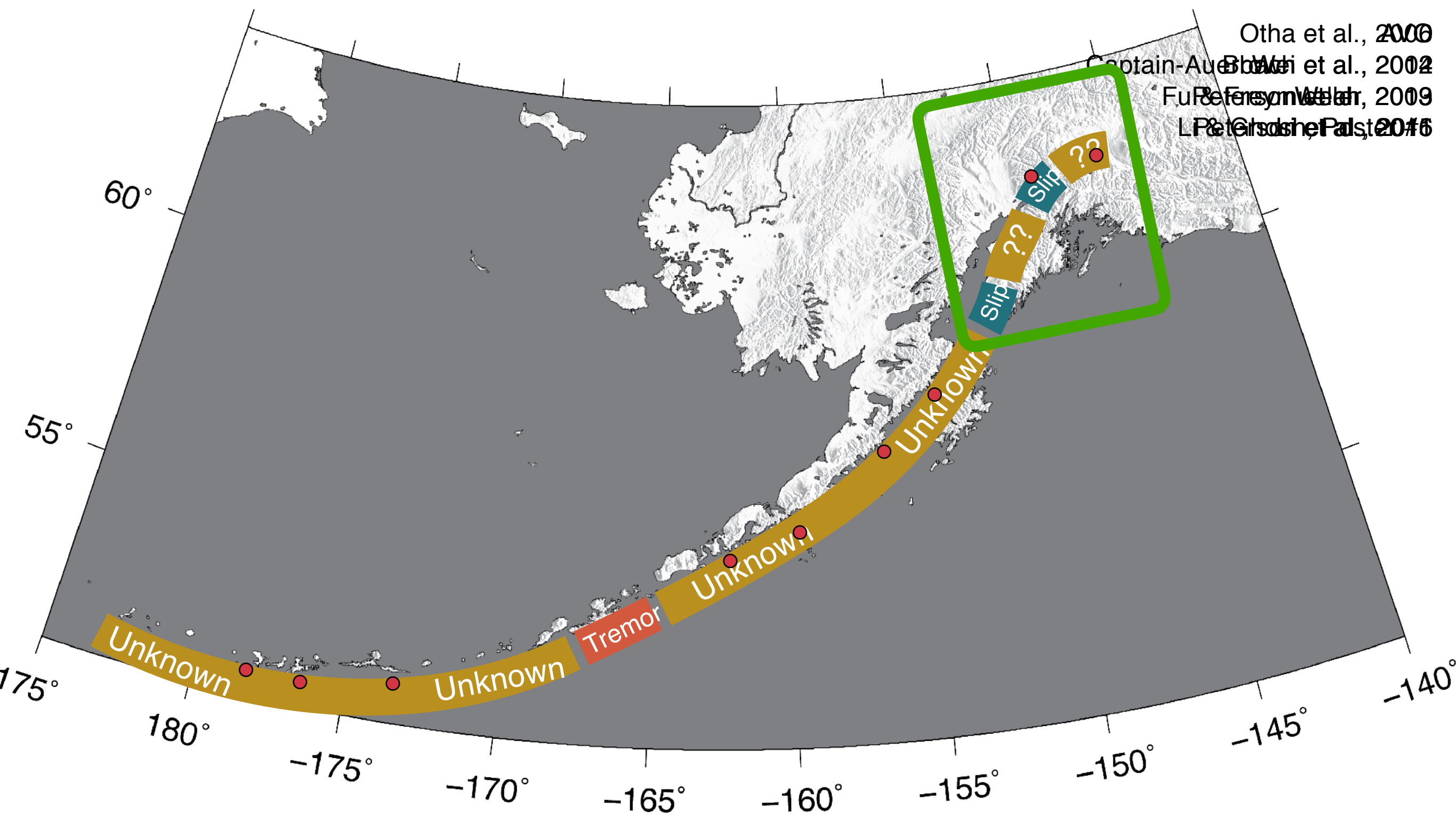


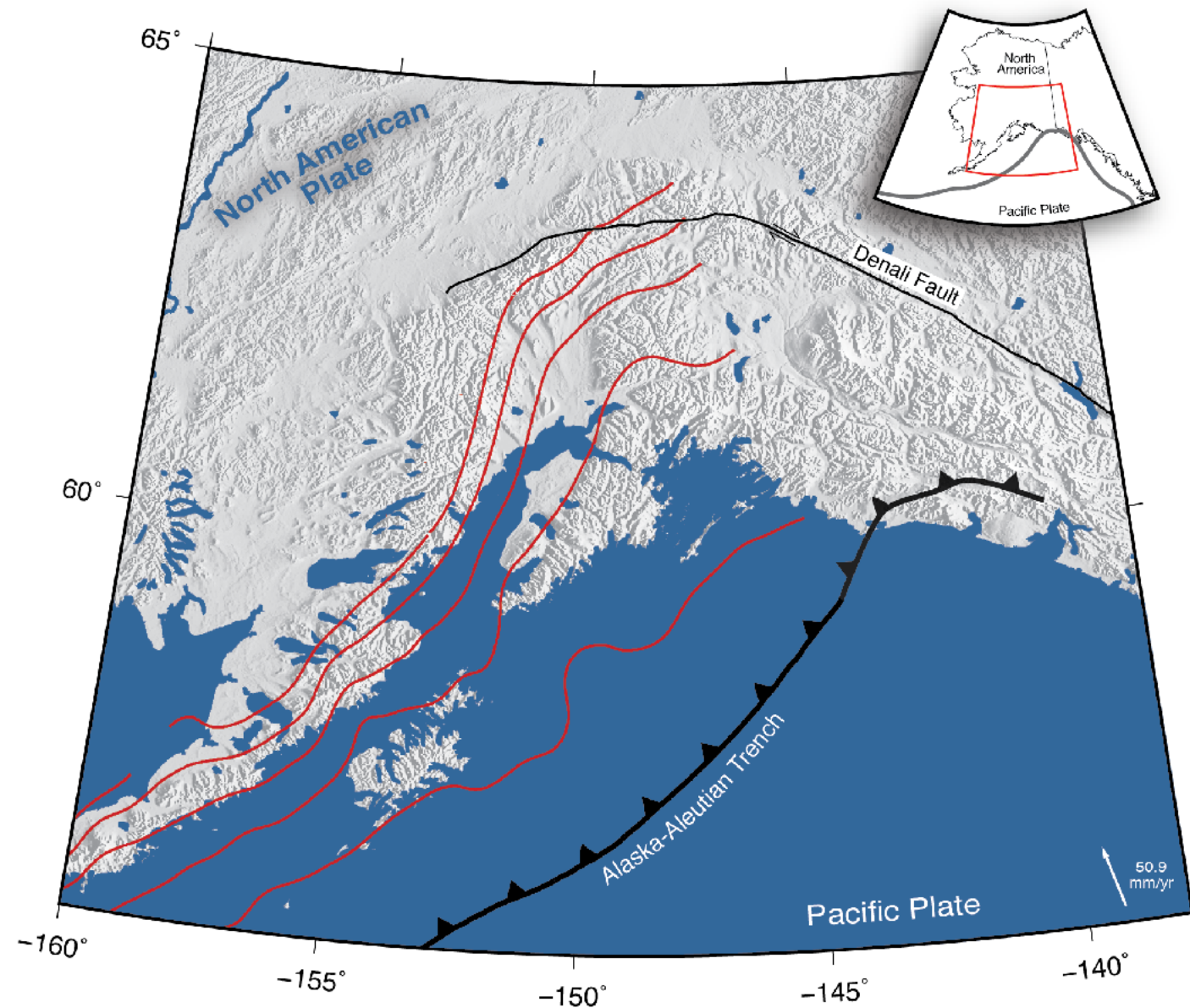
TREMOR AND SLOW SLIP IMPLICATIONS FOR ALASKA TECTONICS

Aaron Wech
US Geological Survey



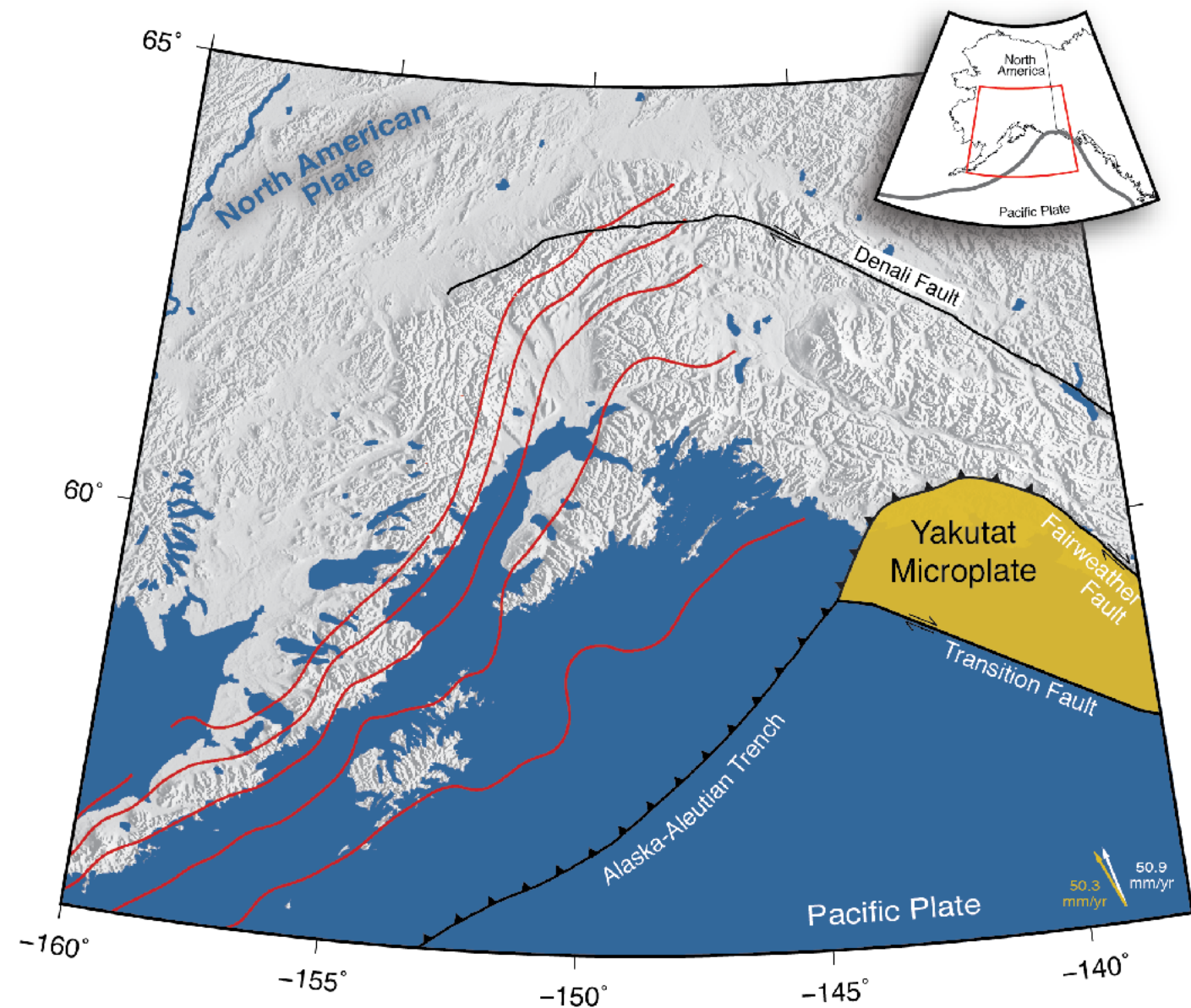
ALASKA SUBDUCTION ZONE

PACIFIC PLATE **SHALLOWS** NEAR
EASTERN EDGE



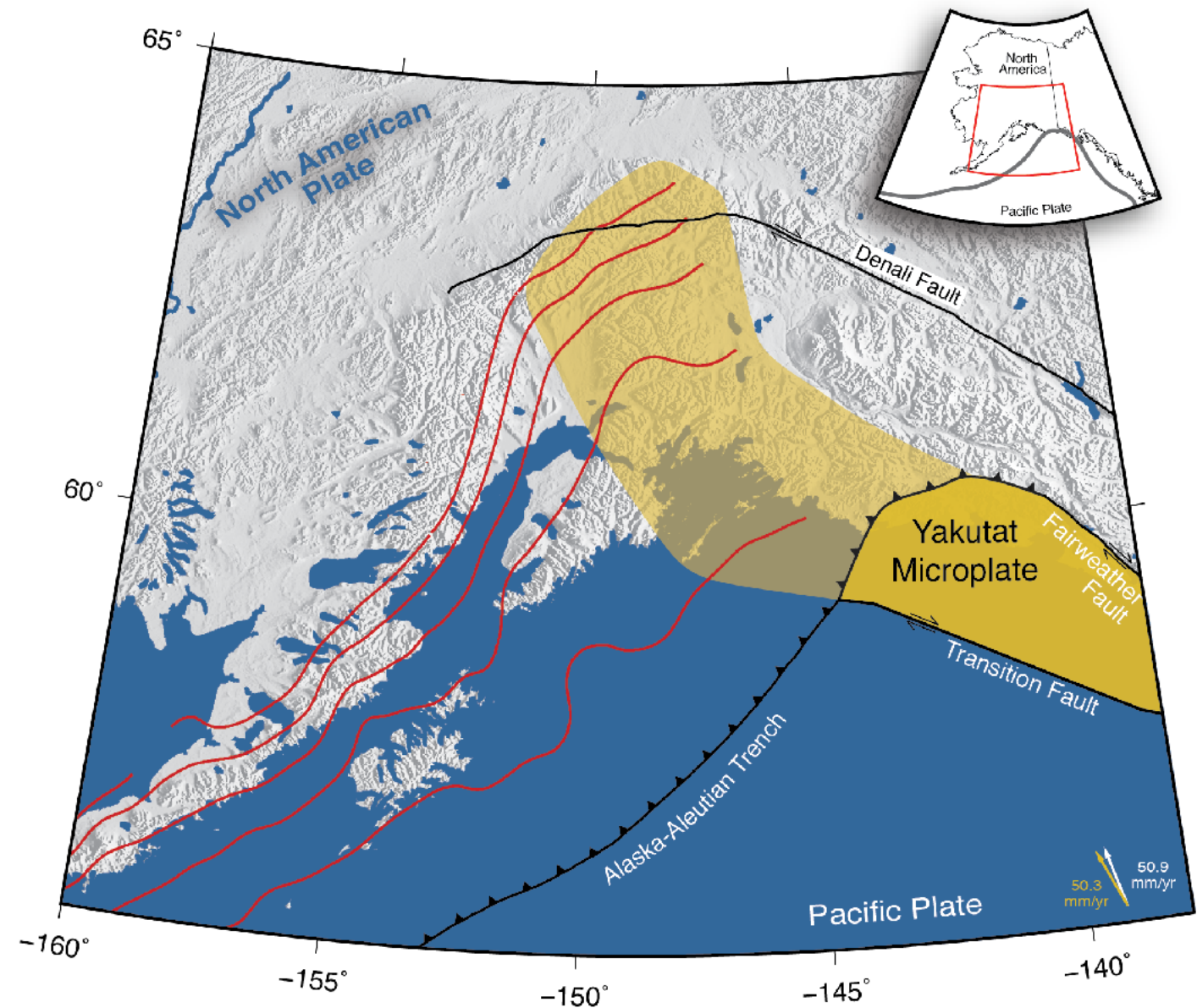
YAKUTAT TERRANE

THICK **OCEANIC PLATEAU** AFFIXED TO
AND TRAVELING WITH PACIFIC PLATE



YAKUTAT SUBDUCTION N

INFERRED FROM TOMOGRAPHY: **THICK**
LOW-VELOCITY CRUST, HIGH V_p/V_s

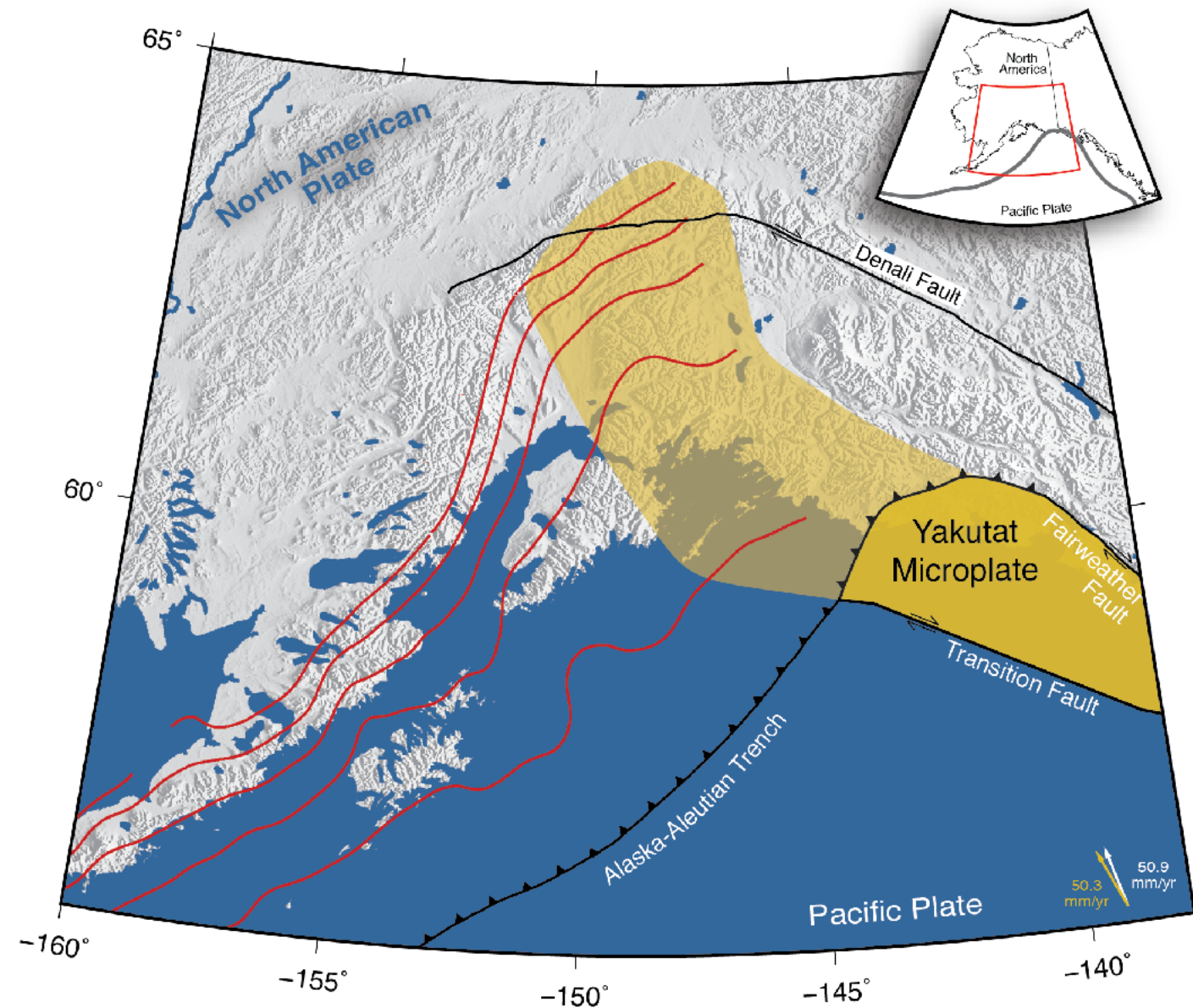


