

# Accretionary Evolution of the Alaskan Crust from Ps Receiver Functions

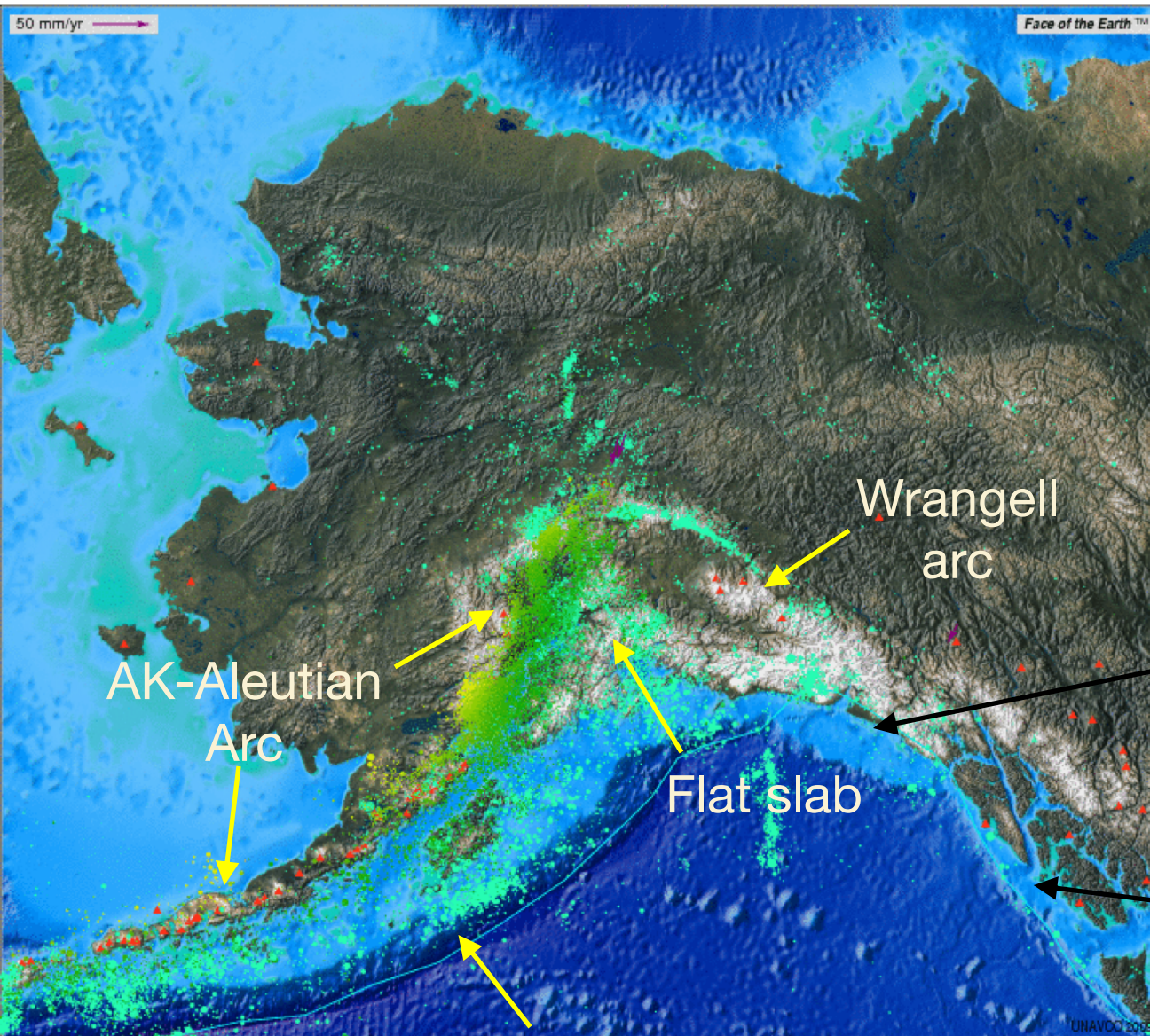
*Meghan S. Miller, Leland J. O'Driscoll, Robert W. Porritt,  
Sarah M. Roeske, and Richard Saltus*



THE  
AUSTRALIAN  
NATIONAL  
UNIVERSITY



# Northern Cordillera Active Tectonics



Corner transition  
from collision to  
flat slab  
subduction

Yakutat microplate

Transform boundary

Alaskan - Aleutian  
subduction zone

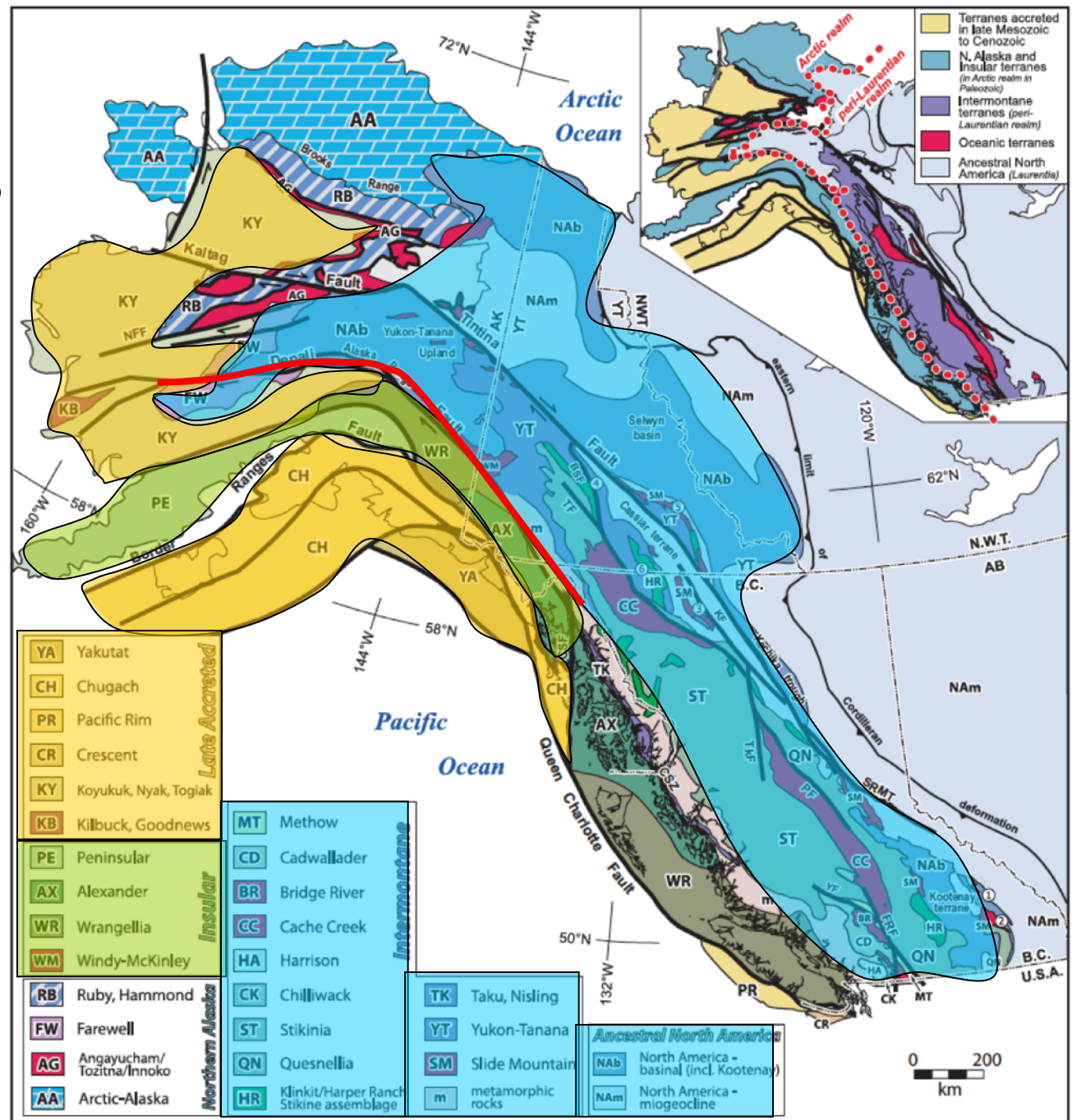
*Slide from Terry Pavlis, modified for this talk*



