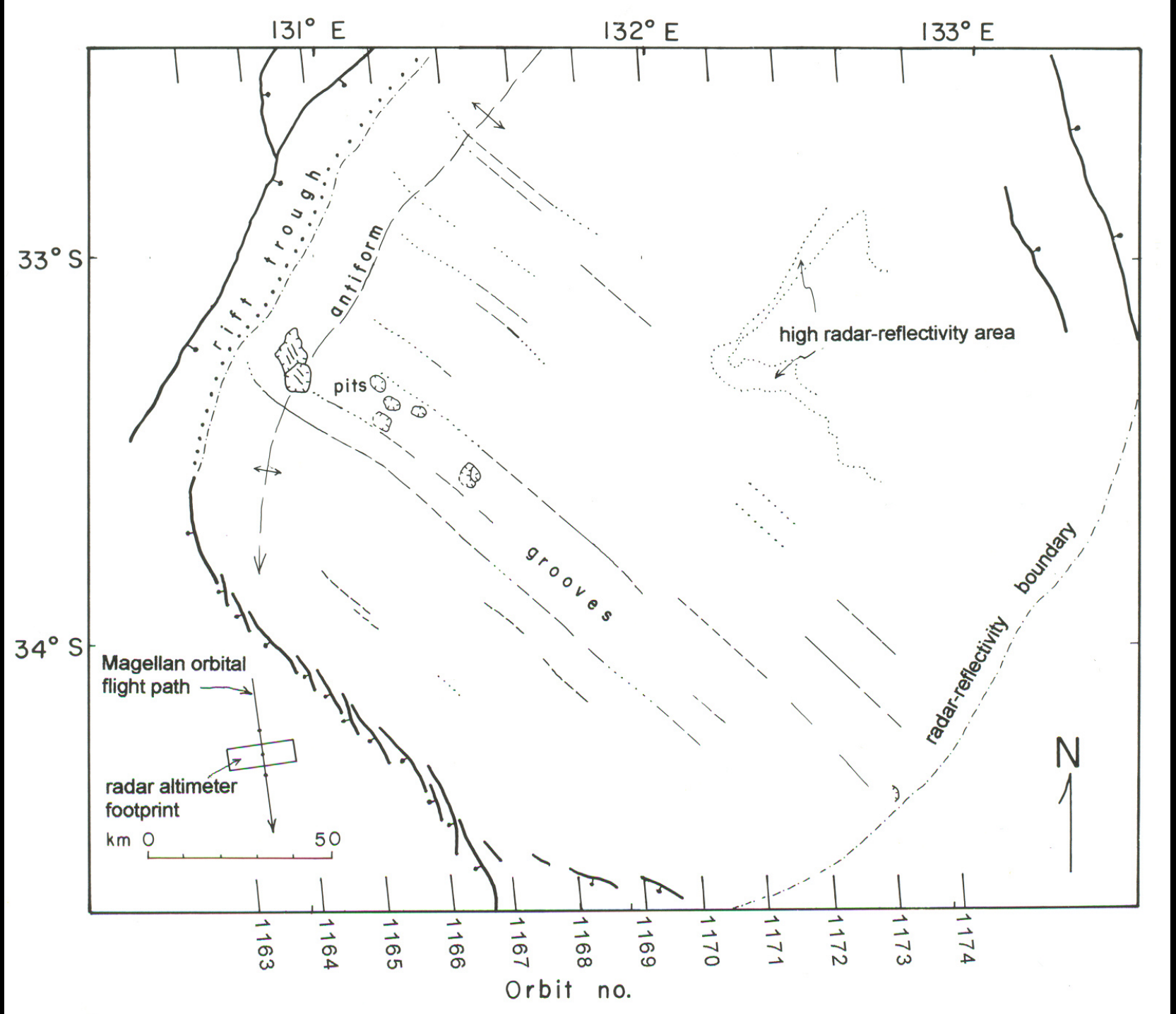

A
B
C
1° 15′ S
1° 20′ S
1° 25′ S
N
2550 m
0
5
km
120° 25′ E
120° 30′ E
120° 35′ E