Eberhart-Phillips et al., 2006

YAKUTAT SUBDUCTION N

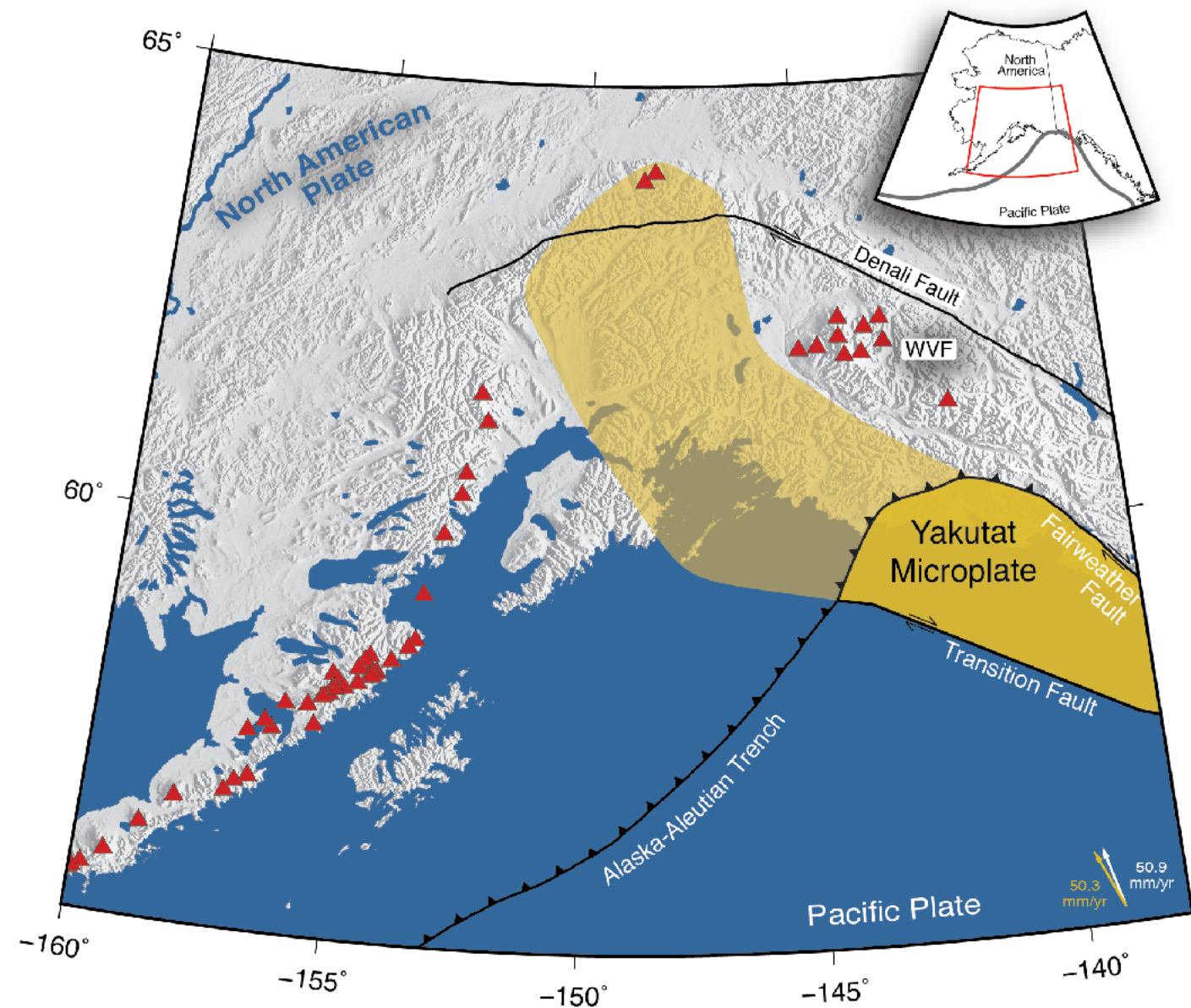
RELATIONSHIP BETWEEN YAKUTAT AND PACIFIC PLATE?

PLATE DOUBLING? OR THICKENED CRUST?



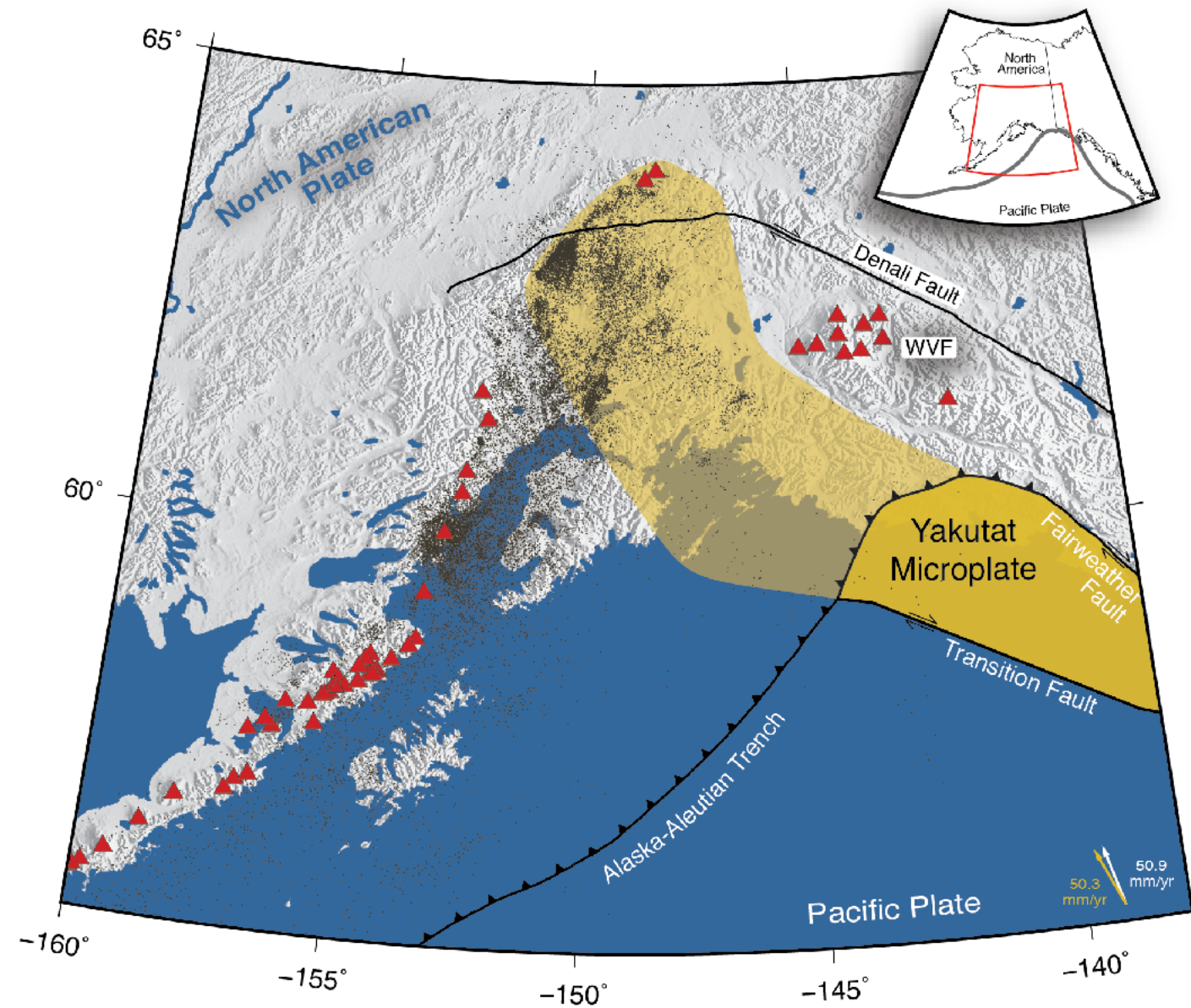
VOLCANIC GAP

RAISES QUESTIONS ABOUT WRANGELL
VOLCANIC FIELD (WVF)



WADATI- BENIOFF ZONE

ALL EARTHQUAKES **> 30 KM DEEP**



1964 RUPTURE AREA

FROM SLIP MODELS & AFTERSHOCK
DISTRIBUTION

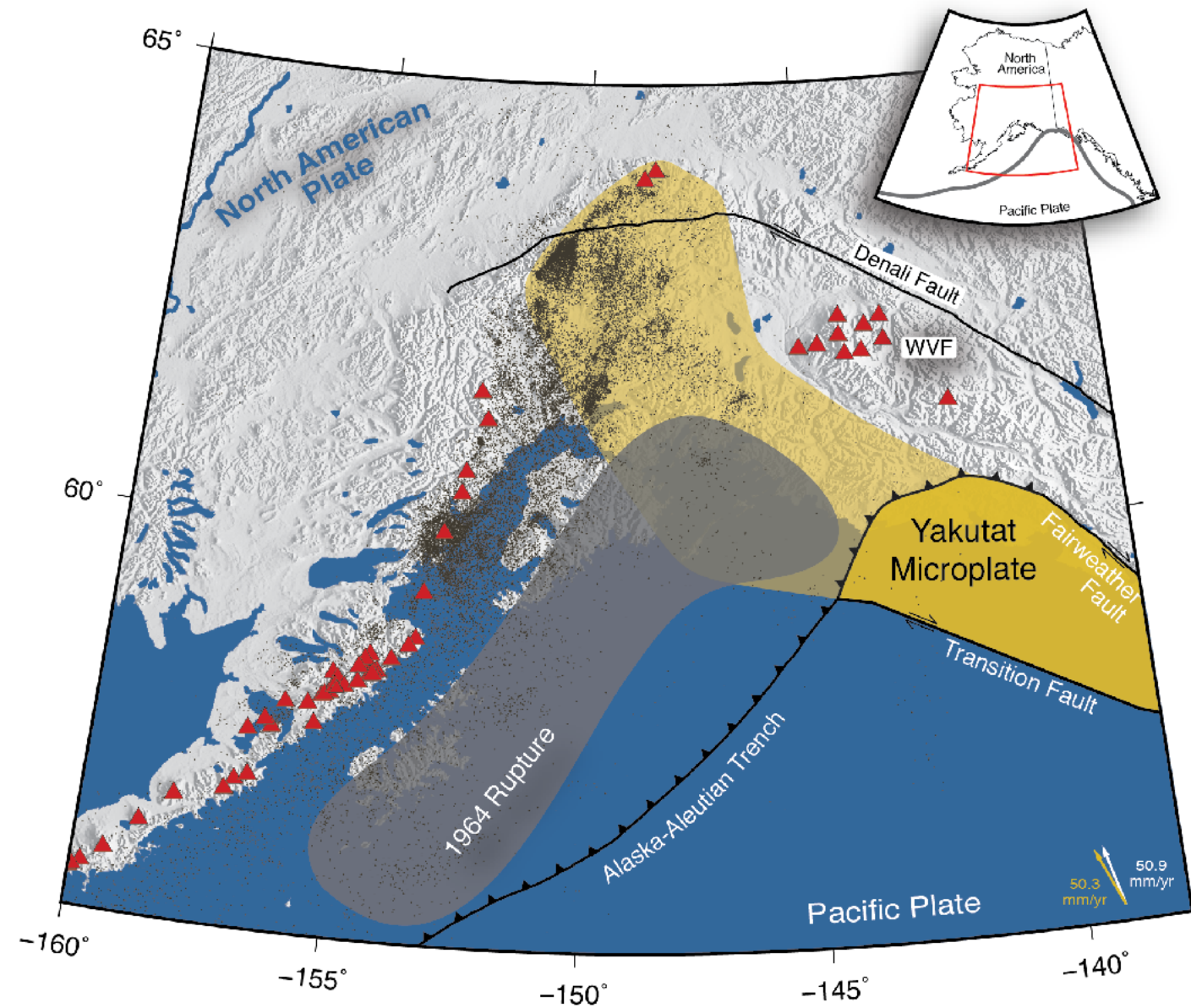
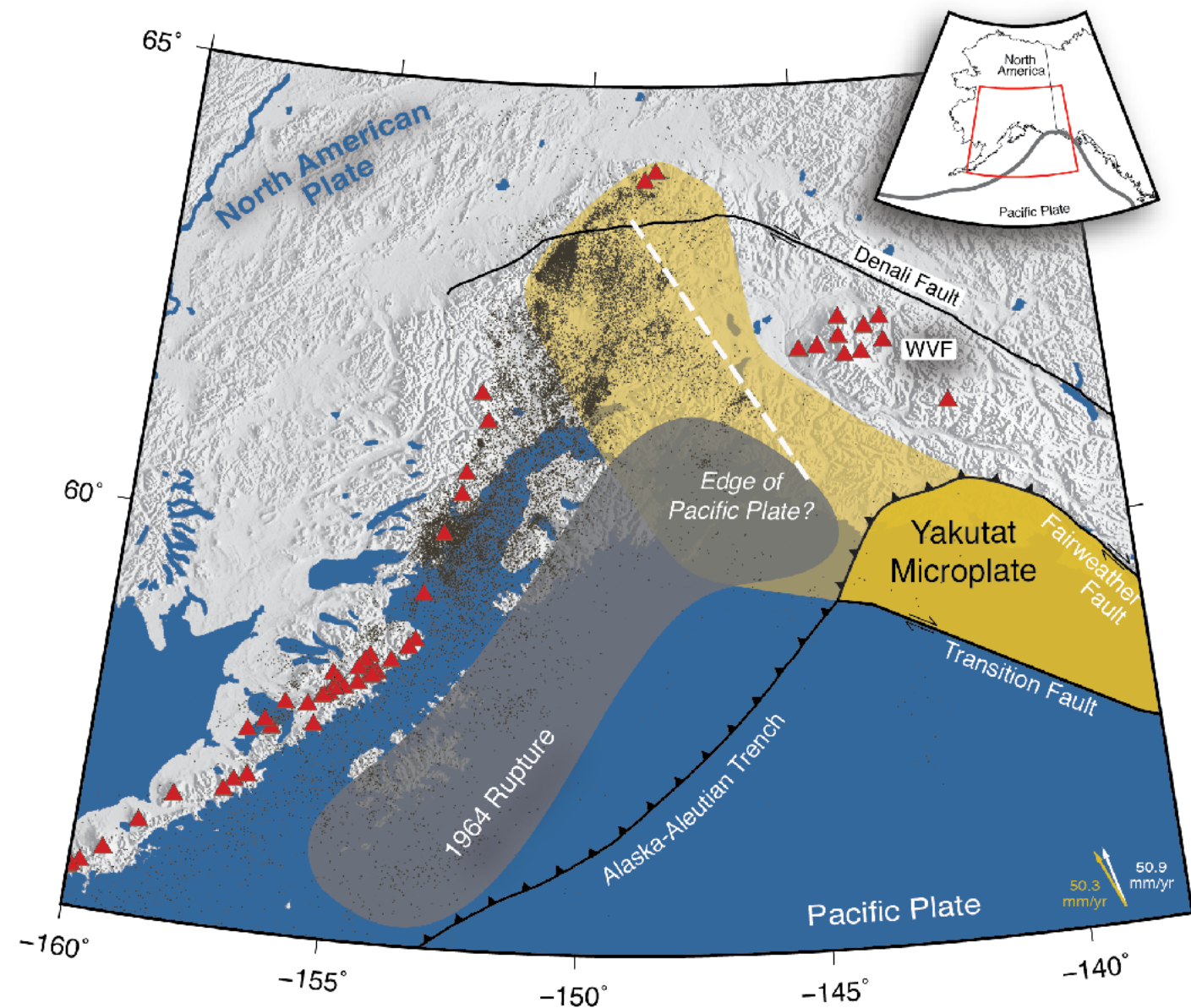


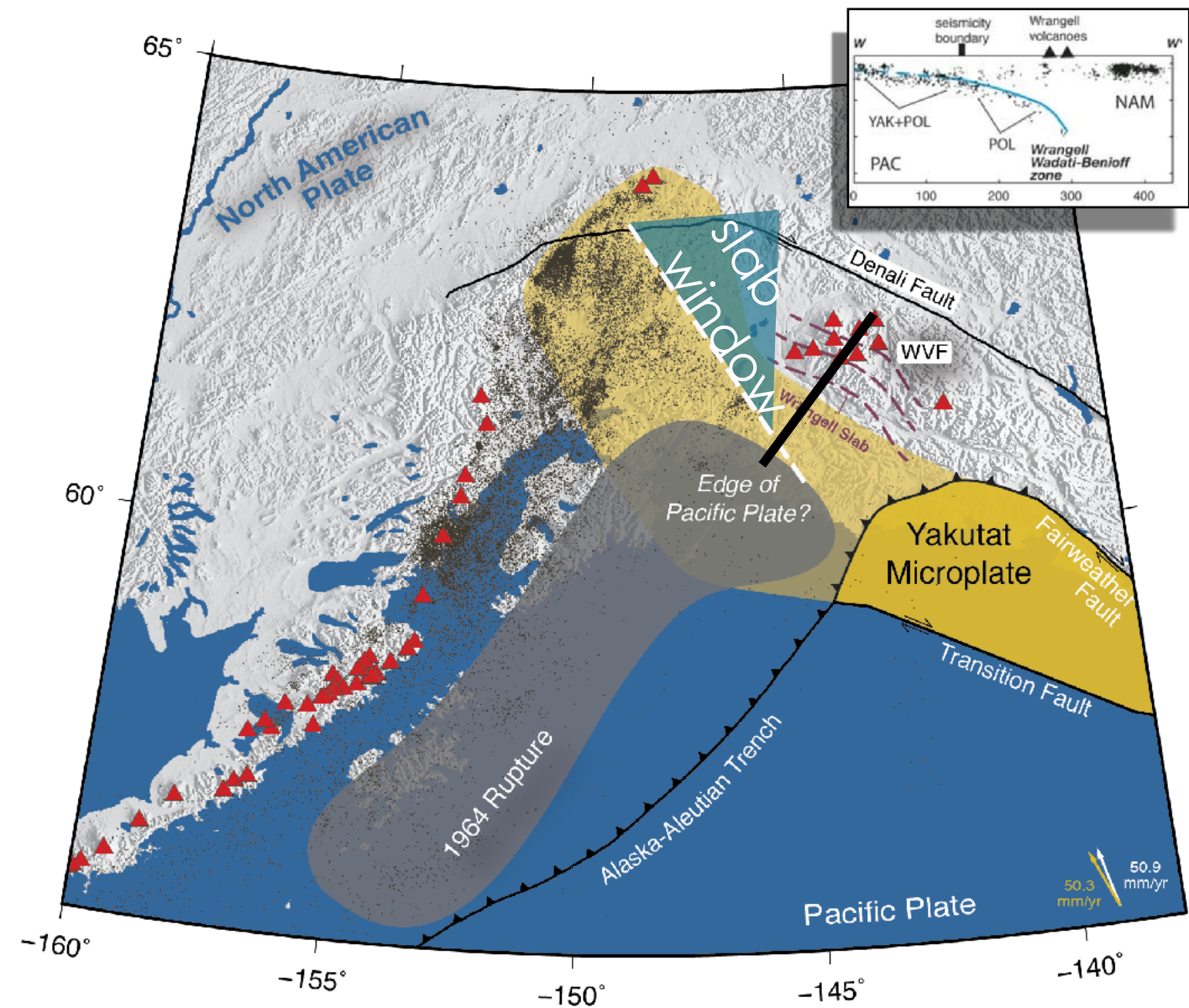
PLATE BOUNDARY EDGE?