# Terrane Assemblages

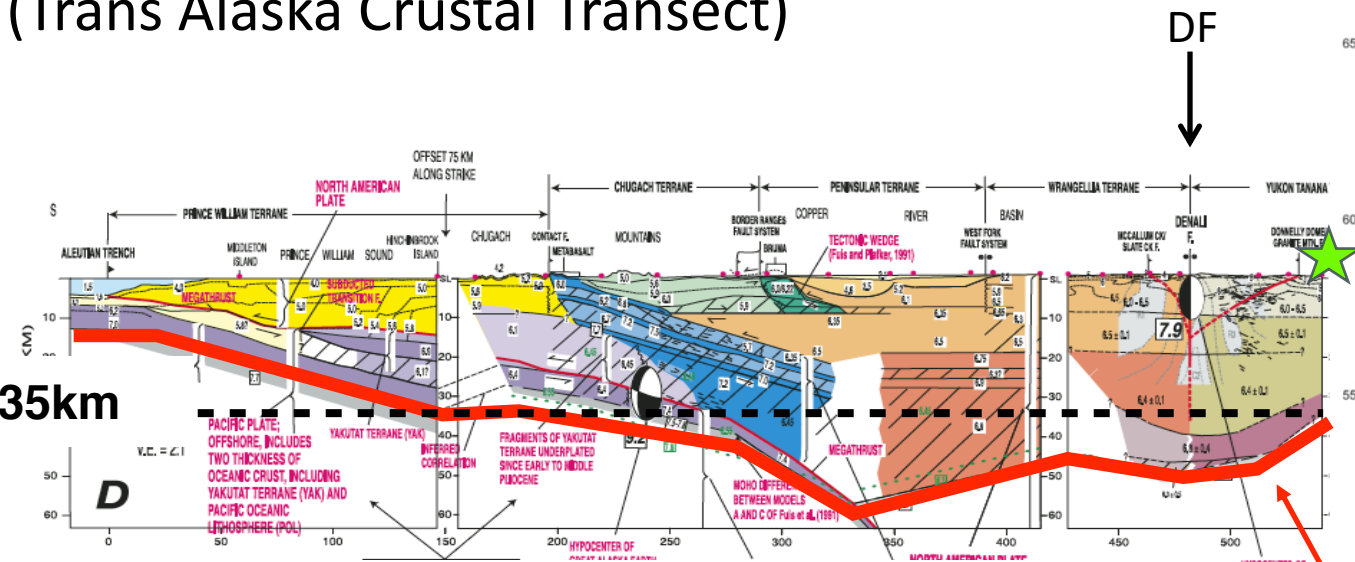
## Denali Fault

Colpron et al. (2007)

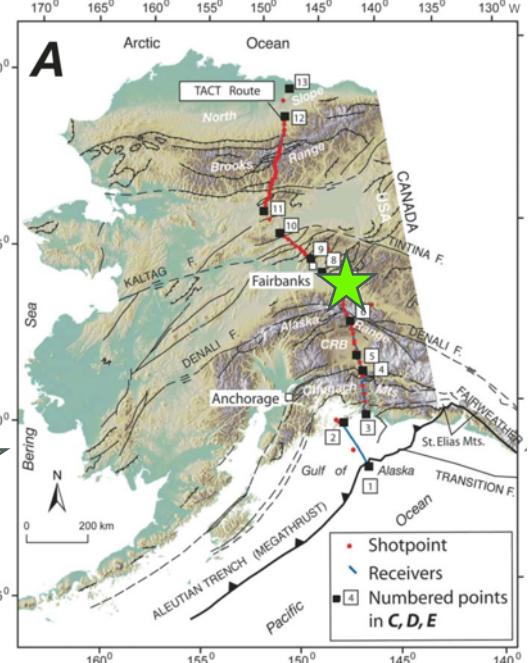


# TACT seismic line

(Trans Alaska Crustal Transect)

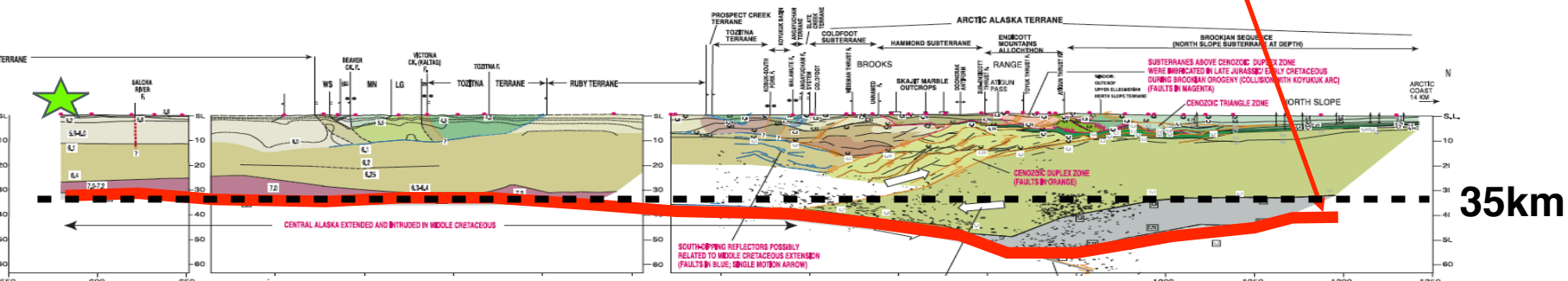


(south >>----->>north)



Fuis et al. (2008)