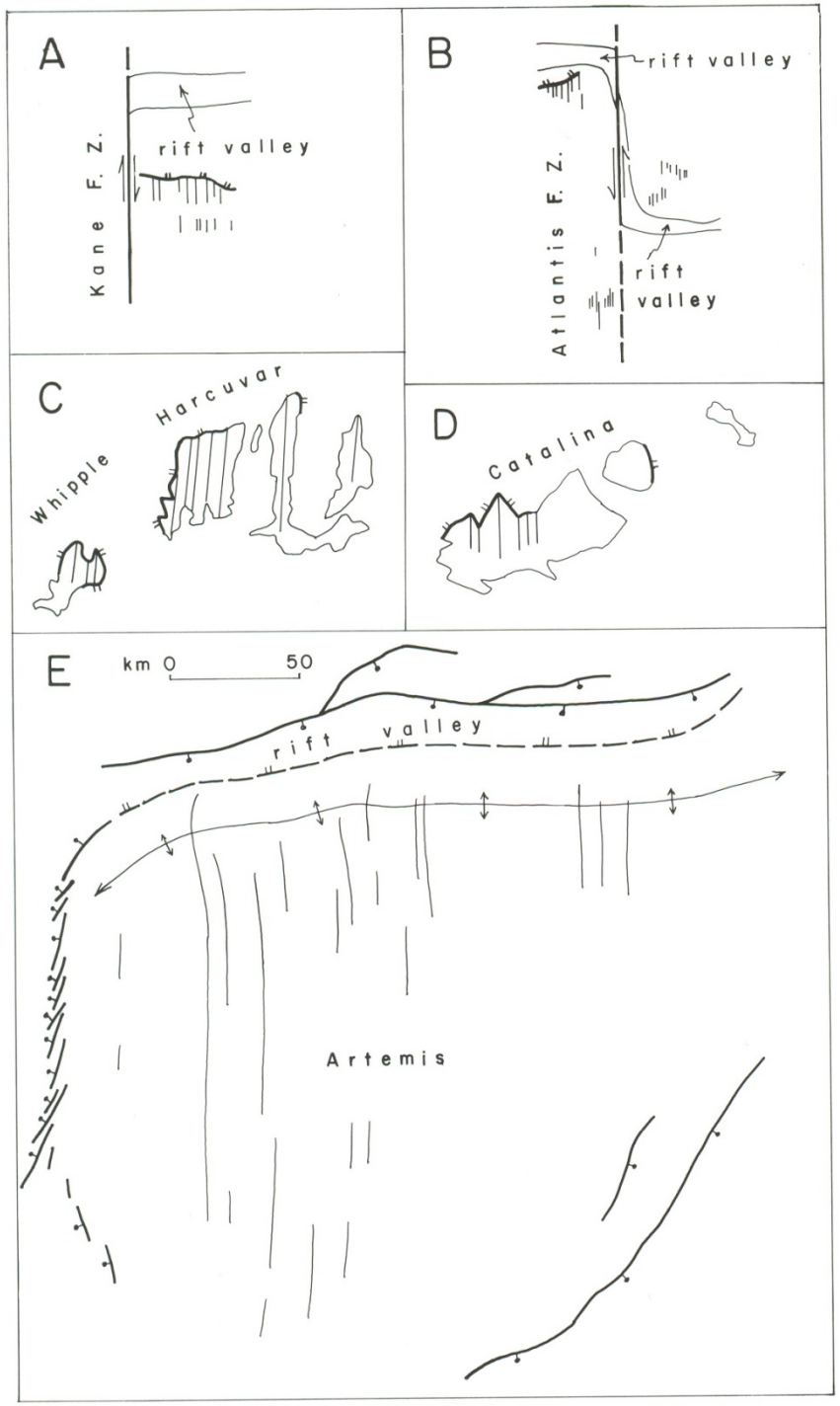
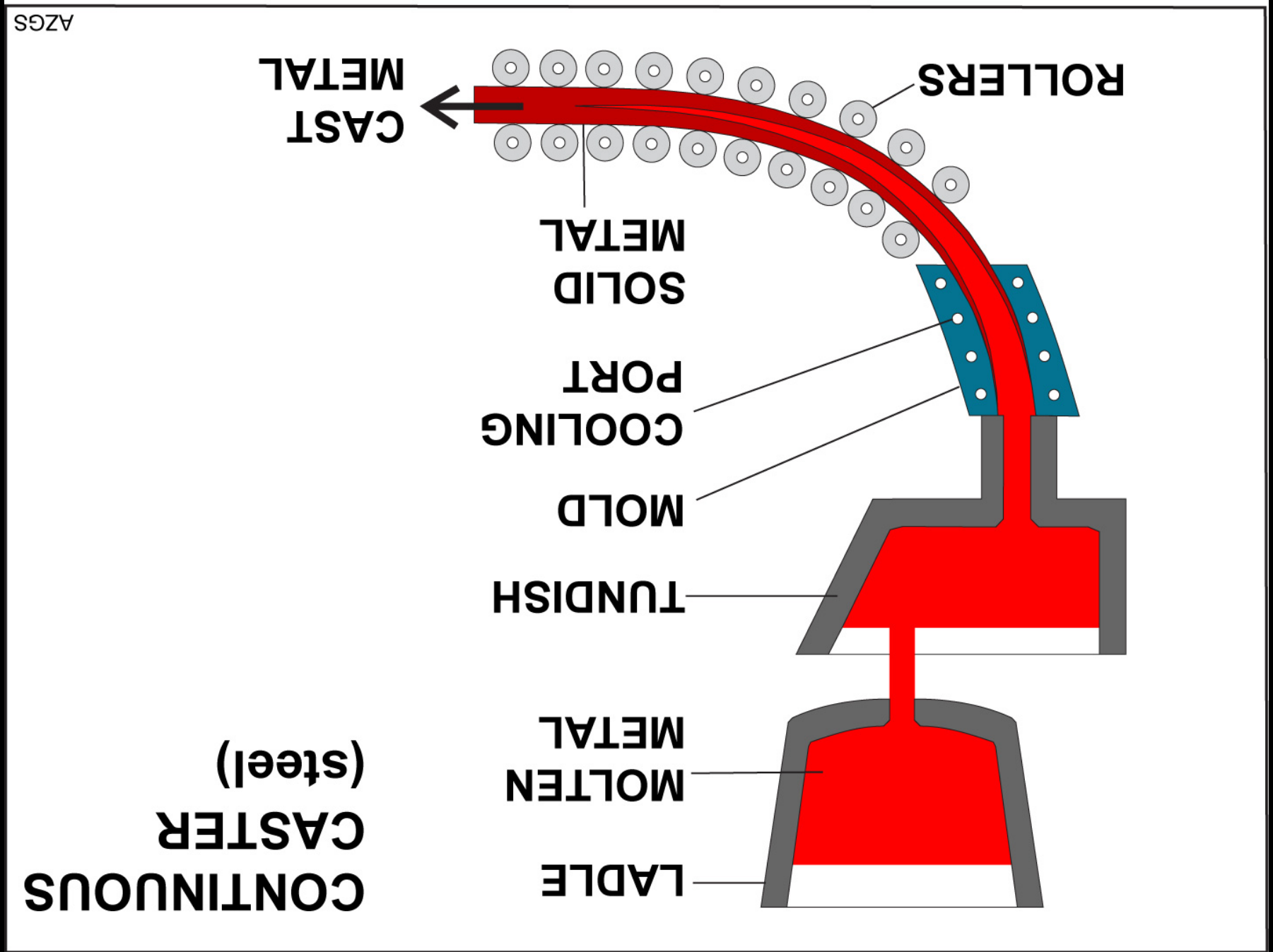

km
A
crush zone?
16°
12.5°
8°
B
15°
3.5°
C
12°
no vertical exaggeration
km

500 km


120°E
130°
140°
northern
northeastern
northeastern interior deformation belt
Fig. 5
Fig. 3
central IDB
right-lateral shear zone
southwestern interior deformation belt
southwestern
southern
southeastern
eastern
Fig. 8
Fig. 7
30°
40° S
km 0
500

50 km


131° E
132° E
133° E
33° S
34° S
rift trough
antiform
pits
high radar-reflectivity area
grooves
radar-reflectivity boundary
Magellan orbital flight path
radar altimeter footprint
km 0
50
N
1163
1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
Orbit no.


A
Kane F. Z.
rift valley
B
rift valley
Atlantis F. Z.
rift
valley
C
Whipple
Harcuvar
D
Catalina
E
km 0
50
rift
valley
Artemis

Core complexes are like upside-down continuous casters!