ALONG-STRIKE **TERMINUS** TO INTRASLAB
SEISMICITY & **1964 RUPTURE** AREA



WRANGELL SLAB?

FAINT **WVF BENIOFF ZONE**, MIGHT IMPLY
SLAB WINDOW?



Fujioka, 2008

QUESTIONS

- What happens to the plate boundary at the eastern edge?
- What is the relationship between the Pacific Plate and the Yakutat terrane?
- What is source of Wrangell volcanism?
- **How can tremor and slow slip help answer these questions?**

SLIP IN SOUTH-CENTRAL AK

2009-2013

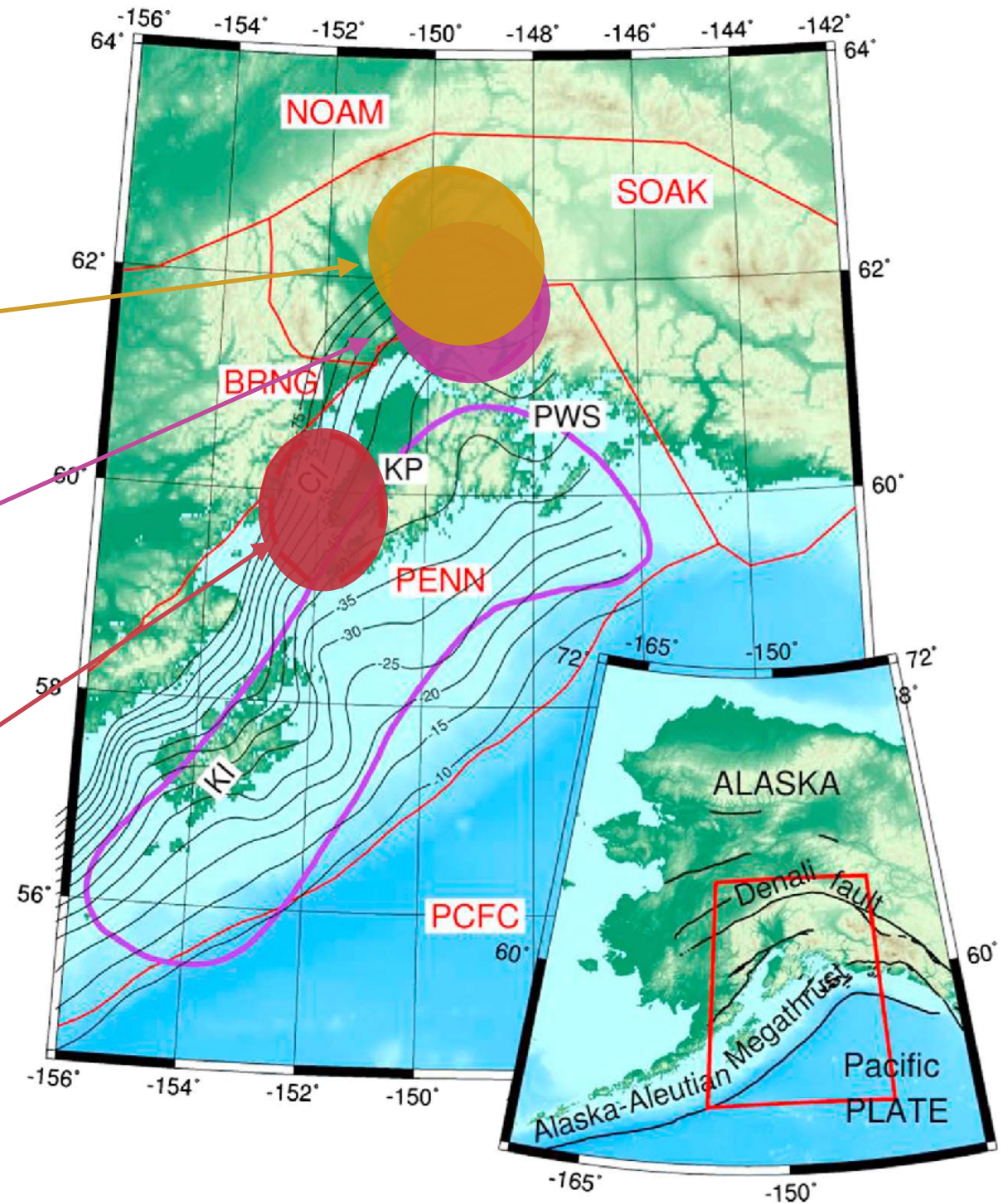
[Fu & Freymueller, 2013]

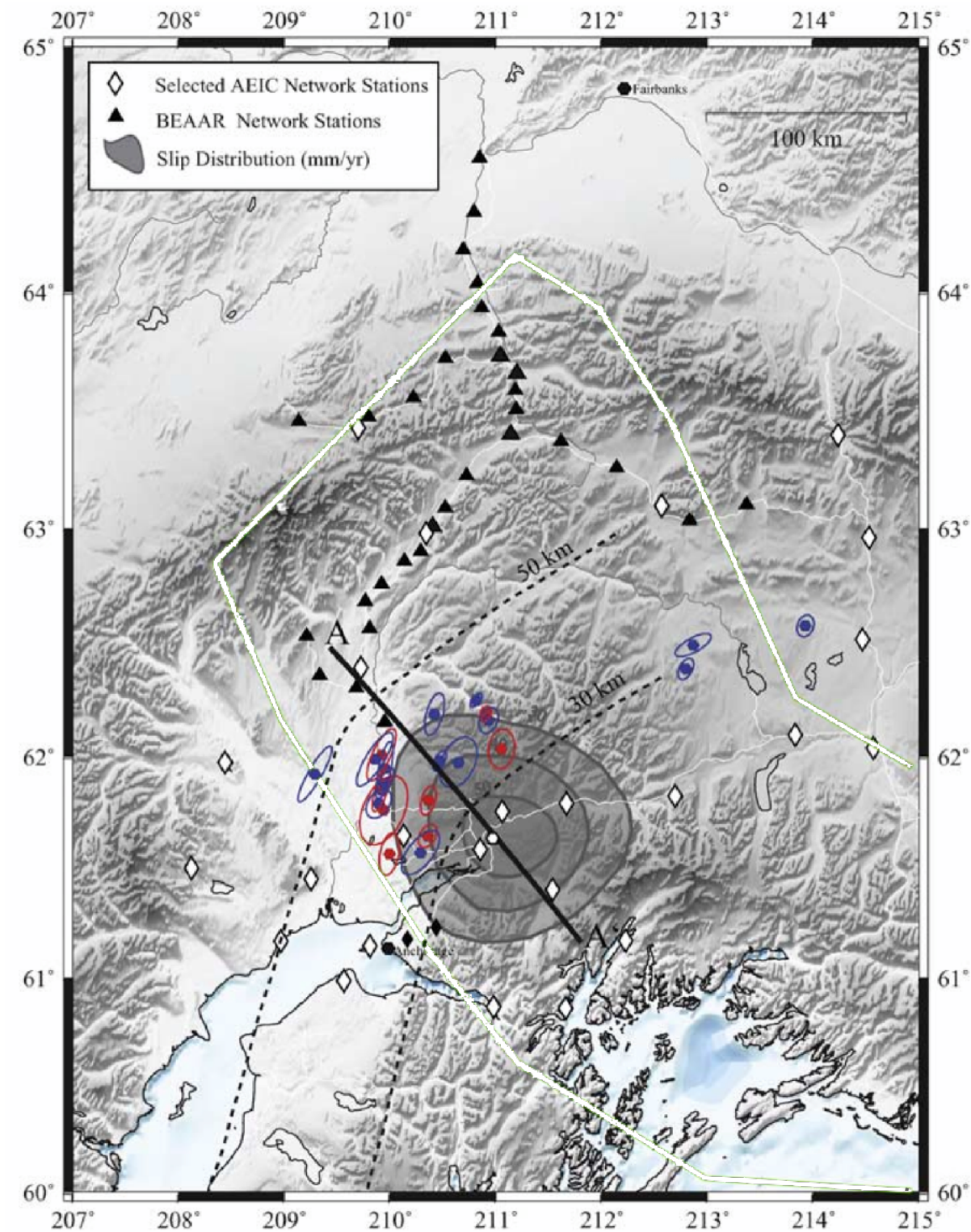
1998-2001

[Otha et al., 2006]

2010-2011

[Wei et al., 2012]