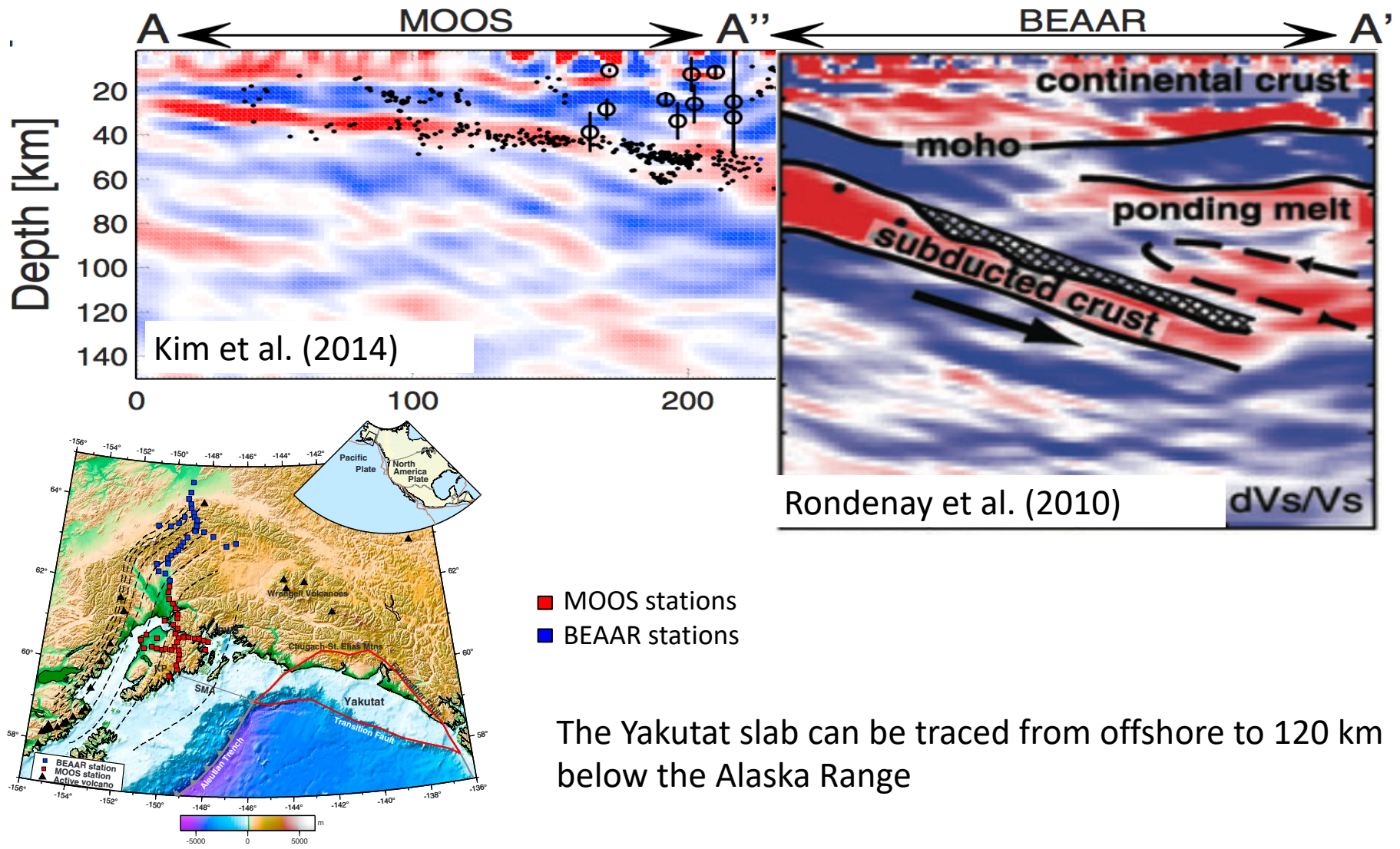
Moho depths



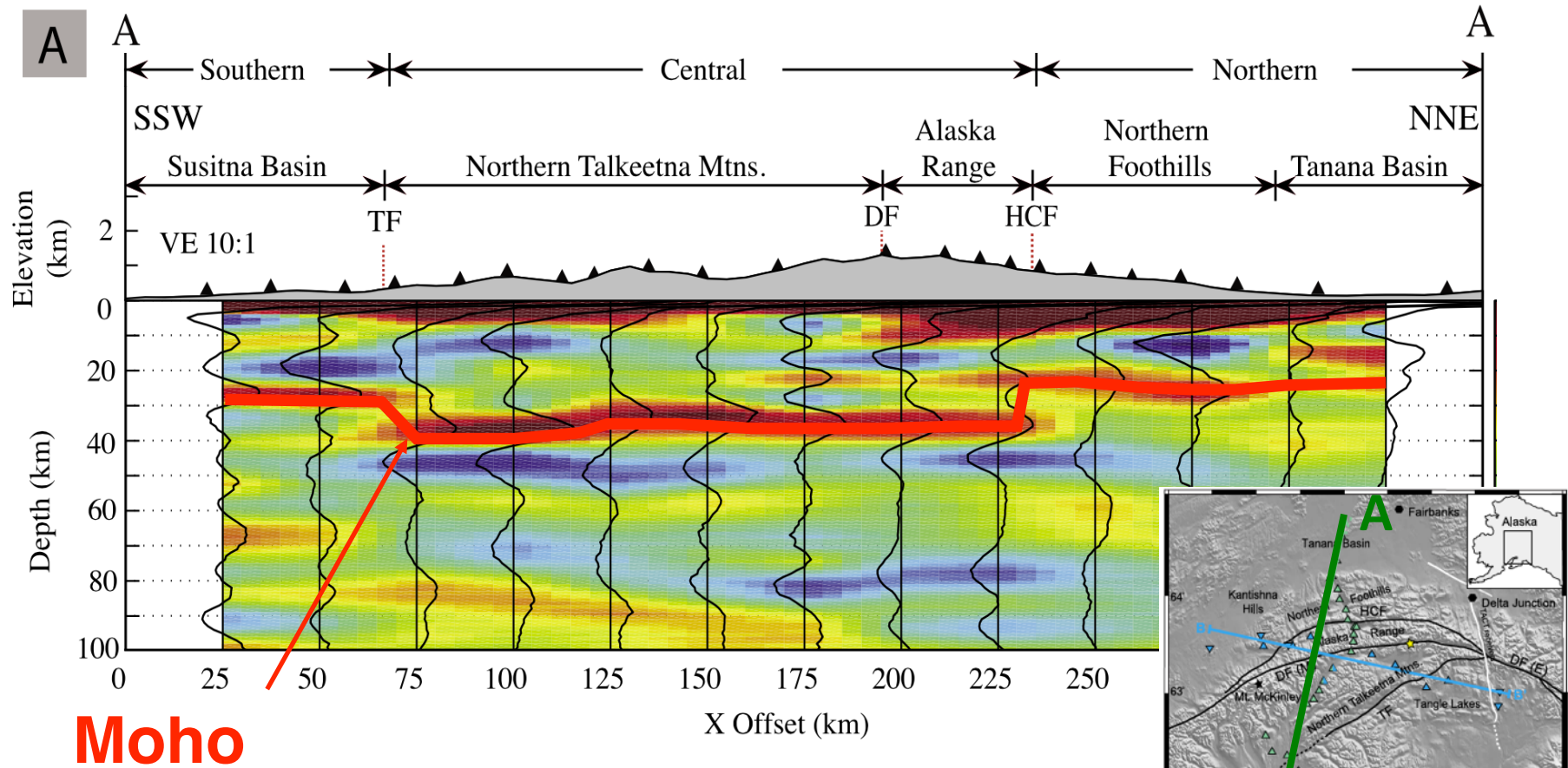
(south >>----->>north)



# GRT imaging: MOOS and BEAAR, crossing the flat slab section



# BEAAR array: crossing the Alaska Range

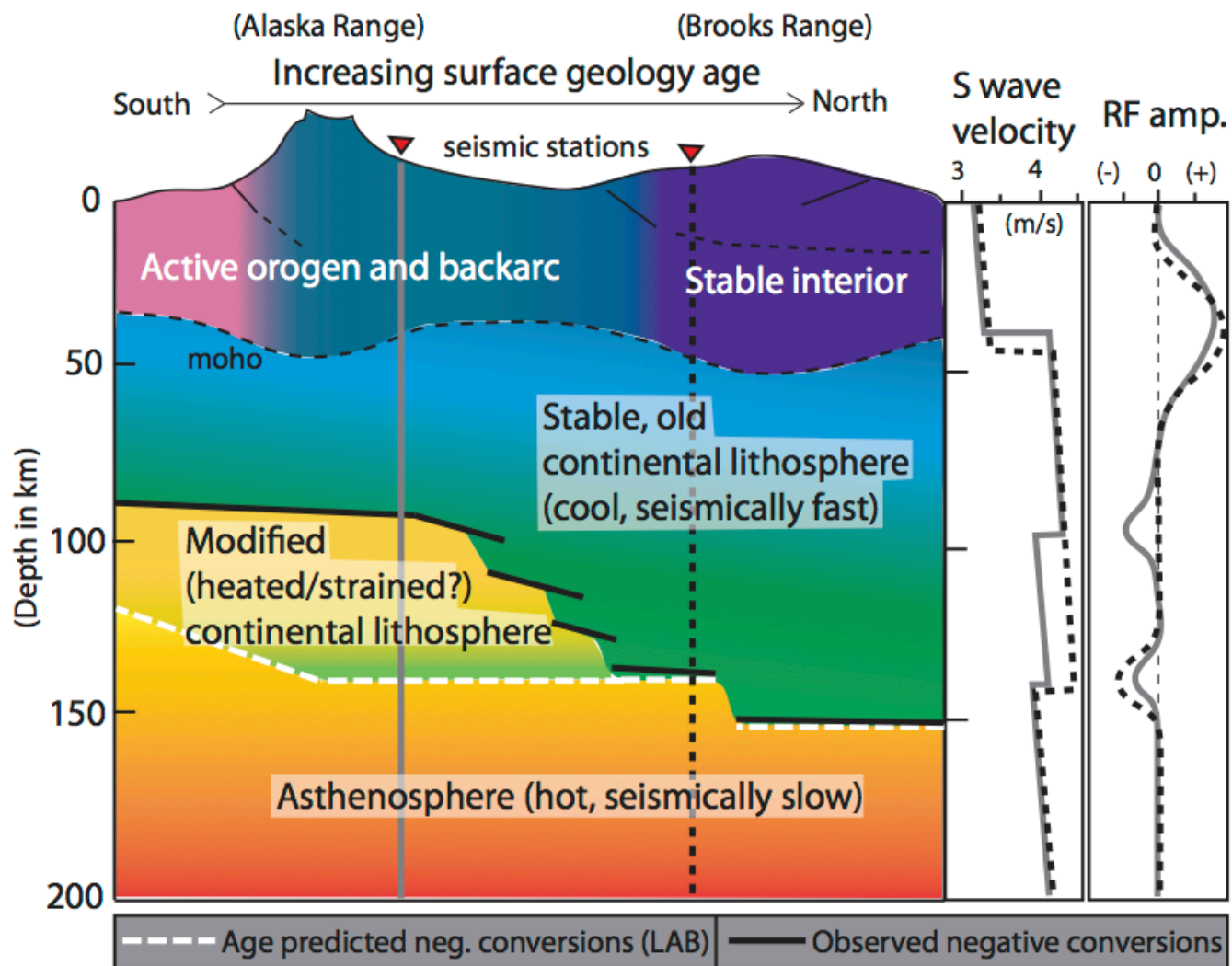


Significant topography on the Moho across terrane boundaries/faults

Brennan et al. (2011)