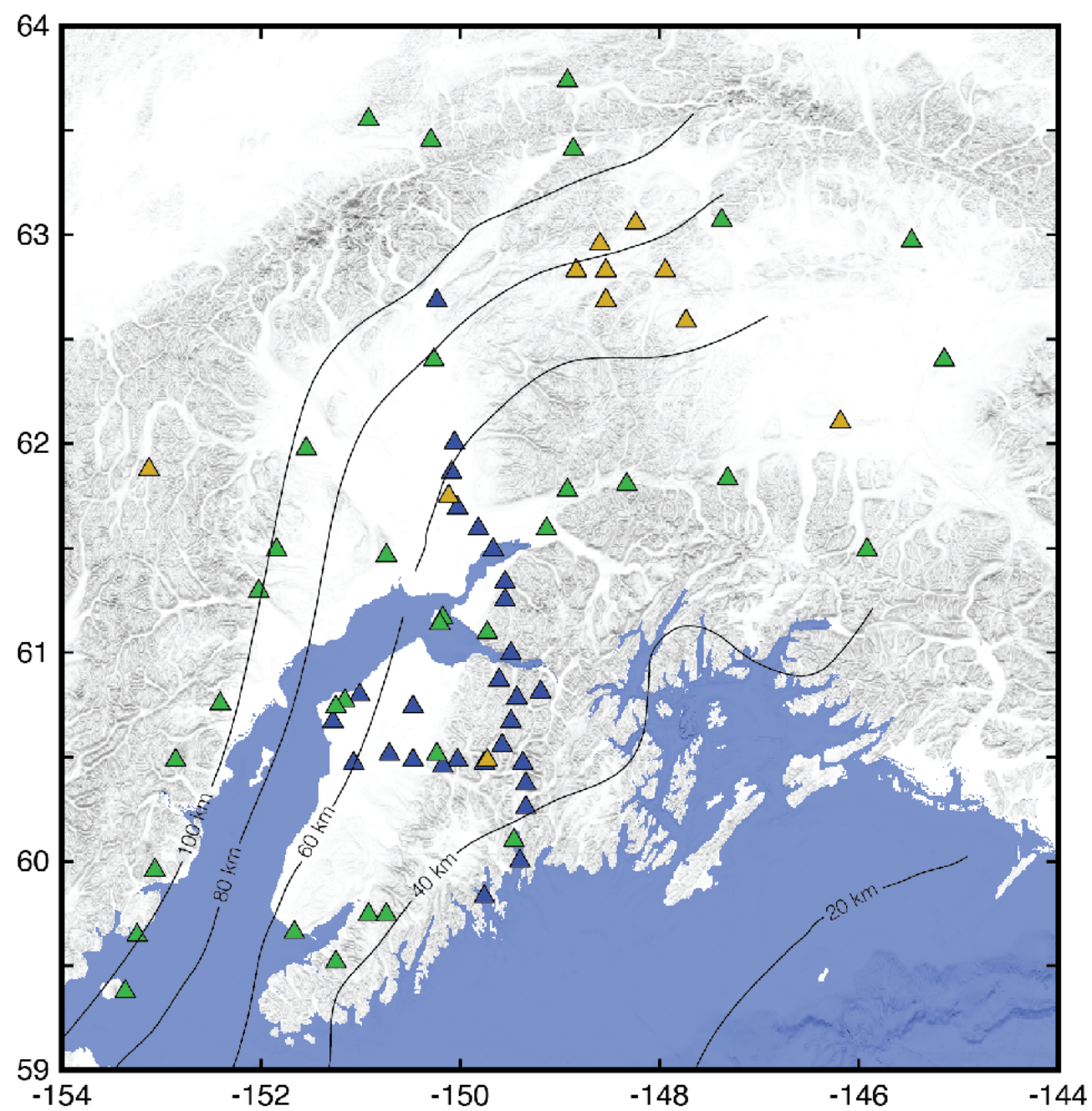
TREMOR IN SOUTH-CENTRAL AK

A few bursts observed down dip of
1999-2001 slow slip event

I'll perform a systematic
search of all available data
from 2007-2016

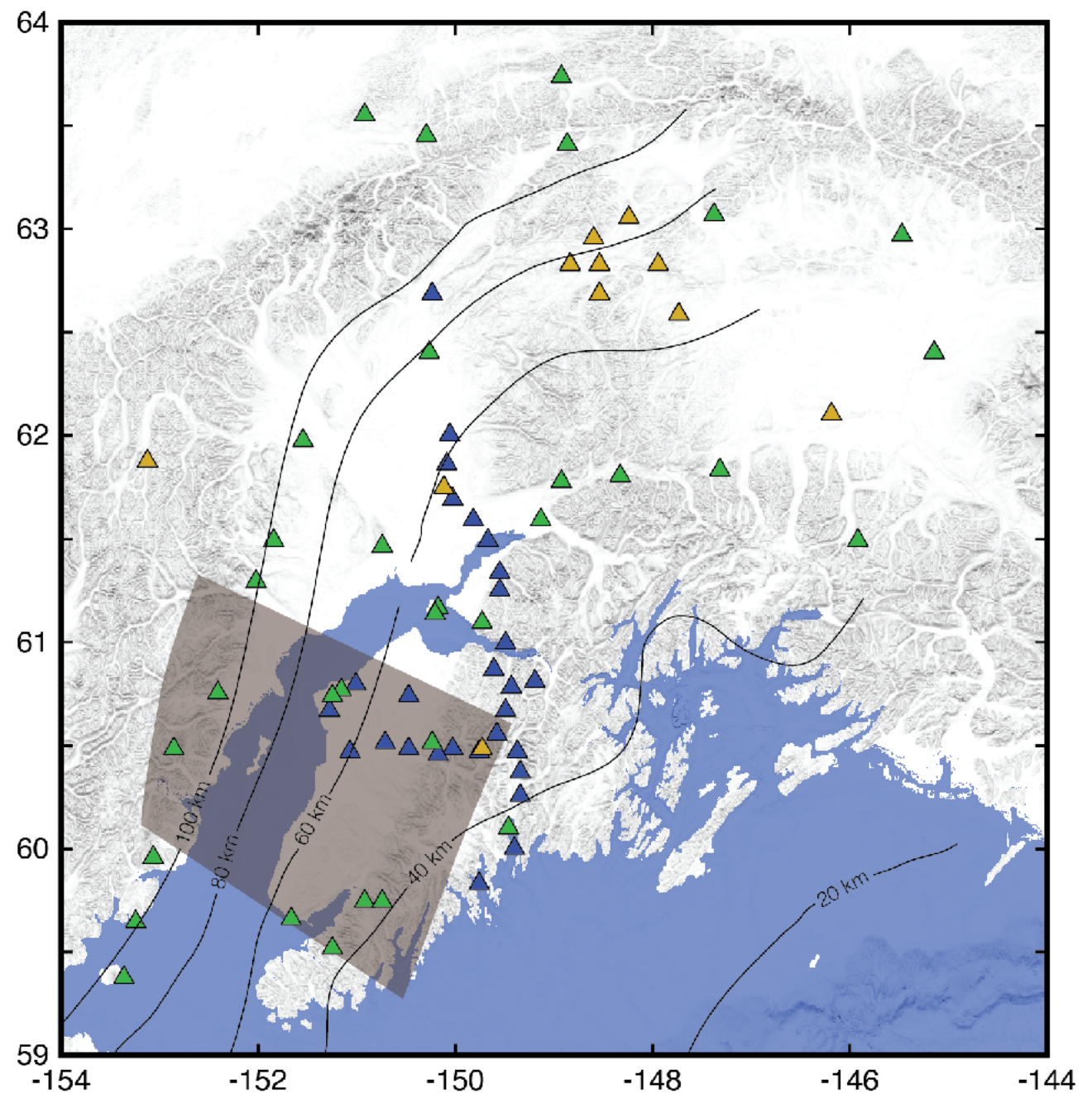
erson et al., EPSL 2009

STATION COVERAGE



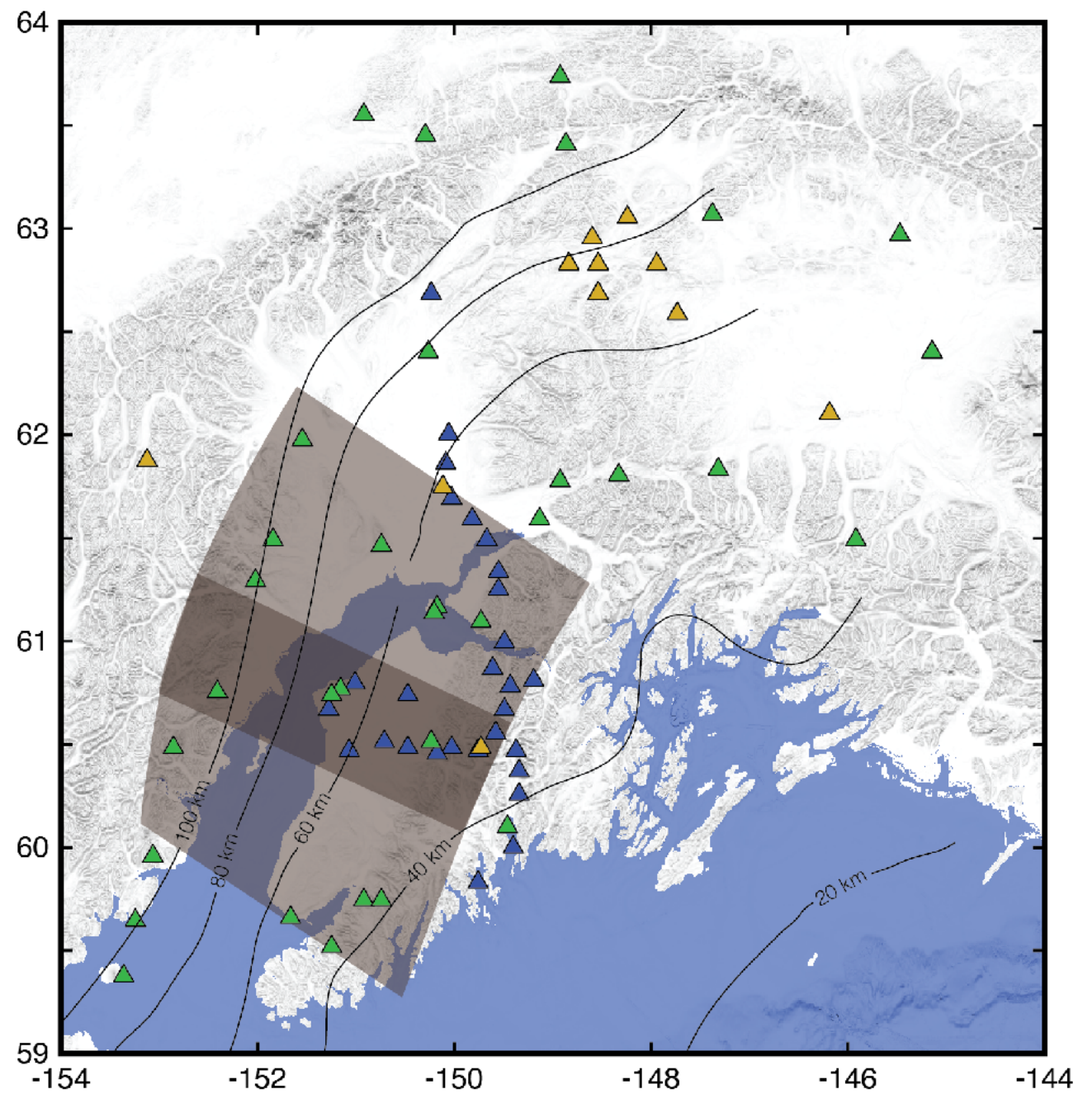
GRID SEARCH

5 OVERLAPPING GRIDS



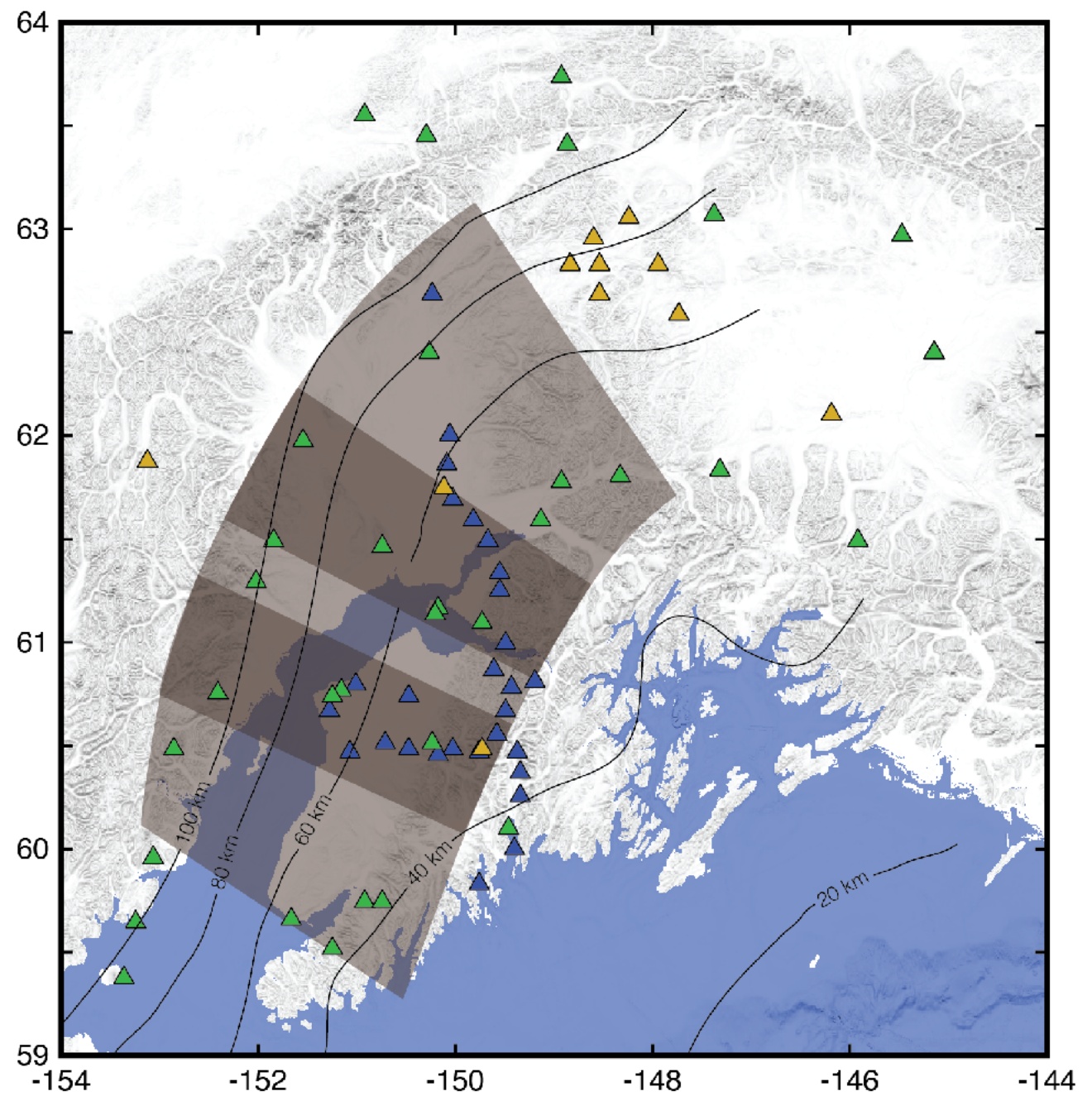
GRID SEARCH

5 OVERLAPPING GRIDS



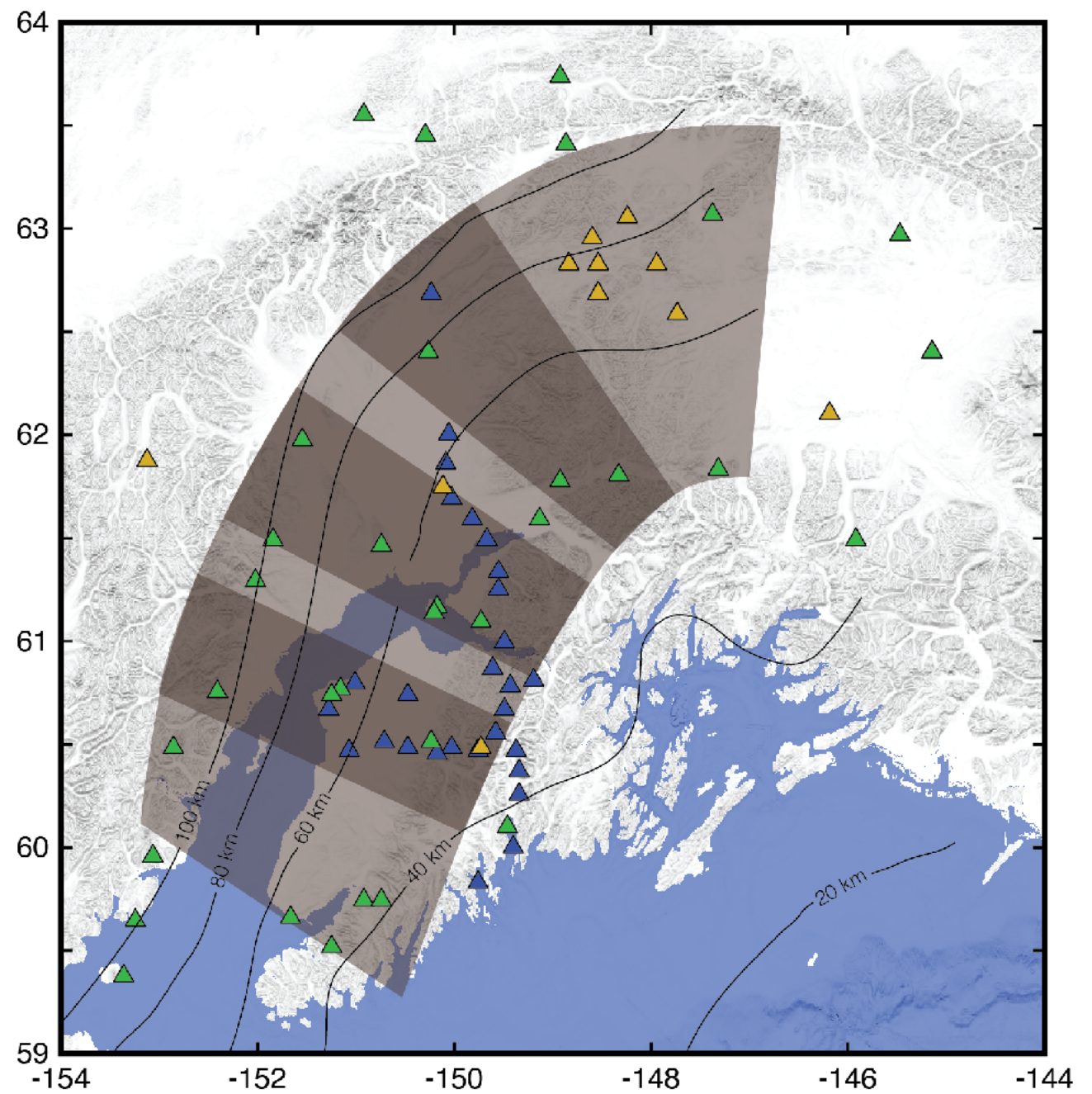
GRID SEARCH

5 OVERLAPPING GRIDS



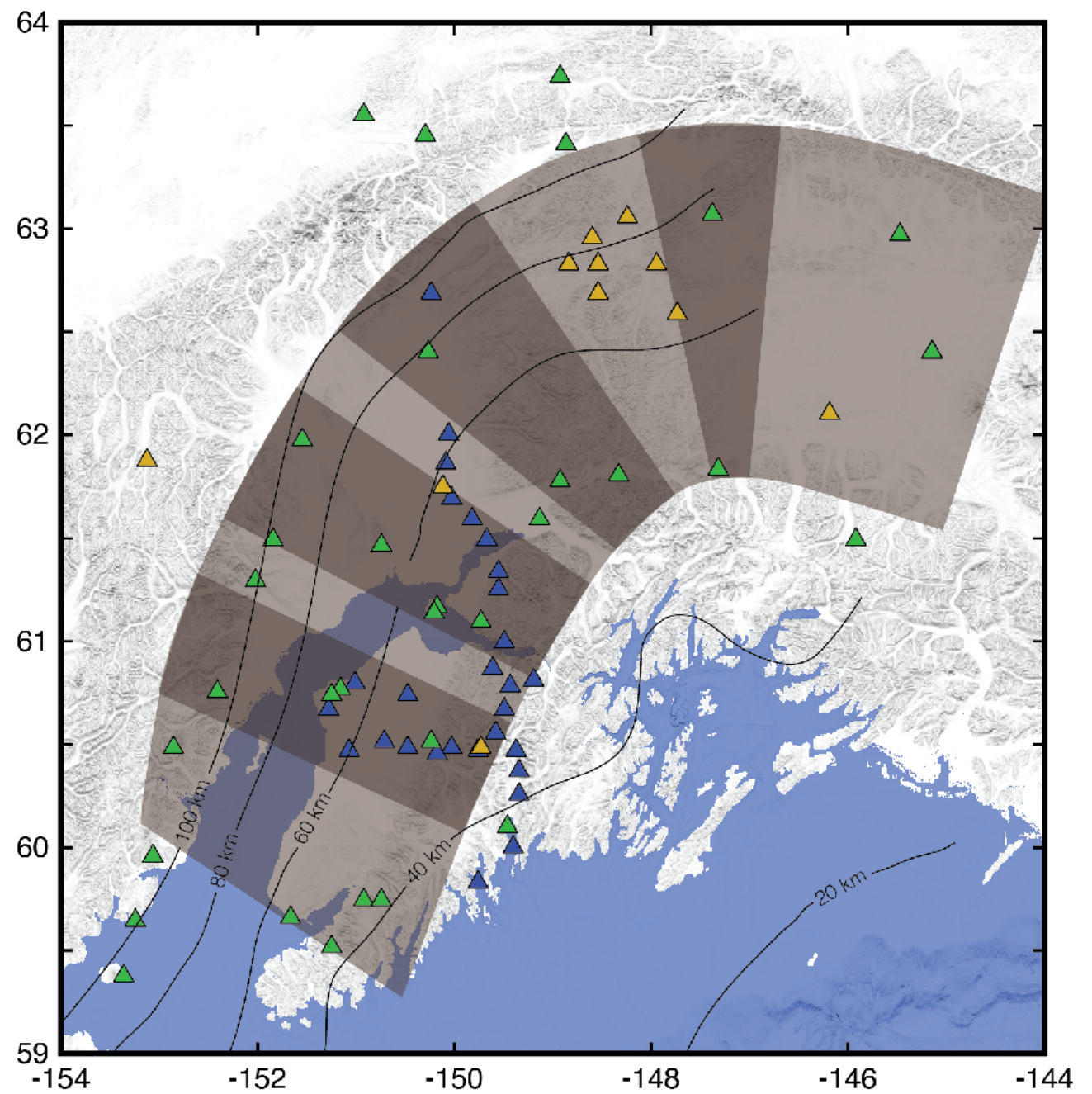
GRID SEARCH

5 OVERLAPPING GRIDS

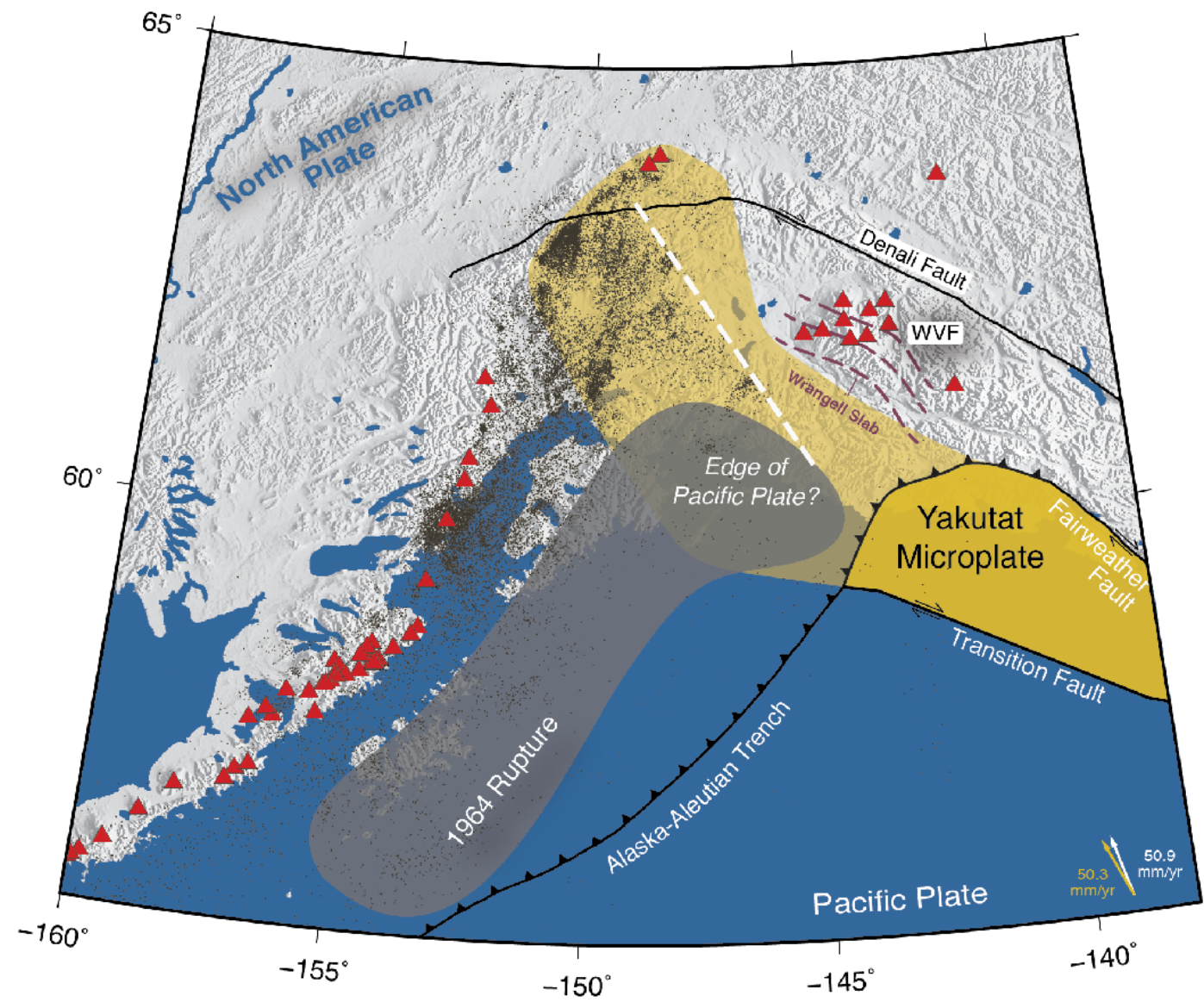


GRID SEARCH

5 OVERLAPPING GRIDS

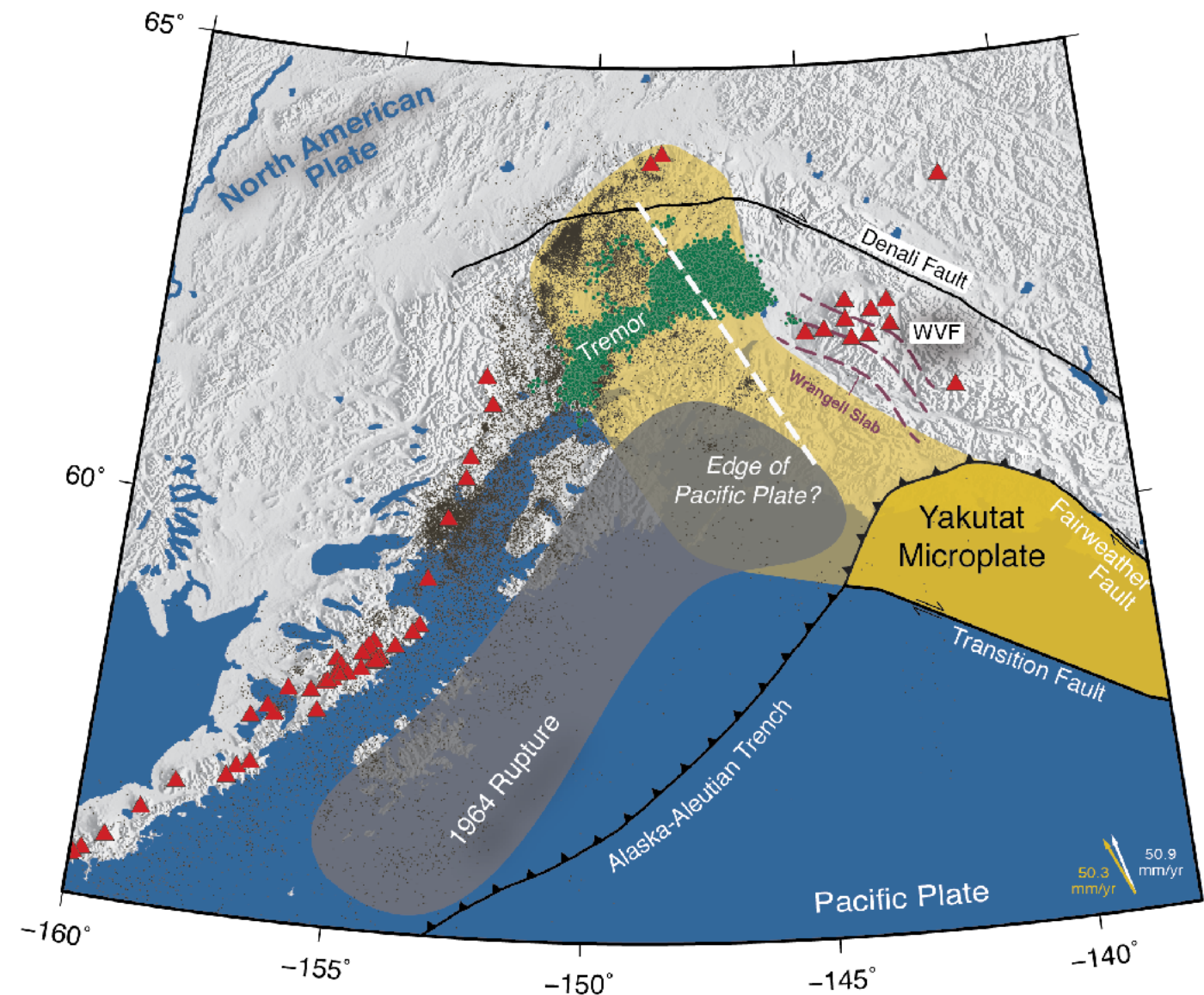


RESULTS



11,000 EPICENTER S

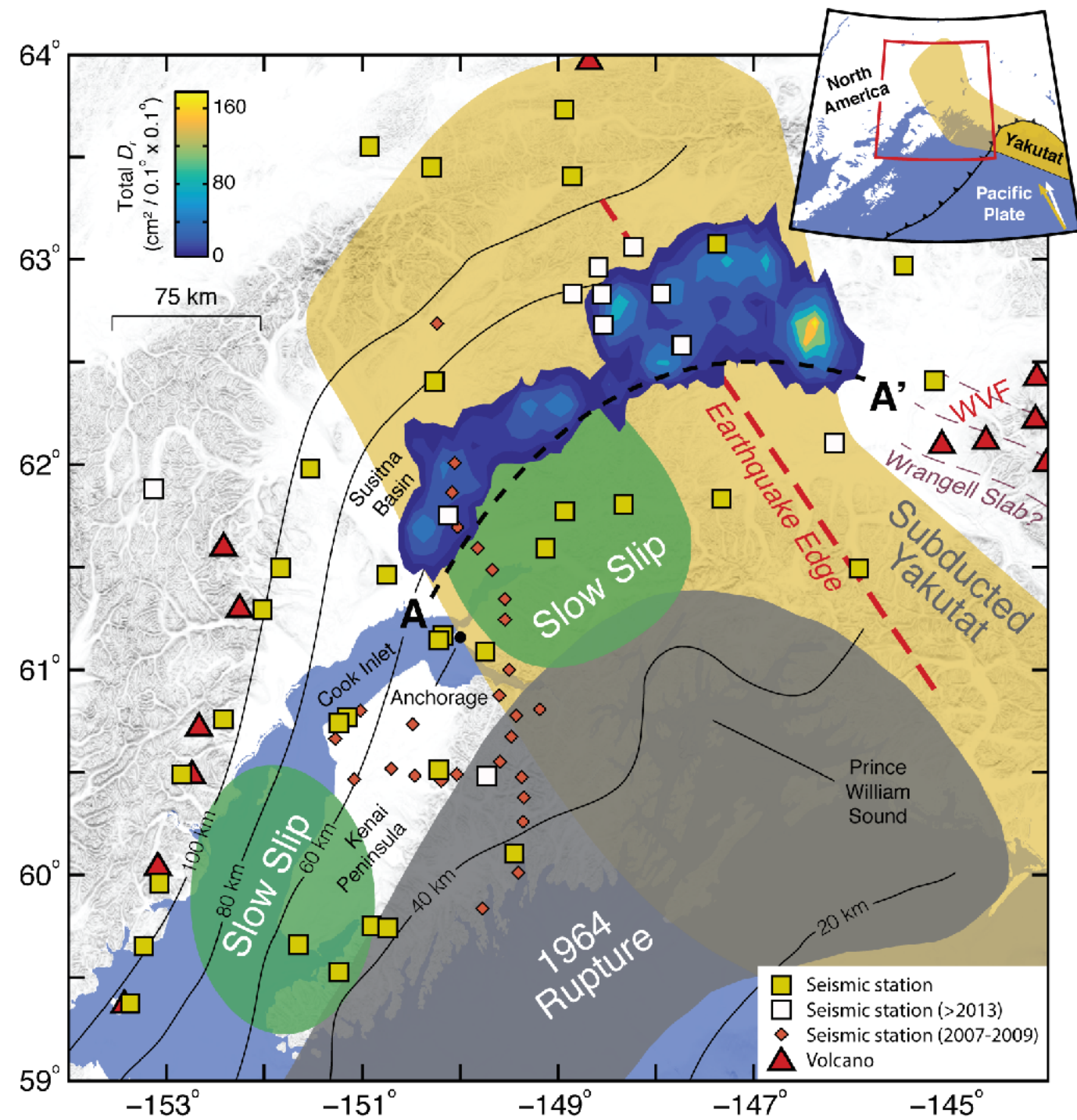
CORRELATES WITH **YAKUTAT** AND
EXTENDS **BEYOND EARTHQUAKES**



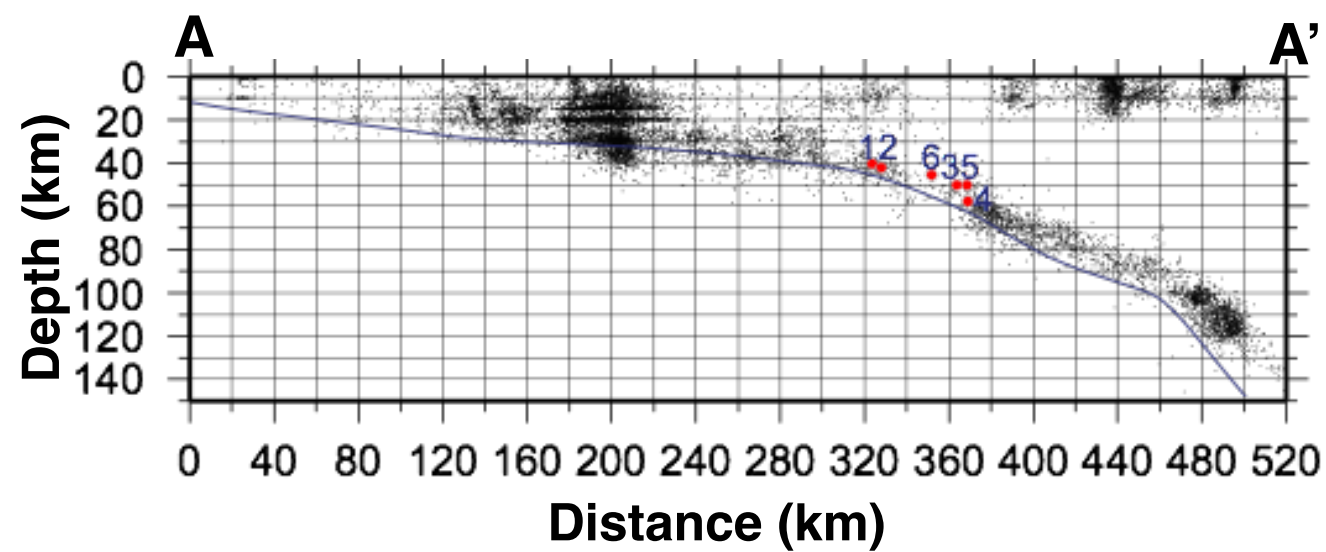
Wech, Geology 2016

TREMOR ENERGY

DOWN-DIP OF SLOW SLIP, AND EXTENDS
PLATE BOUNDARY

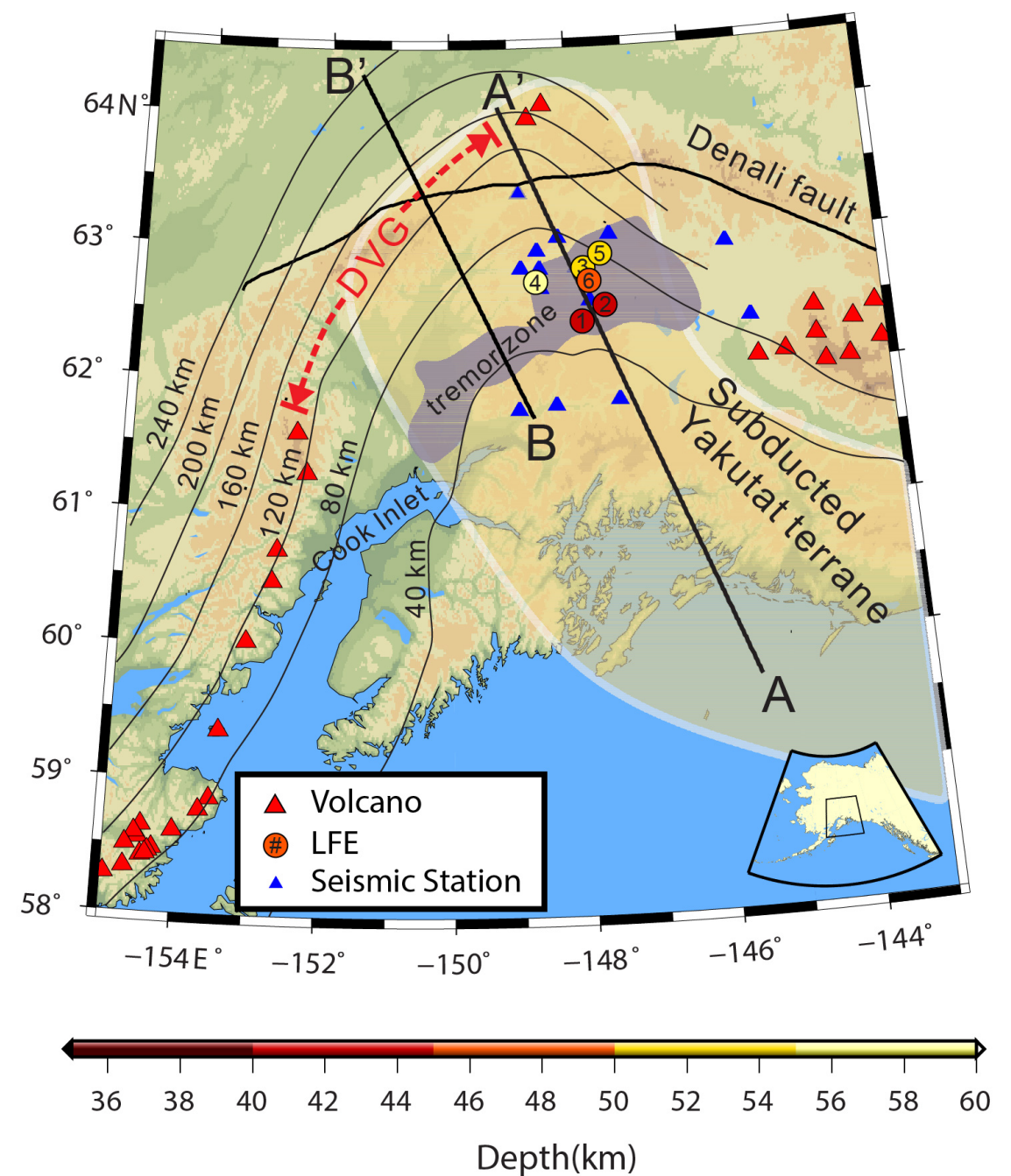


Wech, Geology 2016



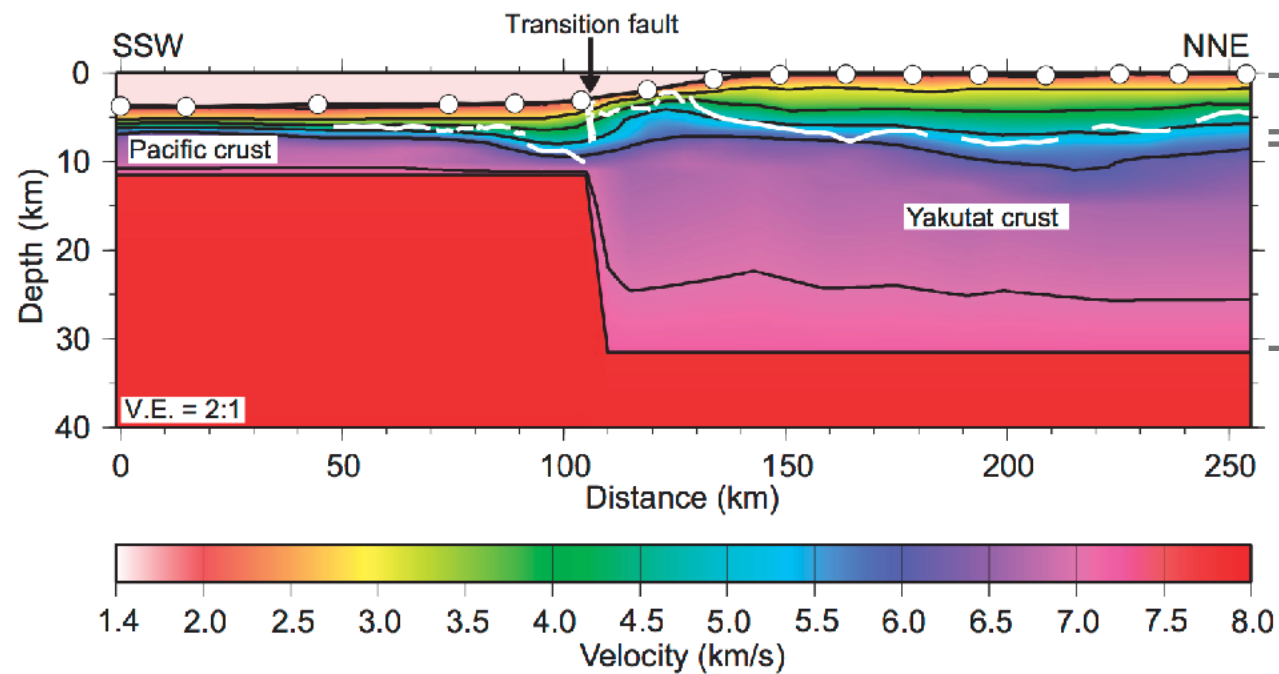
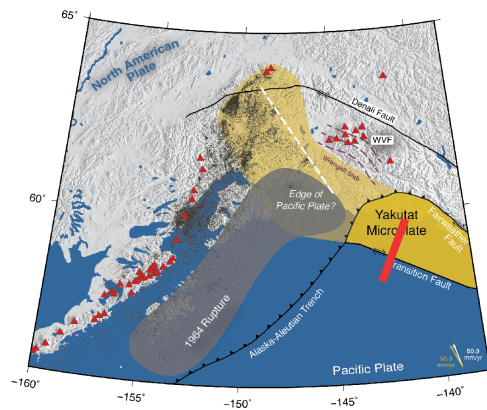
YAKUTAT LFEs

40-58 KM DEEP AT TOP OF ENVELOPE OF SEISMICITY



Chuang et al., Geology 2017

TOP OF YAKUTAT?