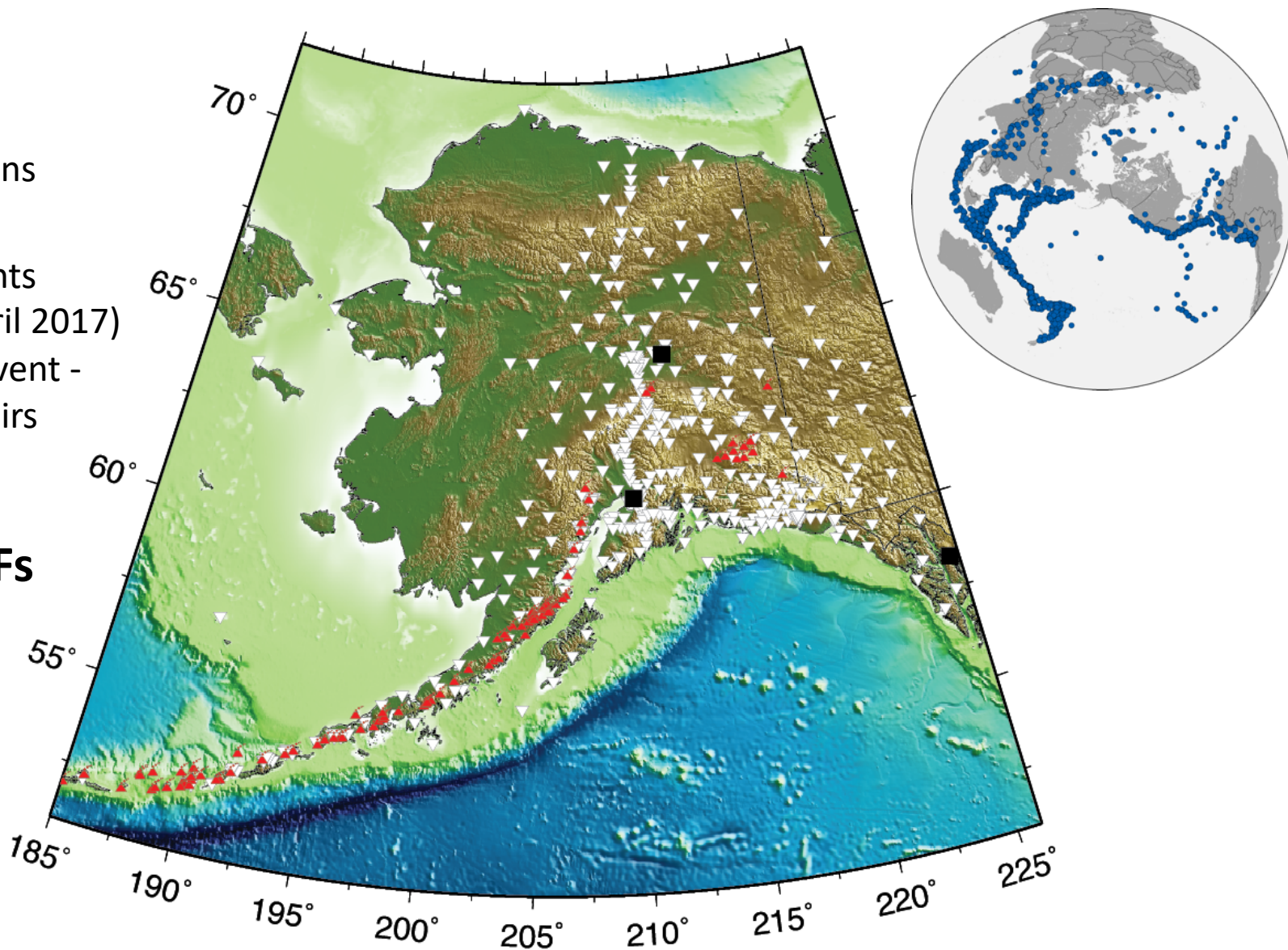




# Broadband stations analyzed

- 468 stations
- 2094 events (1999-April 2017)
- 117097 event - station pairs

**24220 RFs**

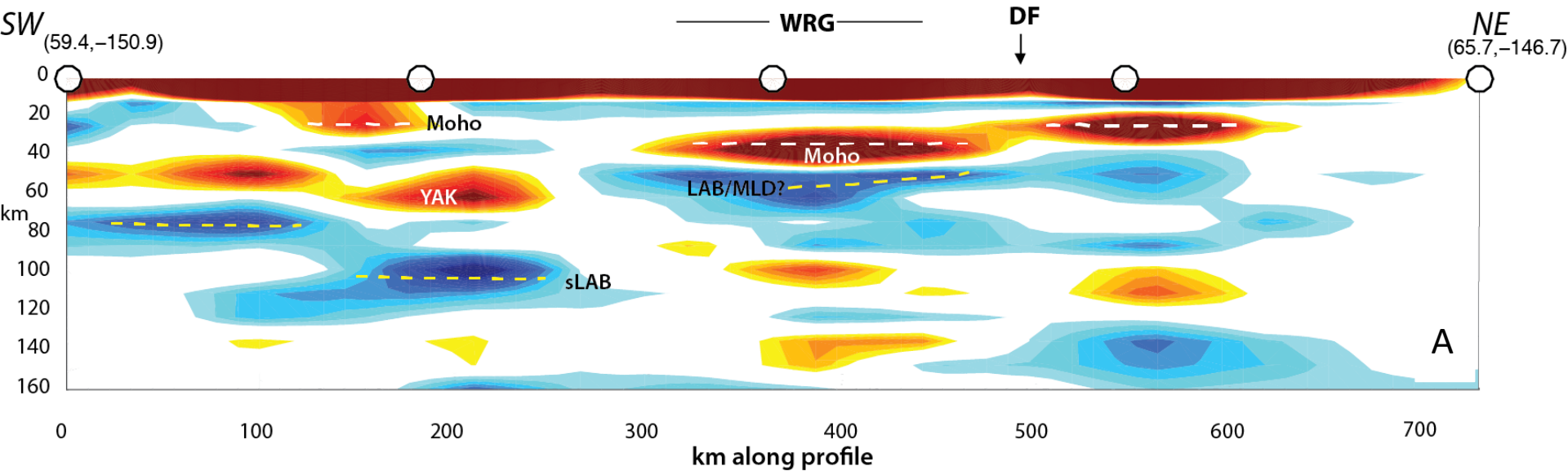


# Receiver function analysis

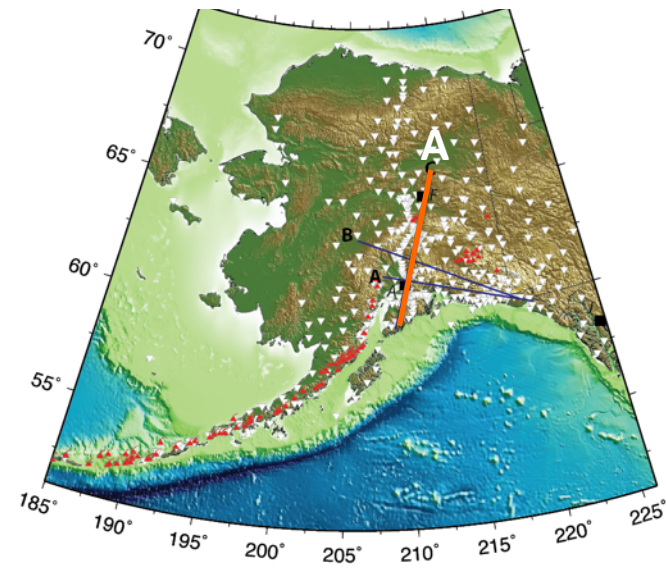
- FuncLab (Eagar and Fouch, SRL 2012)
  - Updated by R.W. Porritt
  - 1.8.0 version
  - <https://robporritt.wordpress.com/software/>
- Iterative time domain deconvolution (Liggoria and Ammon, 1999) on data downloaded with irisFetch.m (Trabant et al., 2012)
- CCP stacking (Clouser and Langston, 1995; Dueker and Sheehan, 1997)



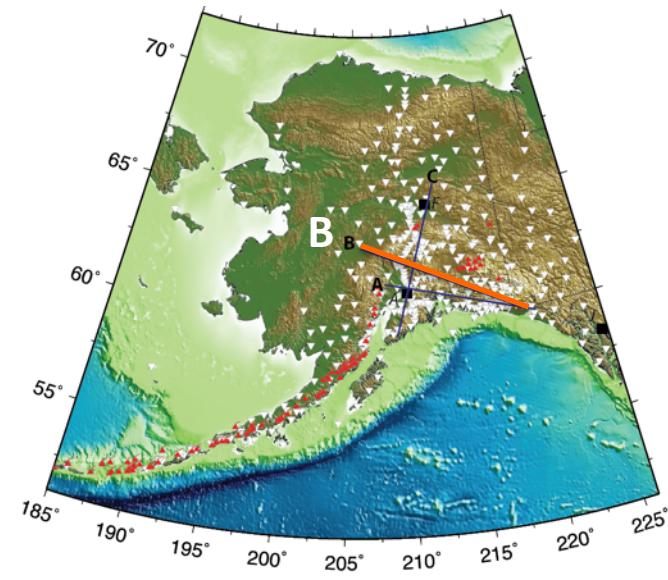
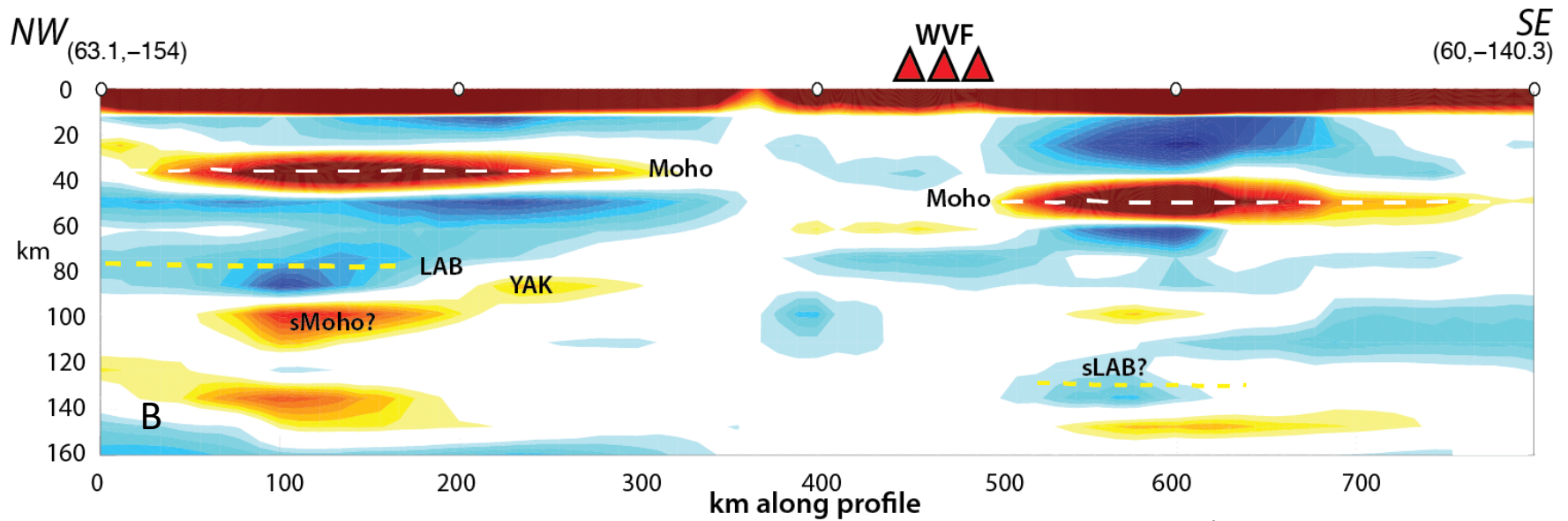
# CCP volume cross-section A



(south >>----->>north)

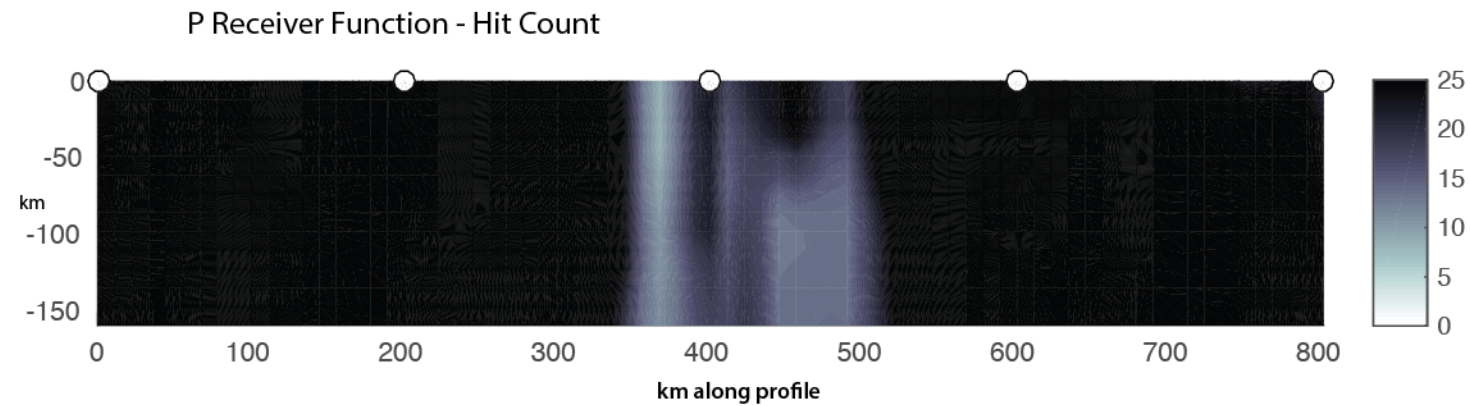
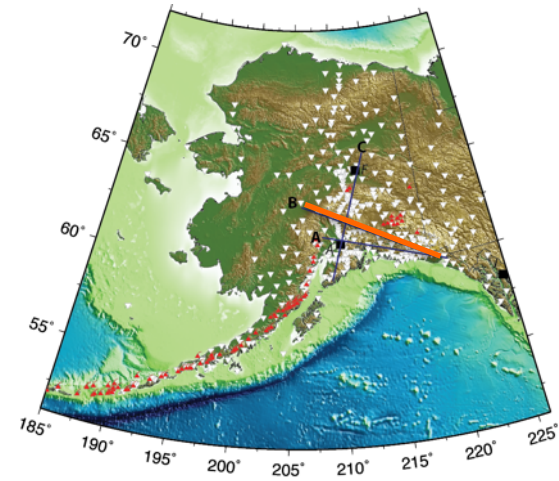
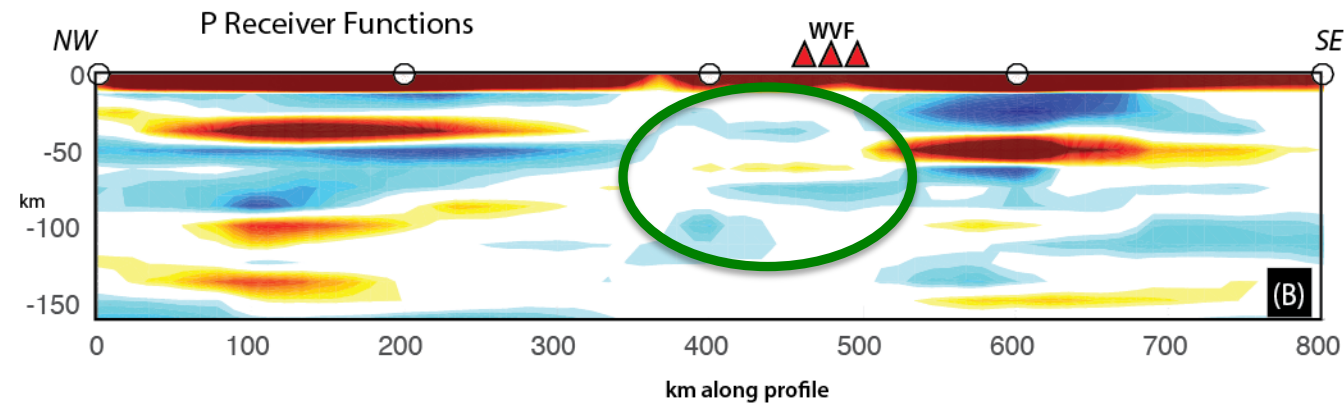
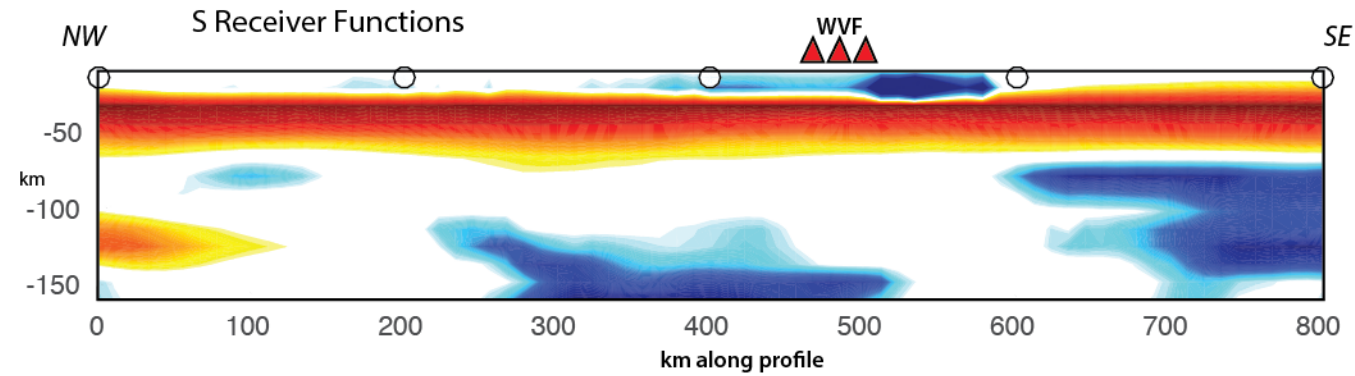


# CCP volume cross-section B

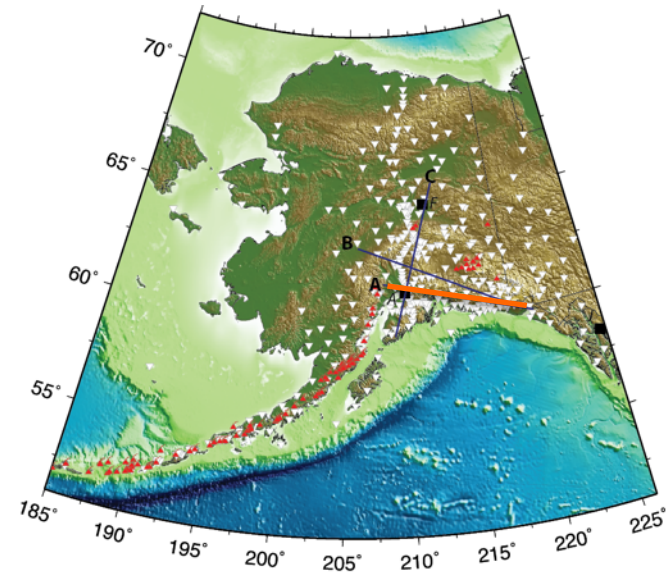
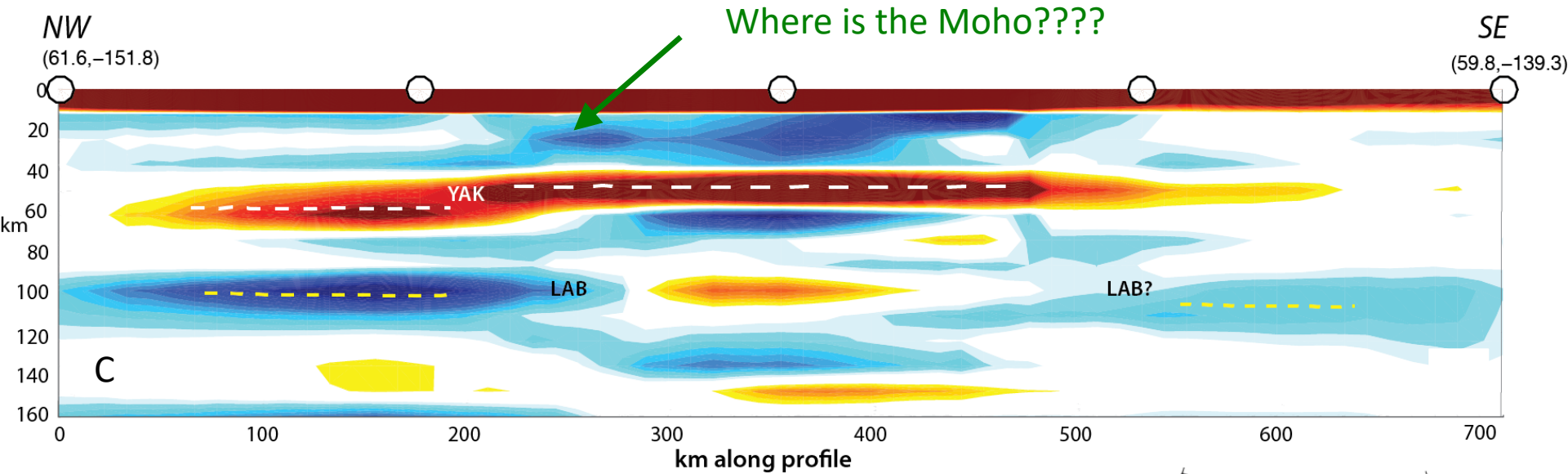