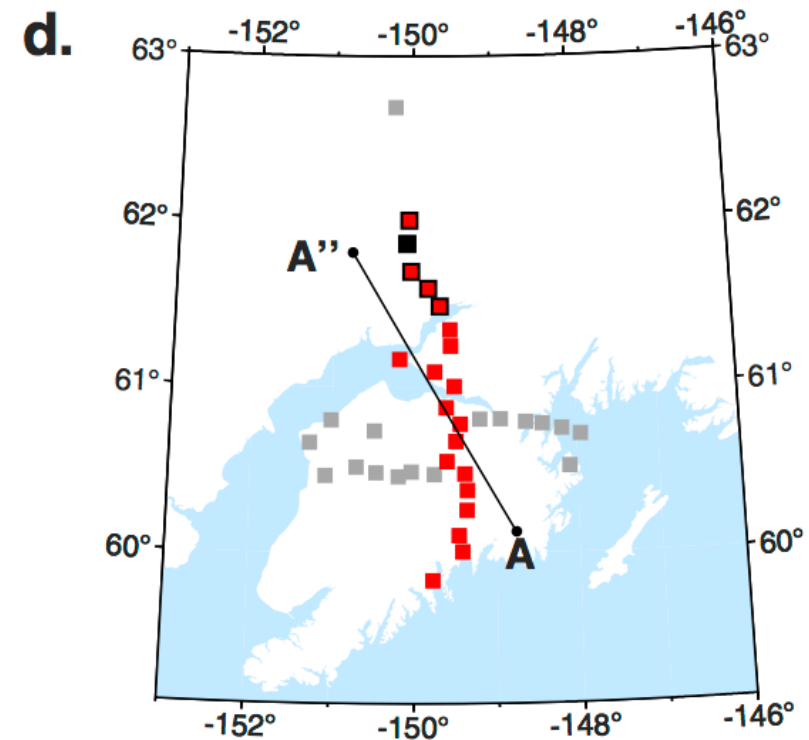
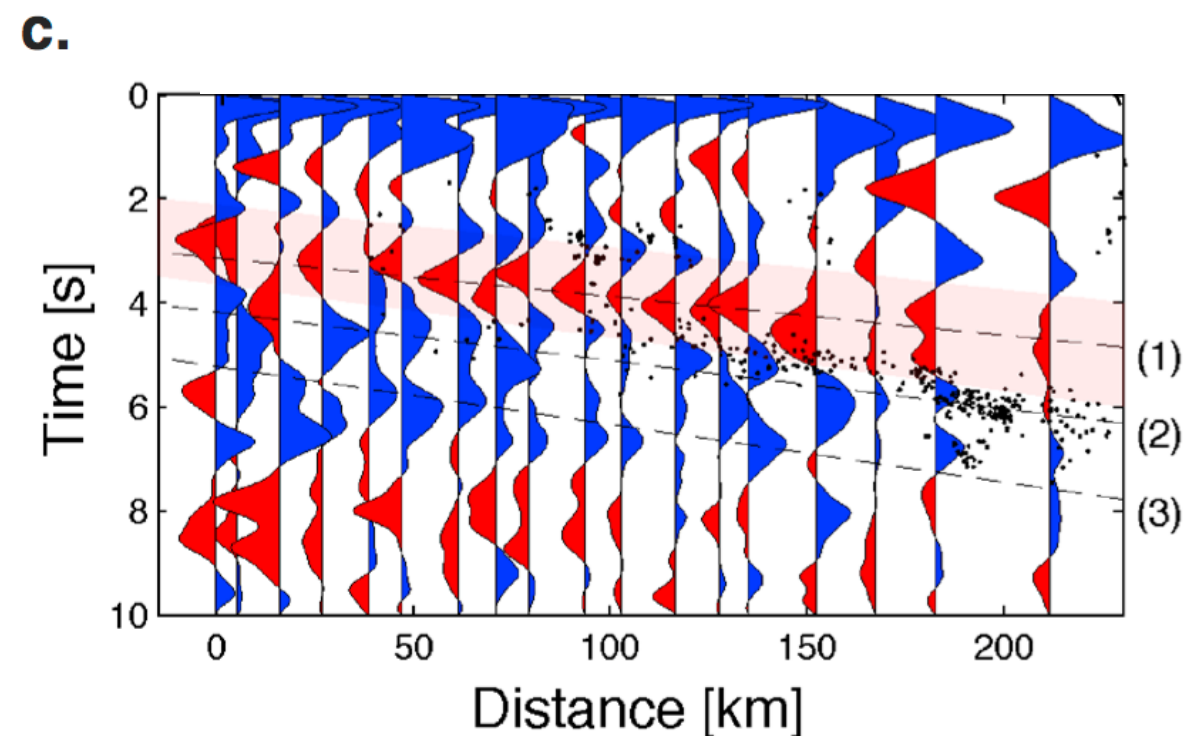
thick sediments

thick oceanic plate

(becomes low velocity channel)

YAKUTAT LOW VELOCITY ZONE

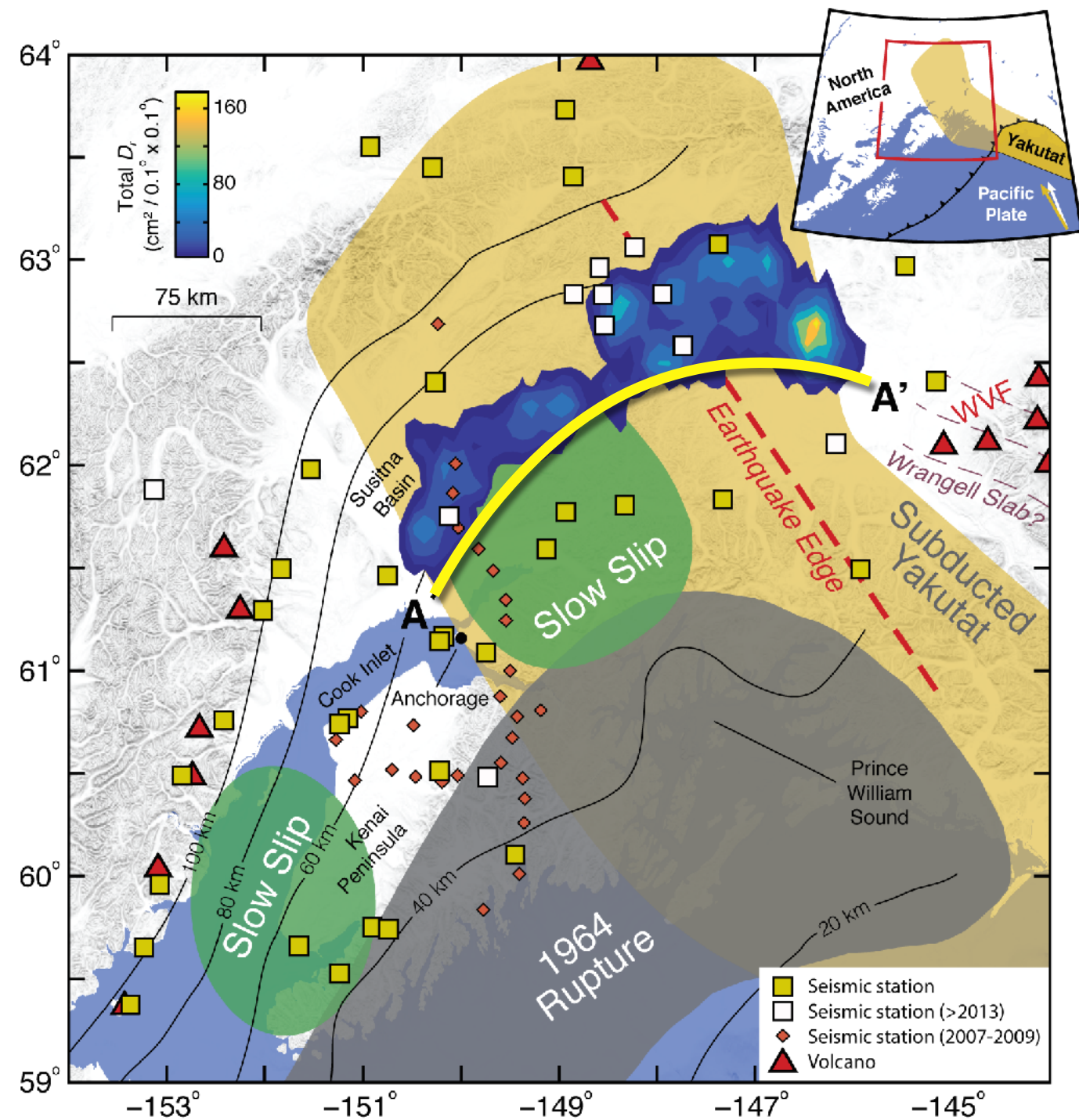
Receiver functions: LVZ at interface with North American Plate



low v_s channel → thick, fluid-saturated sediments
→ high pore pressure → weak interface
consistent with global observations

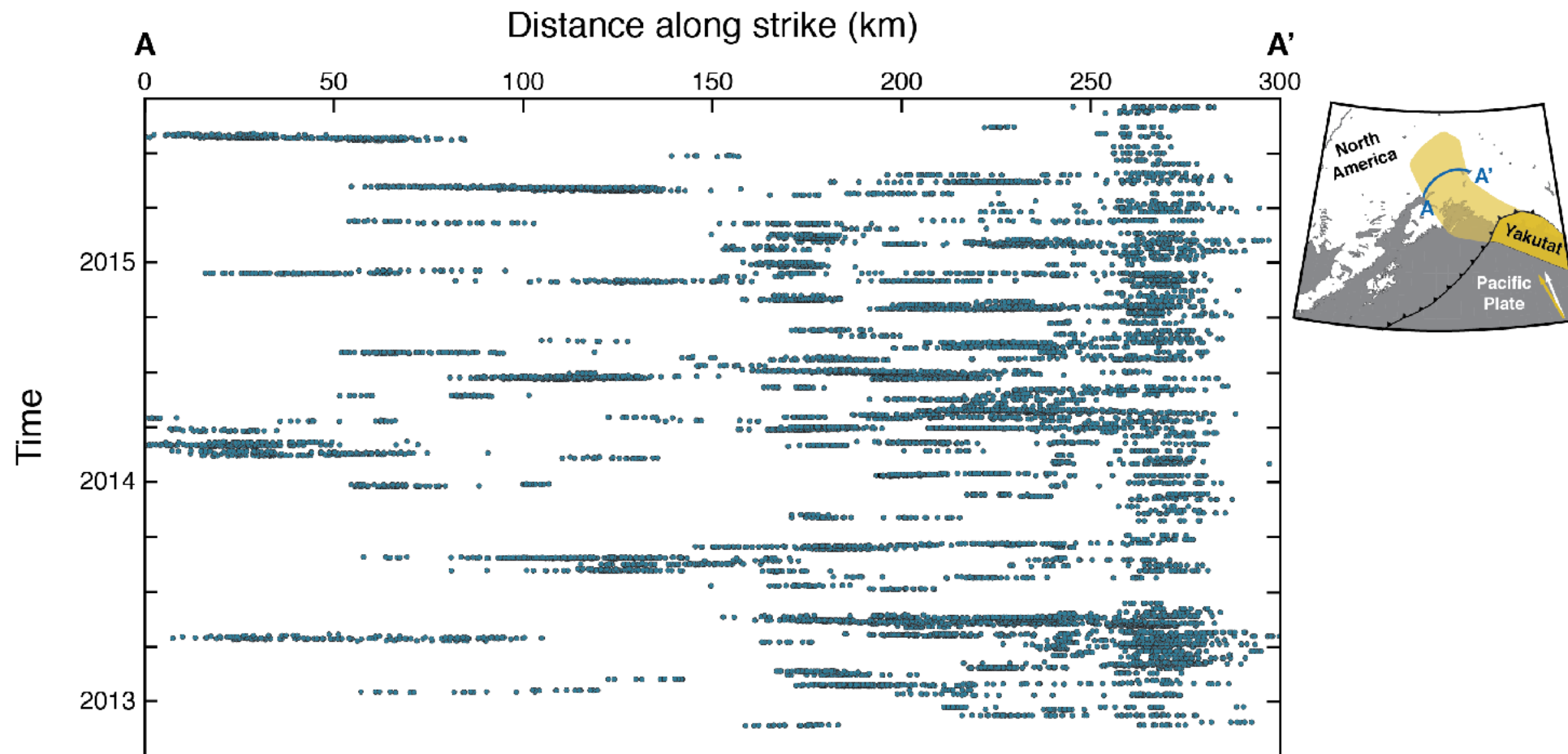
TREMOR - EARTHQUAKE RELATIONSHIP

ANY CONNECTION?



Wech, Geology 2016

ALONG-STRIKE PROFILE



space-time plot shows **variable periodicity** along-strike

ALONG-STRIKE PROFILE

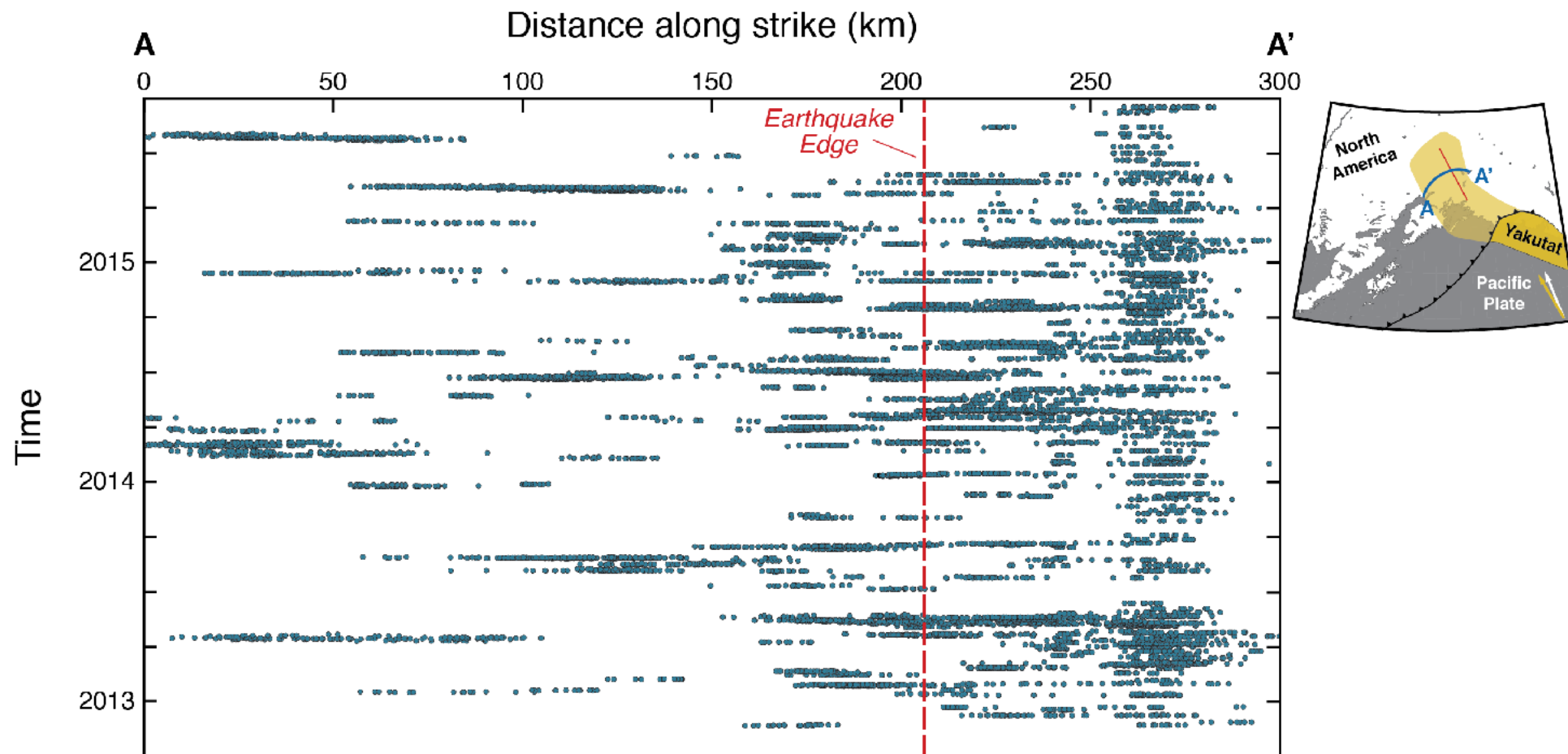
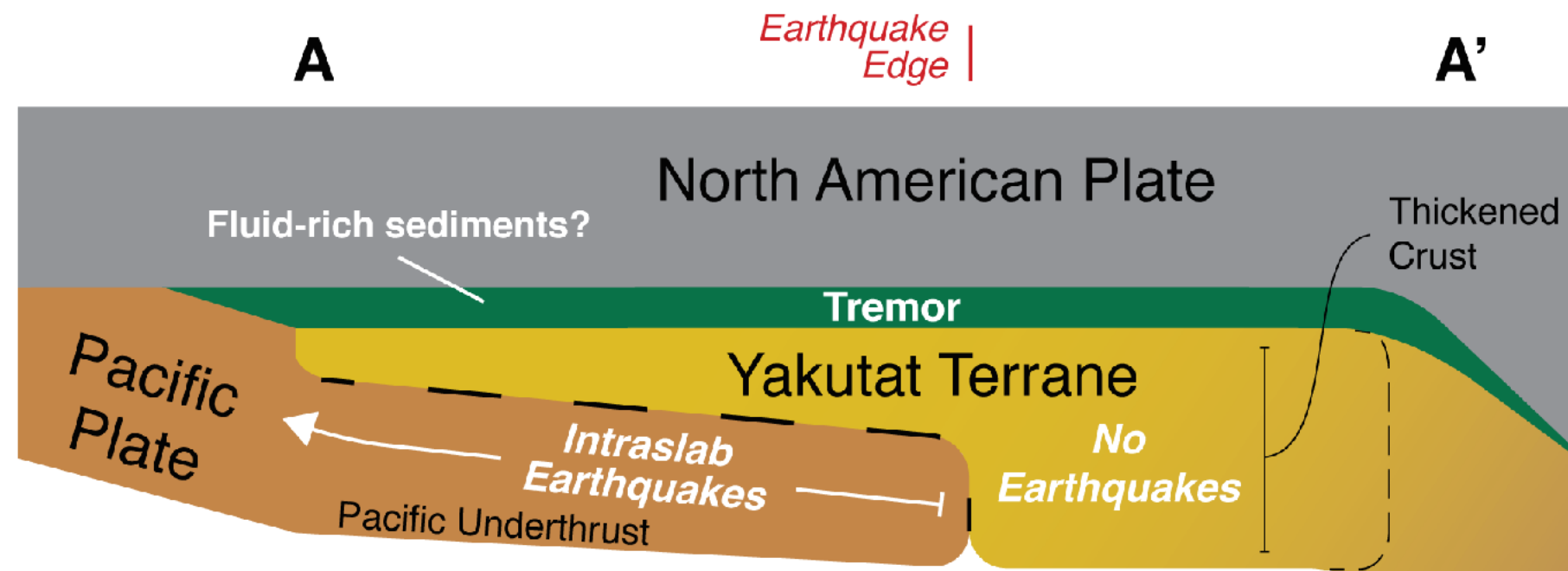


plate boundary activity **indifferent**
to controls on **intraslab seismicity**

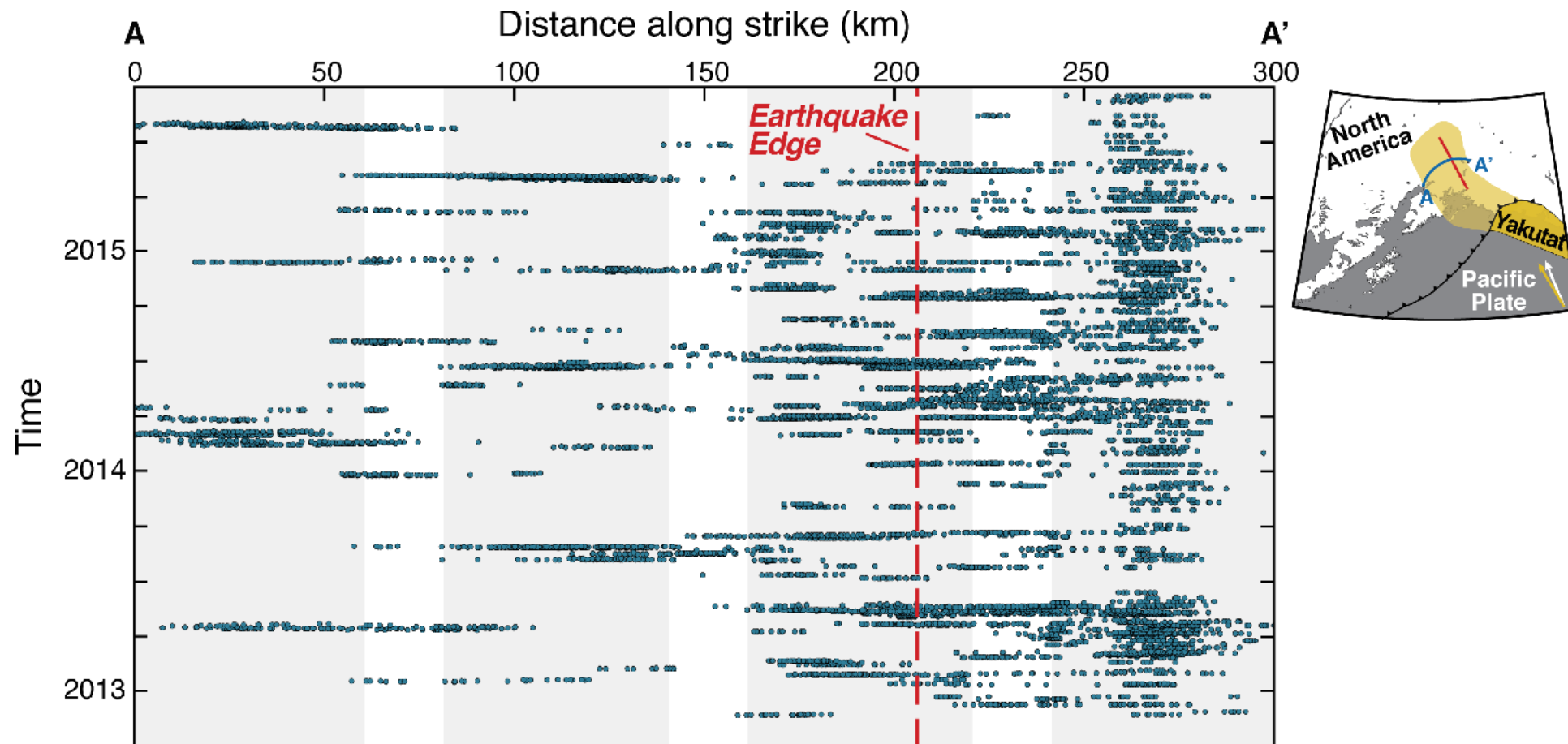
WHY DO EARTHQUAKES STOP, BUT TREMOR CONTINUES?