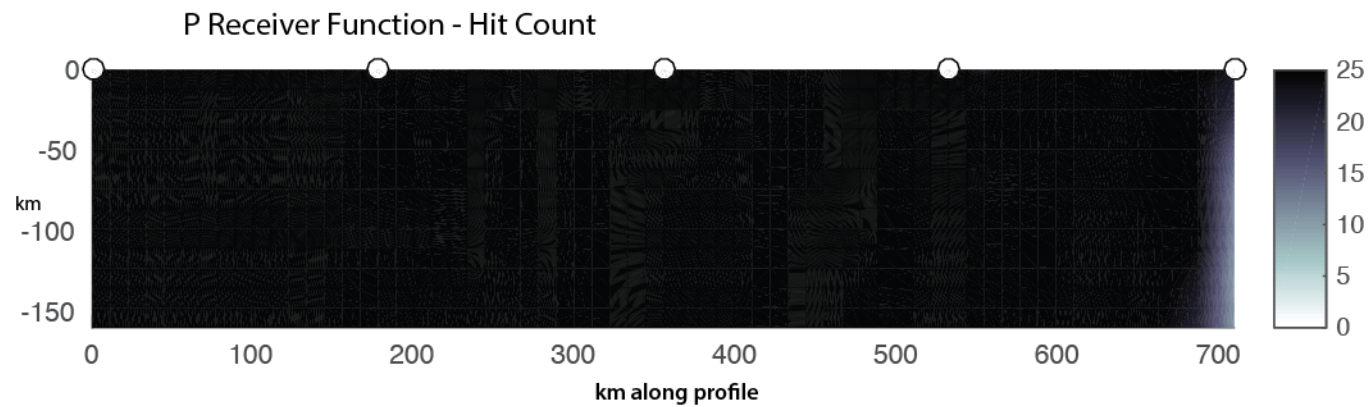
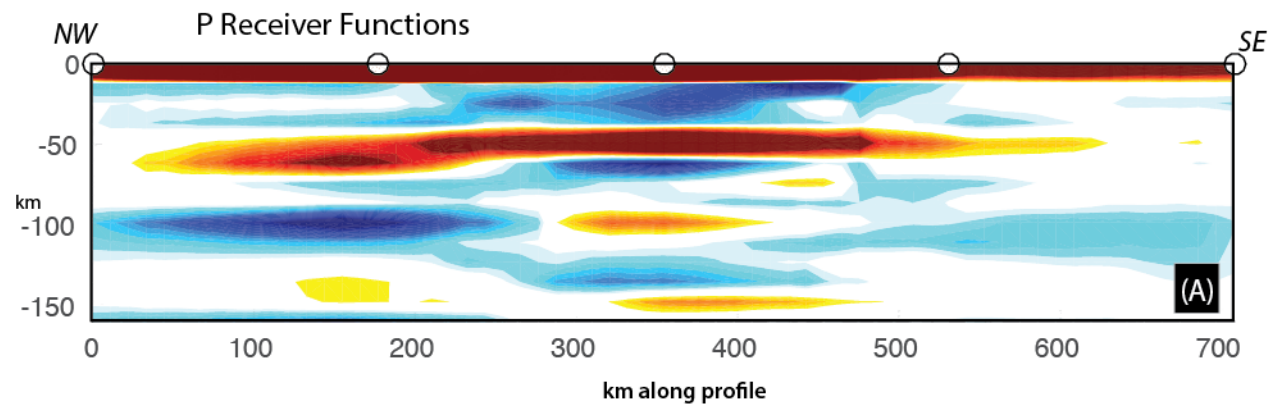
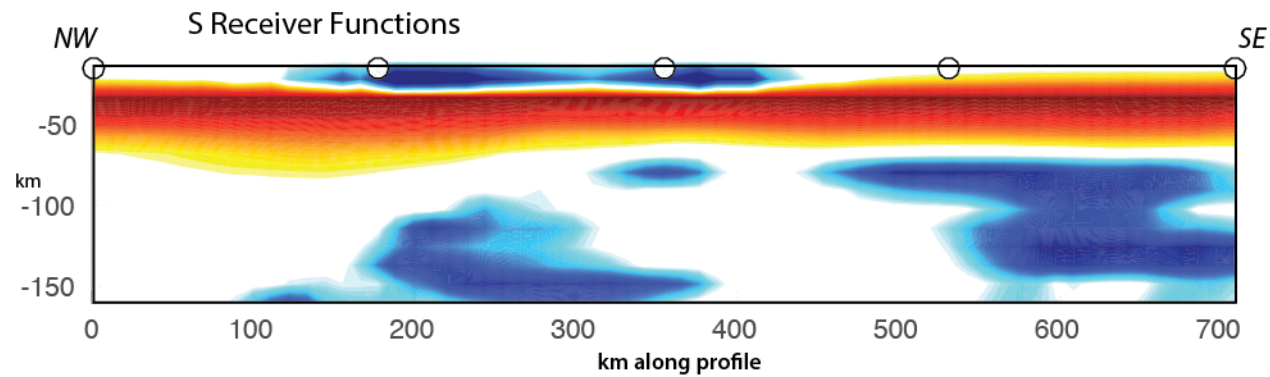


O'Driscoll and Miller (2015)

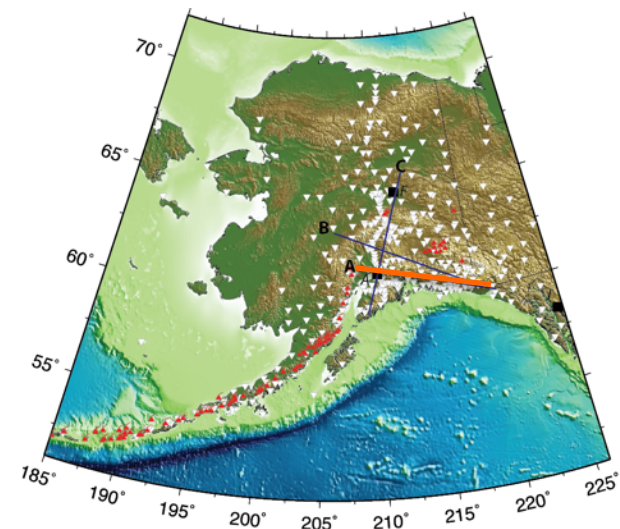


# CCP volume cross-section C



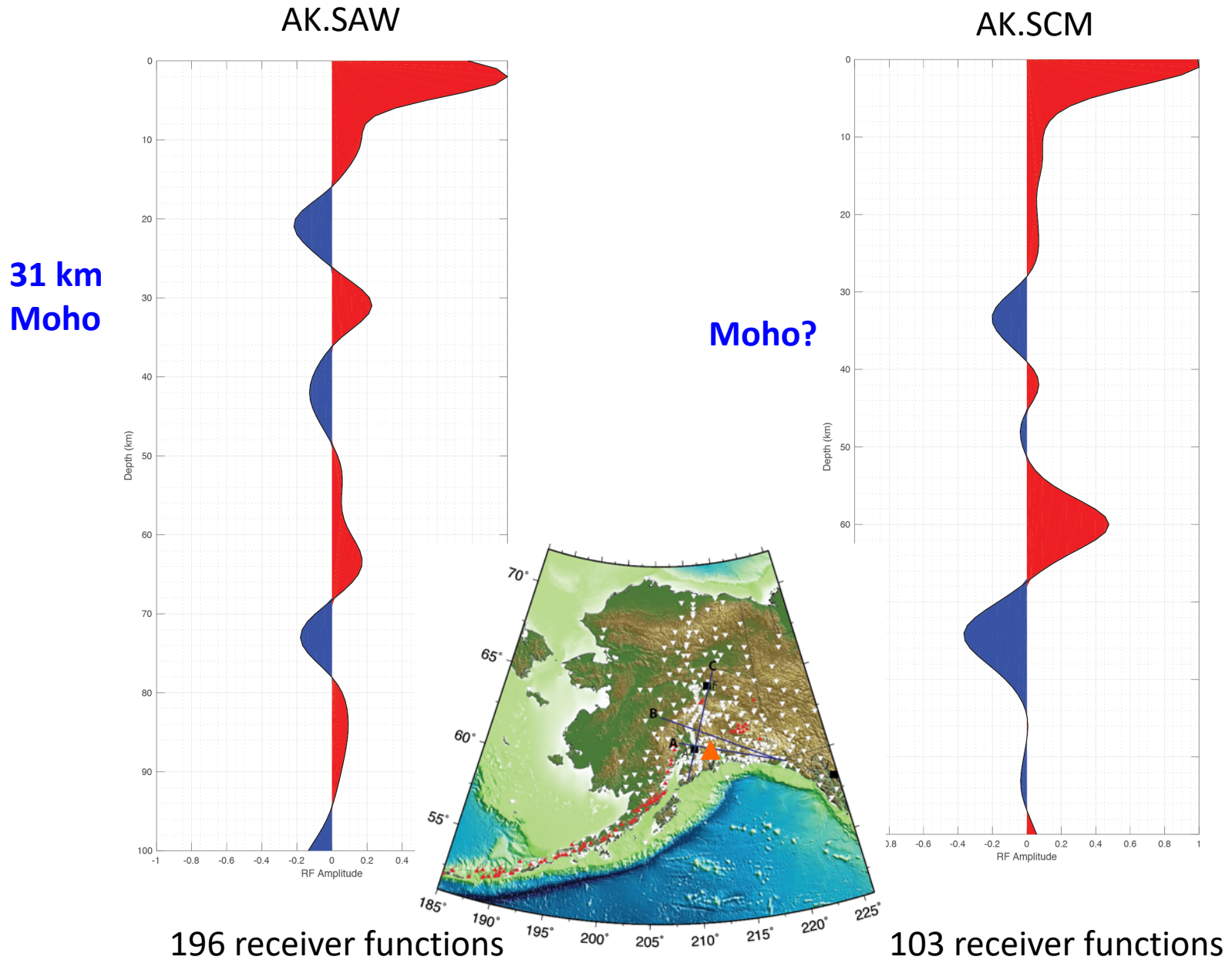


O'Driscoll and Miller (2015)



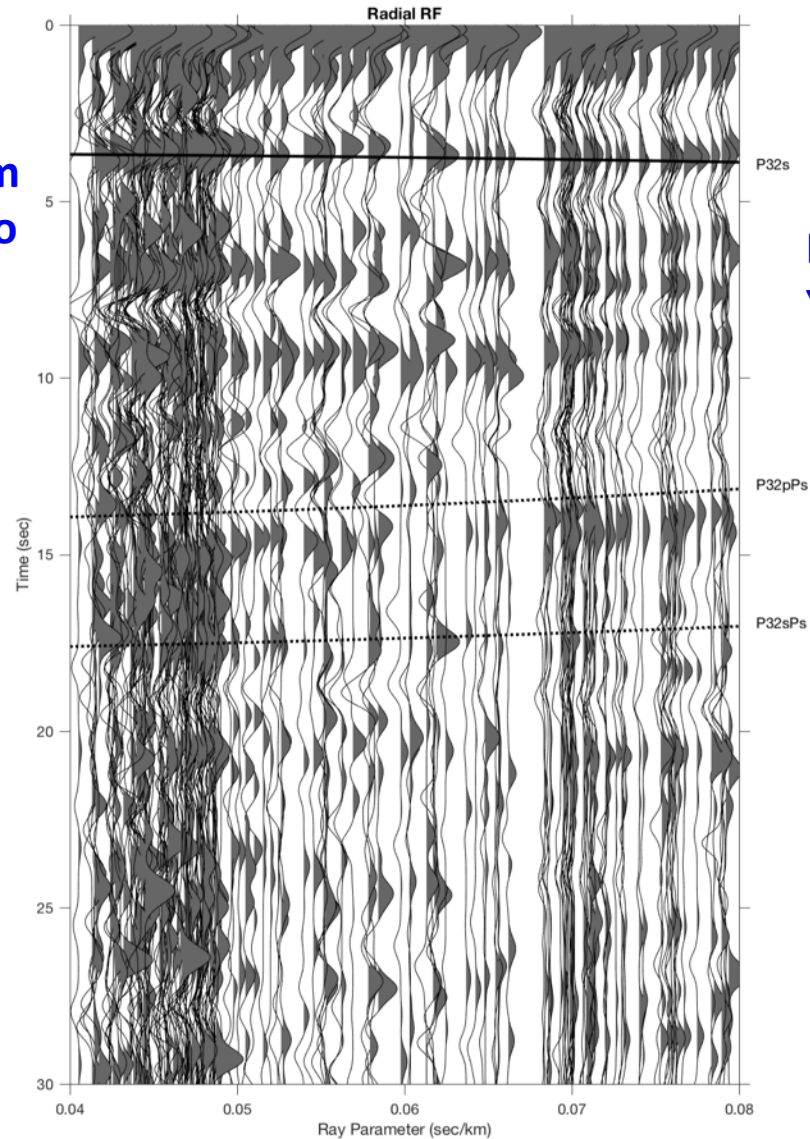


# Receiver function stacks – in depth



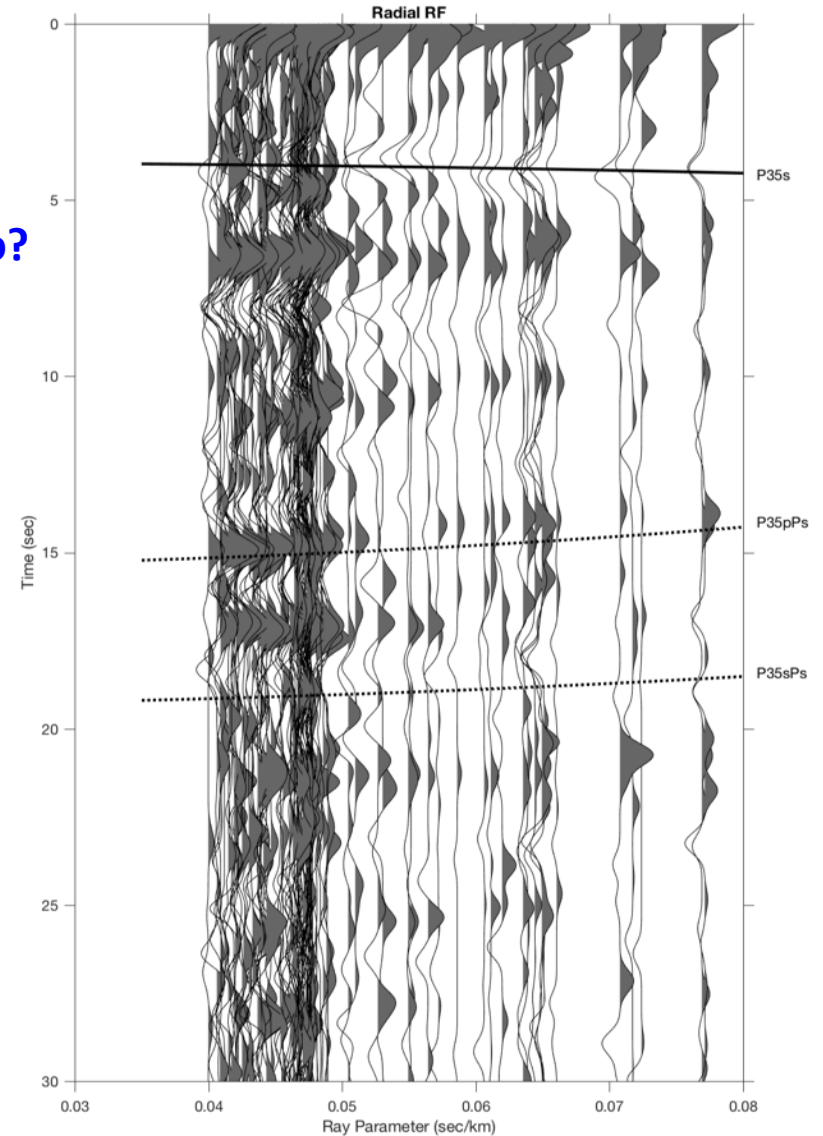
# Receiver gathers – sorted by moveout

AK.SAW

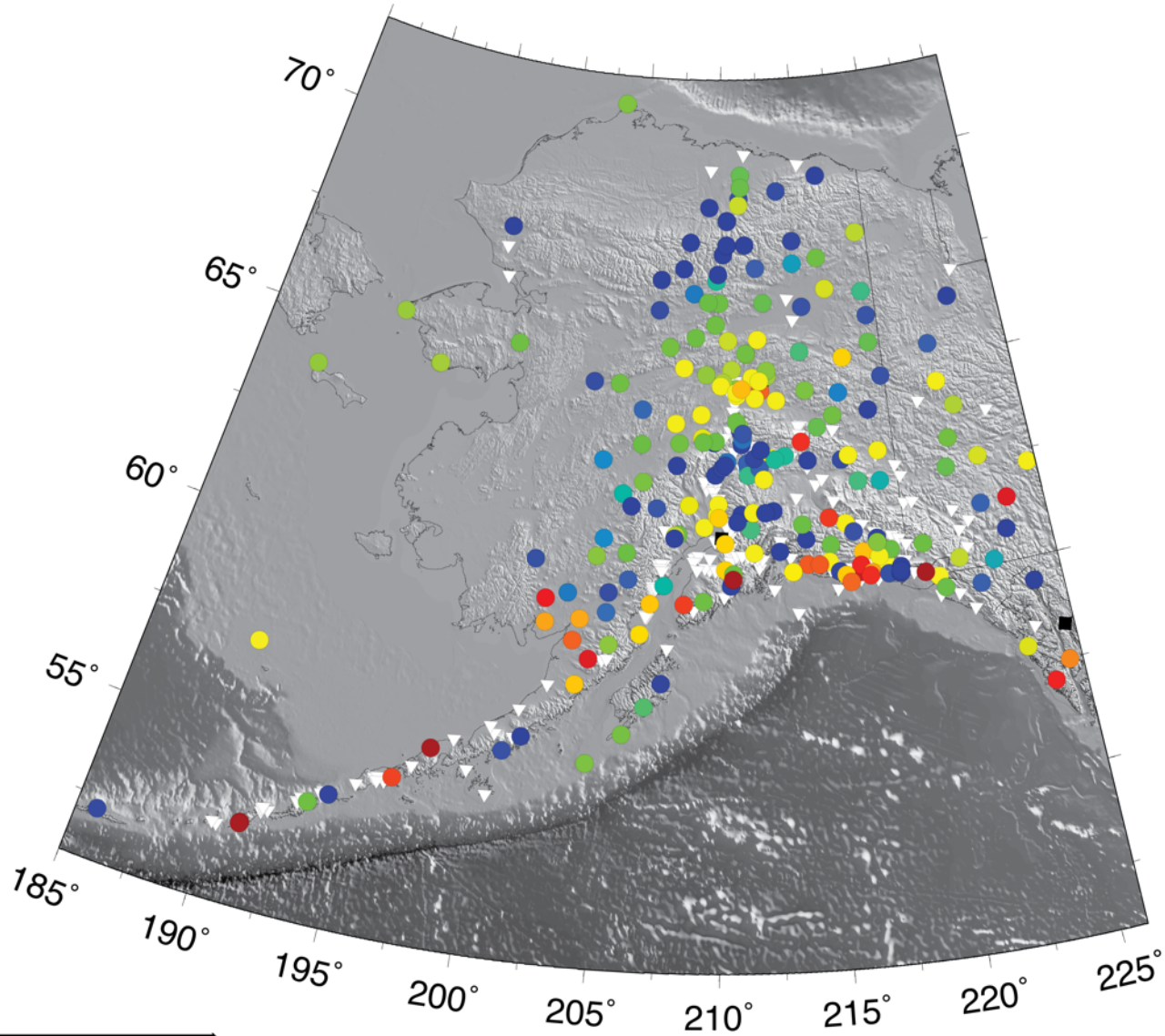