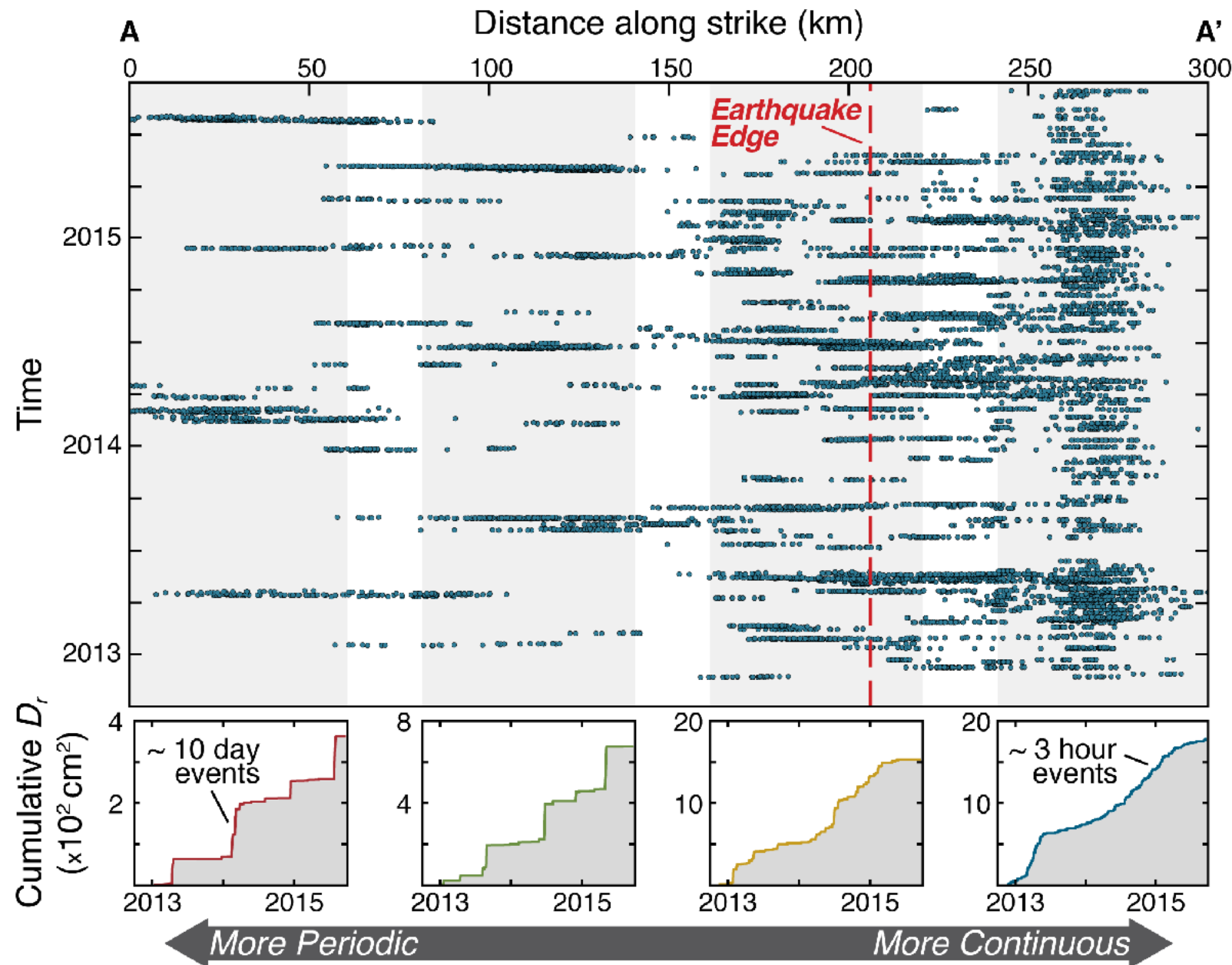
tremor occurs at Yakutat interface, but earthquakes only in **Pacific Plate**

Wech, Geology 2016

ALONG-STRIKE PROFILE



ALONG-STRIKE PROFILE

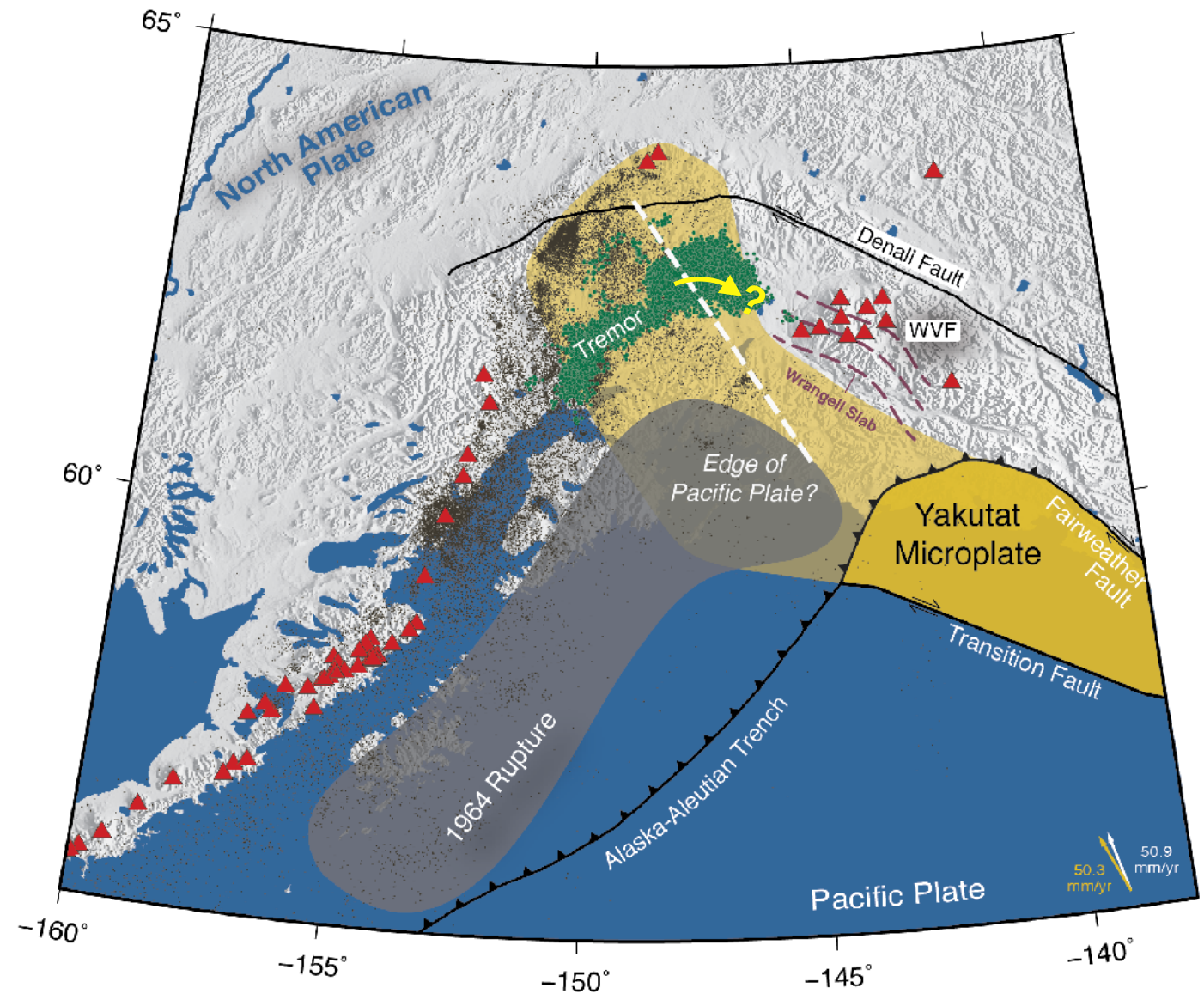


If tremor =
slippages from
large, infrequent
in the west &
to smaller, more
frequent, aseismic
east

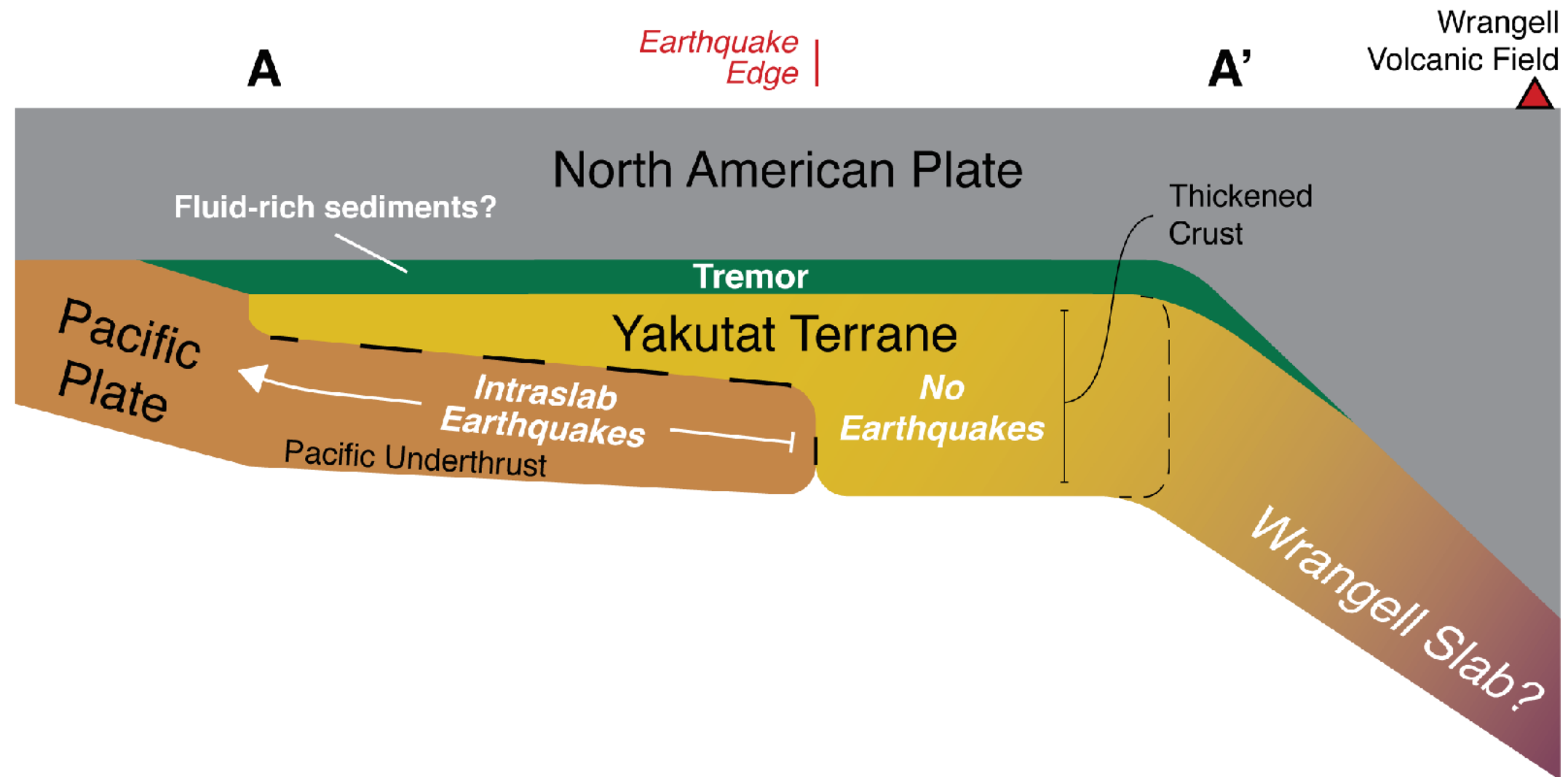
*same trend seen
 with increasing
 depth in
 subduction zones
 and strike slip

CONTINUED PLATE BOUNDARY

EXTRAPOLATING TREMOR TREND MIGHT
MEAN **MORE ASEISMIC SLIP SE?**

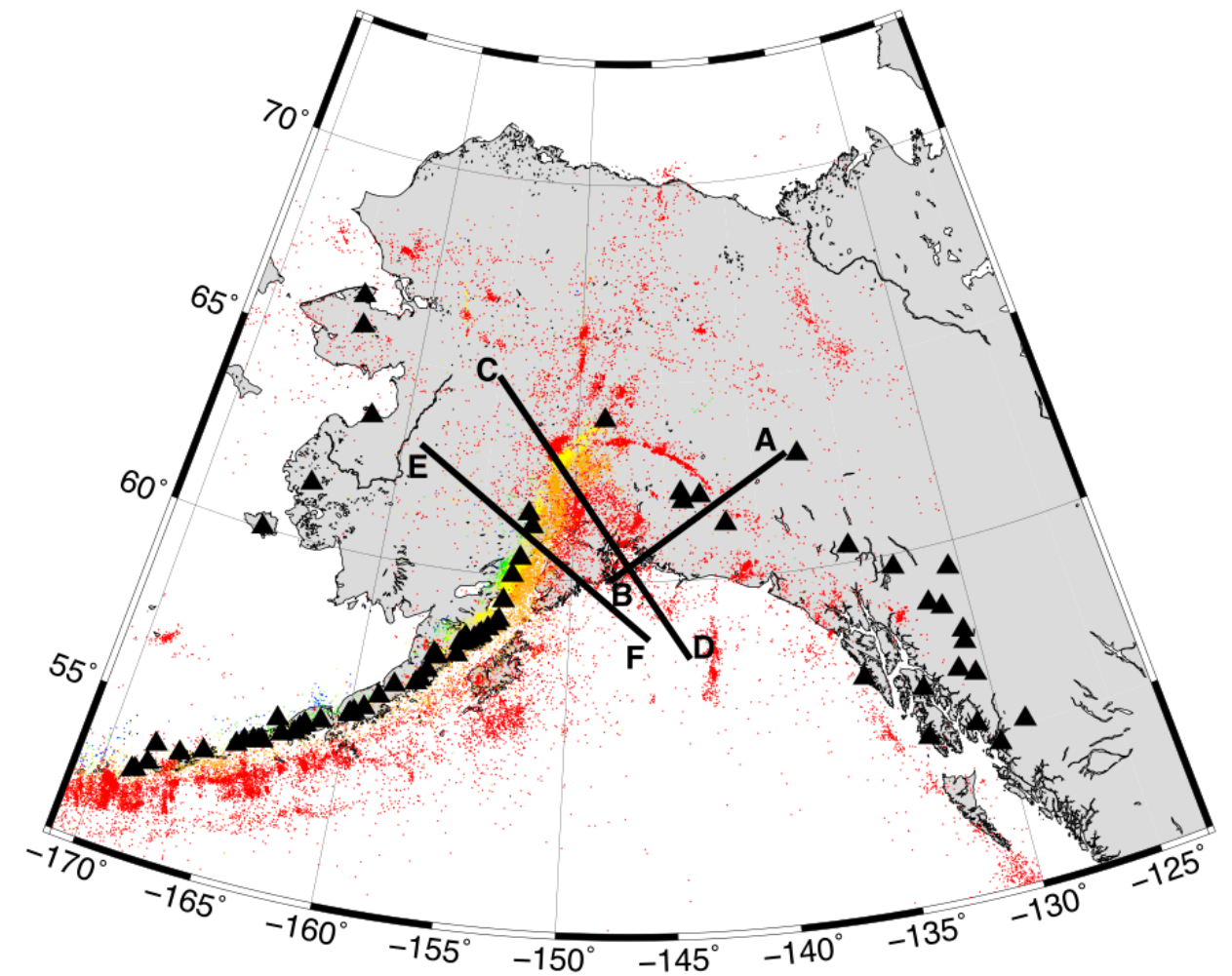
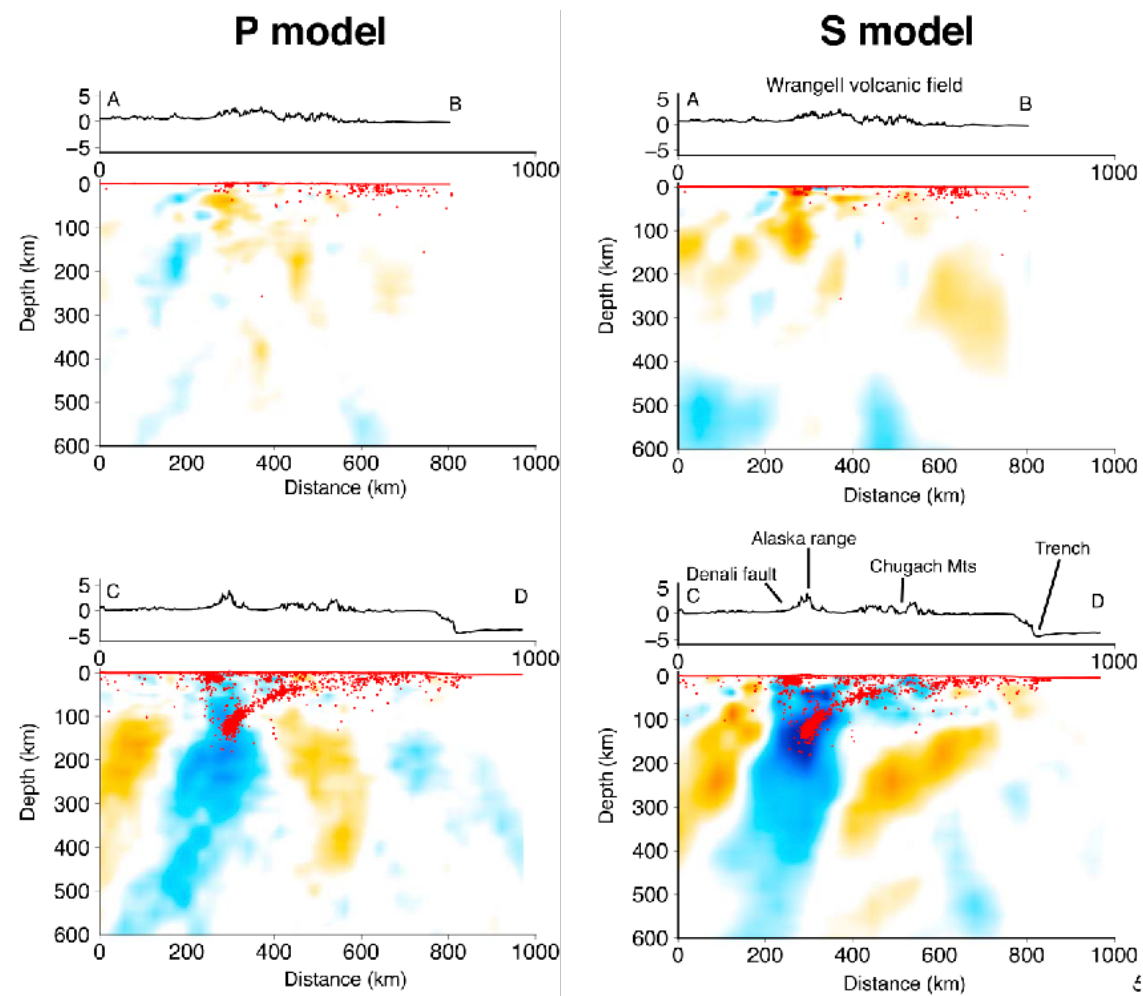


CARTOON MODEL

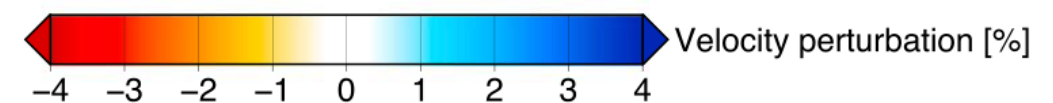


interface transitions to aseismic Wrangell slab?

Wech, Geology 2016



WRANGELL SLAB?
NOT FROM TOMOGRAPHY

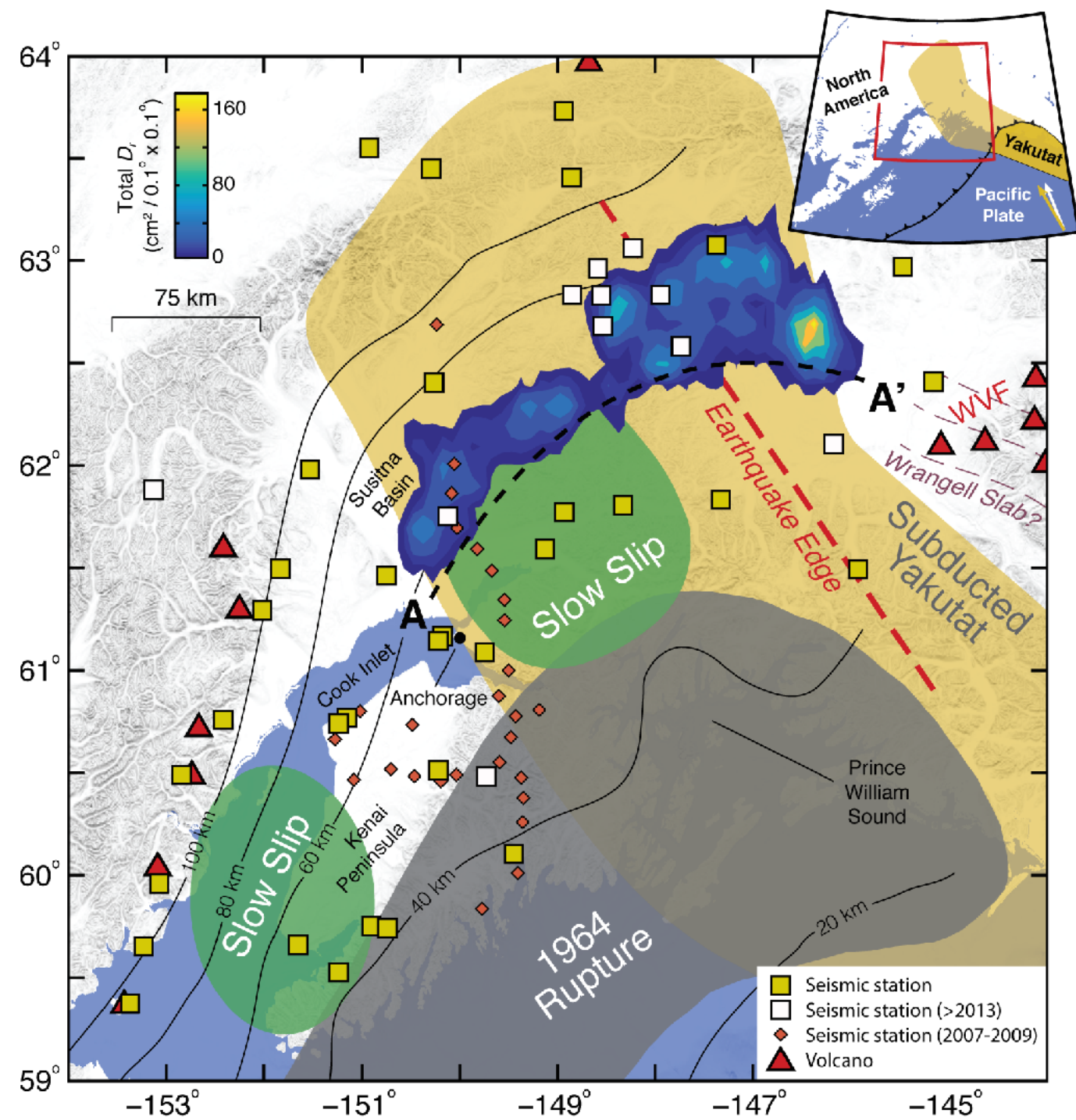


Martin-Short et al., GRL 2016

QUESTIONS

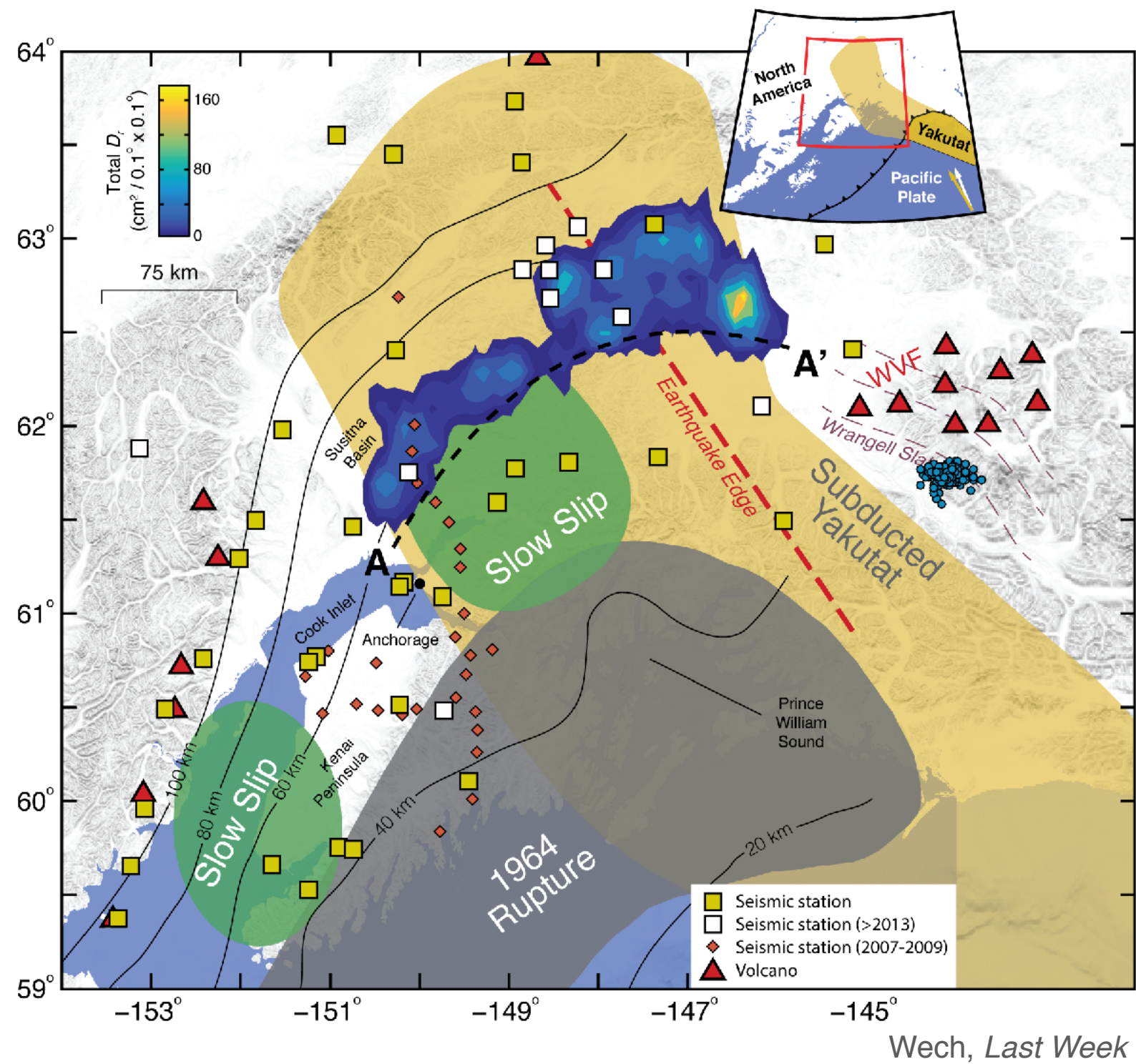
- What happens to the plate boundary at the eastern edge?
 - plate boundary continues, transitions to aseismic, may extend beneath Wrangells
- What is the relationship between the Pacific Plate and the Yakutat terrane?
 - combination of subducted oceanic plateau and Pacific Plate underthrusting
- What is source of Wrangell volcanism?
 - Unclear. Possibly oblique subduction of aseismic Wrangell slab

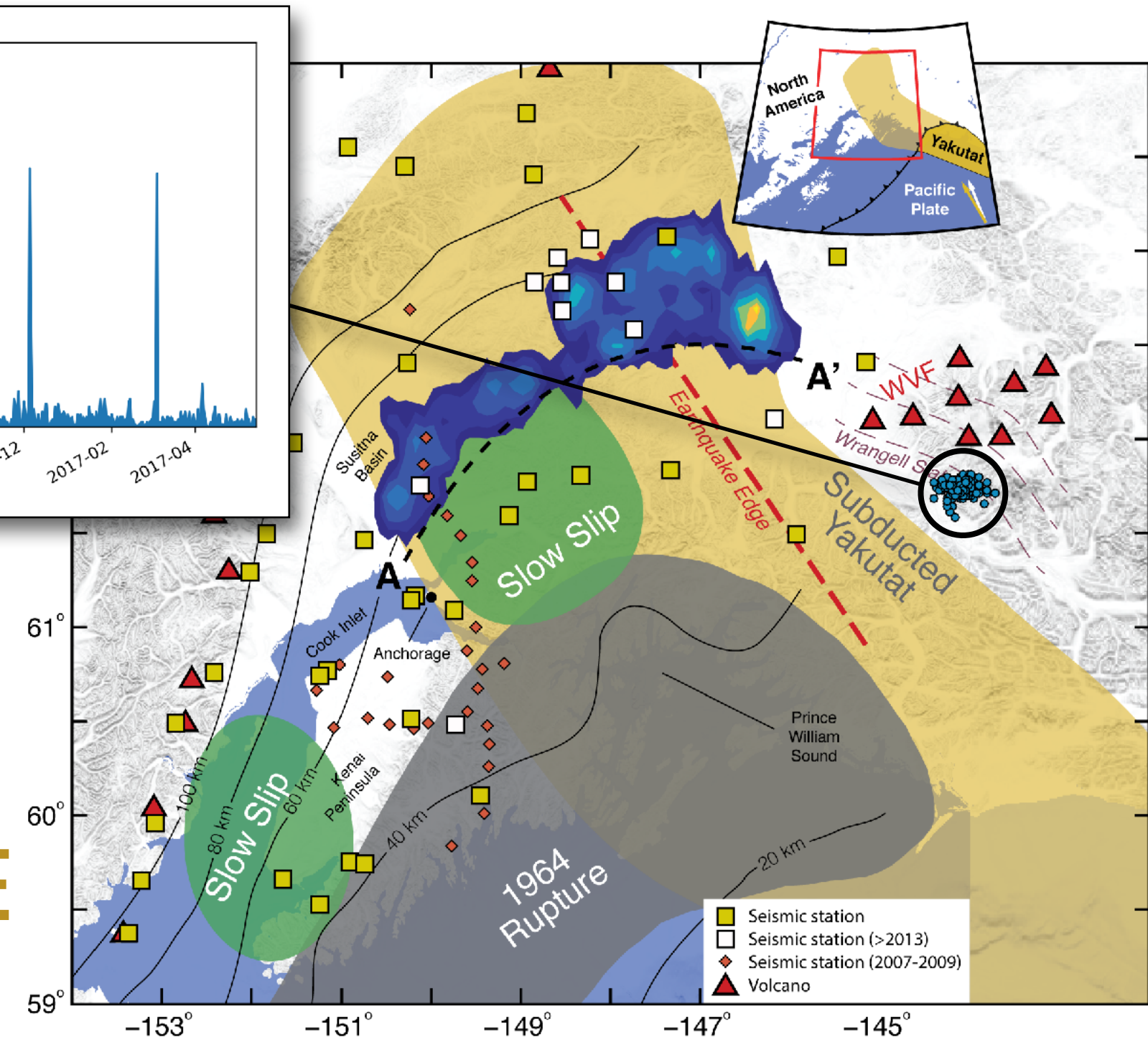
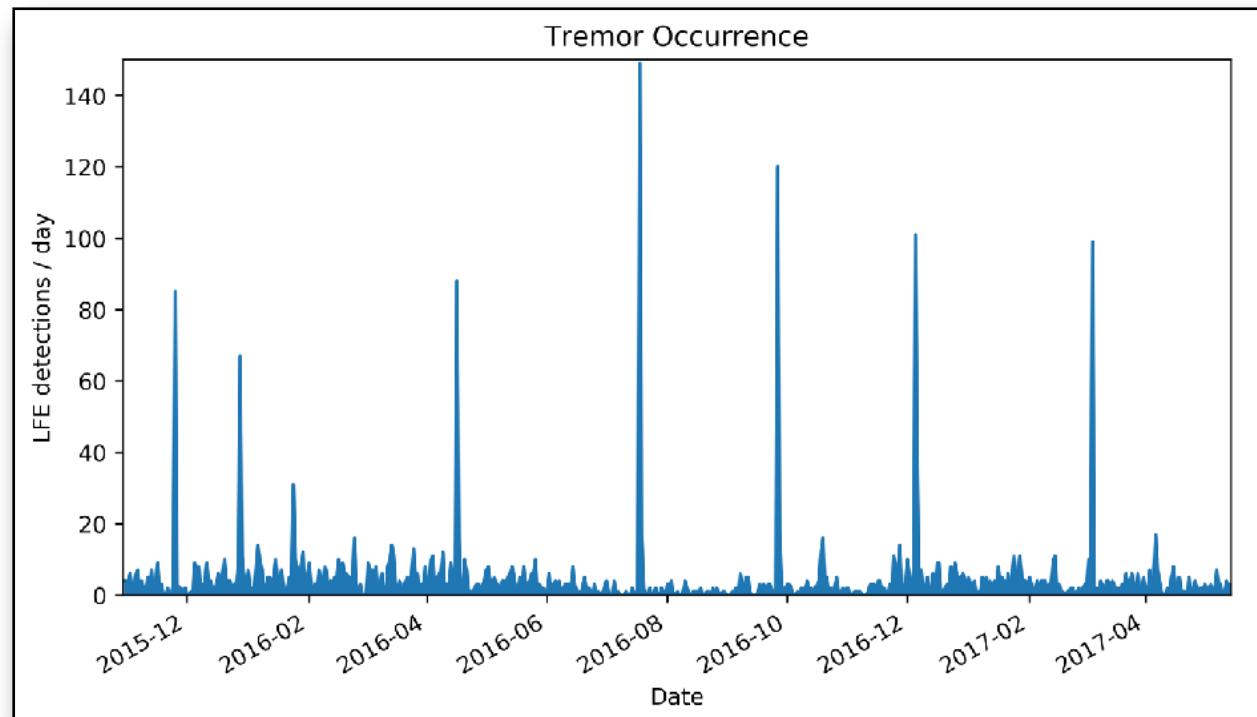
BUT WAIT,
THERE'S
MORE



BUT WAIT,
THERE'S
MORE
TREMOR

SOUTH OF WVF, EAST OF YAKUTAT,
~30 KM DEEP





EPISODIC RECURRENCE

Wech, Last Week

QUESTIONS?