Moho?  
YAK?

AK.SCM

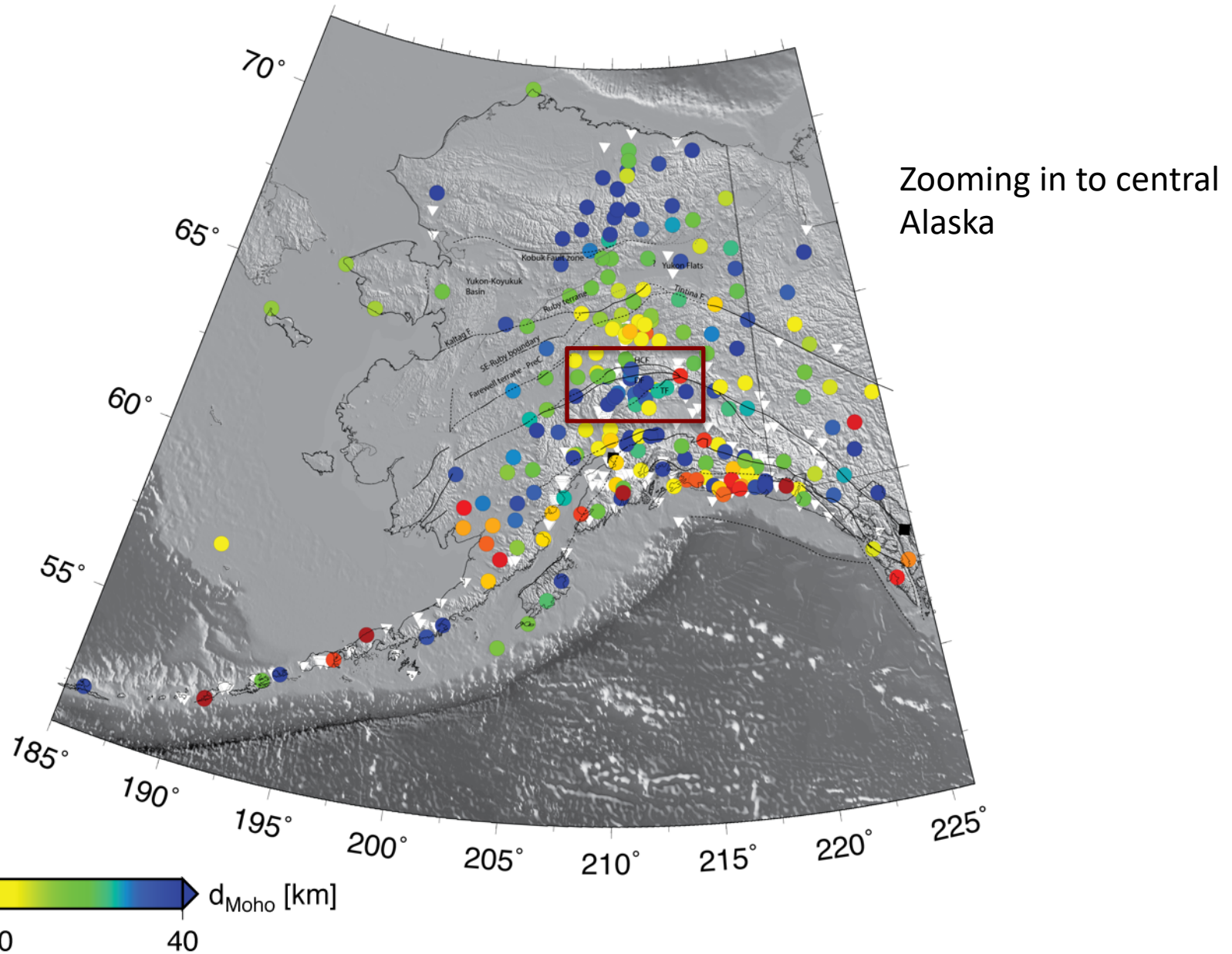


# Moho picks at stations

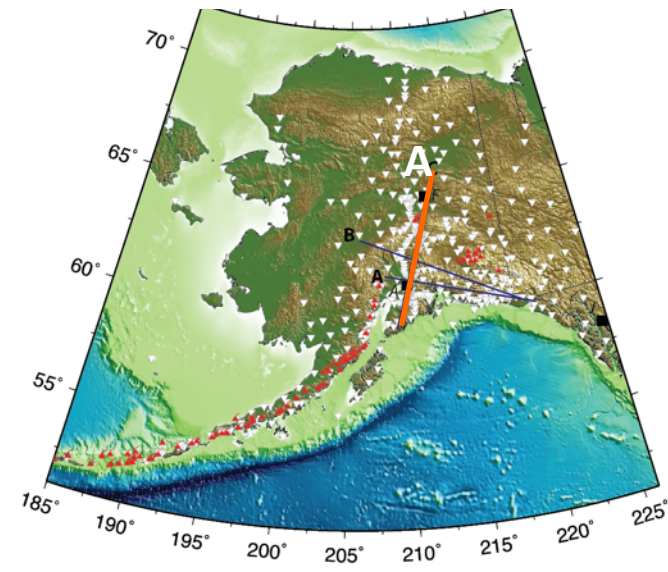
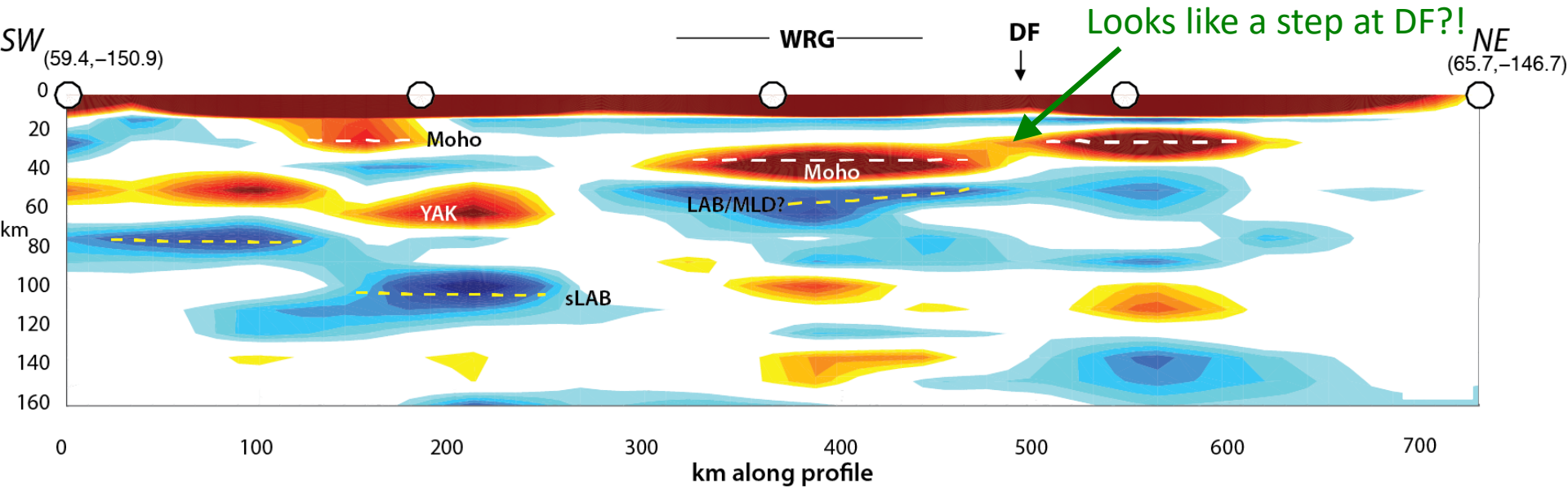




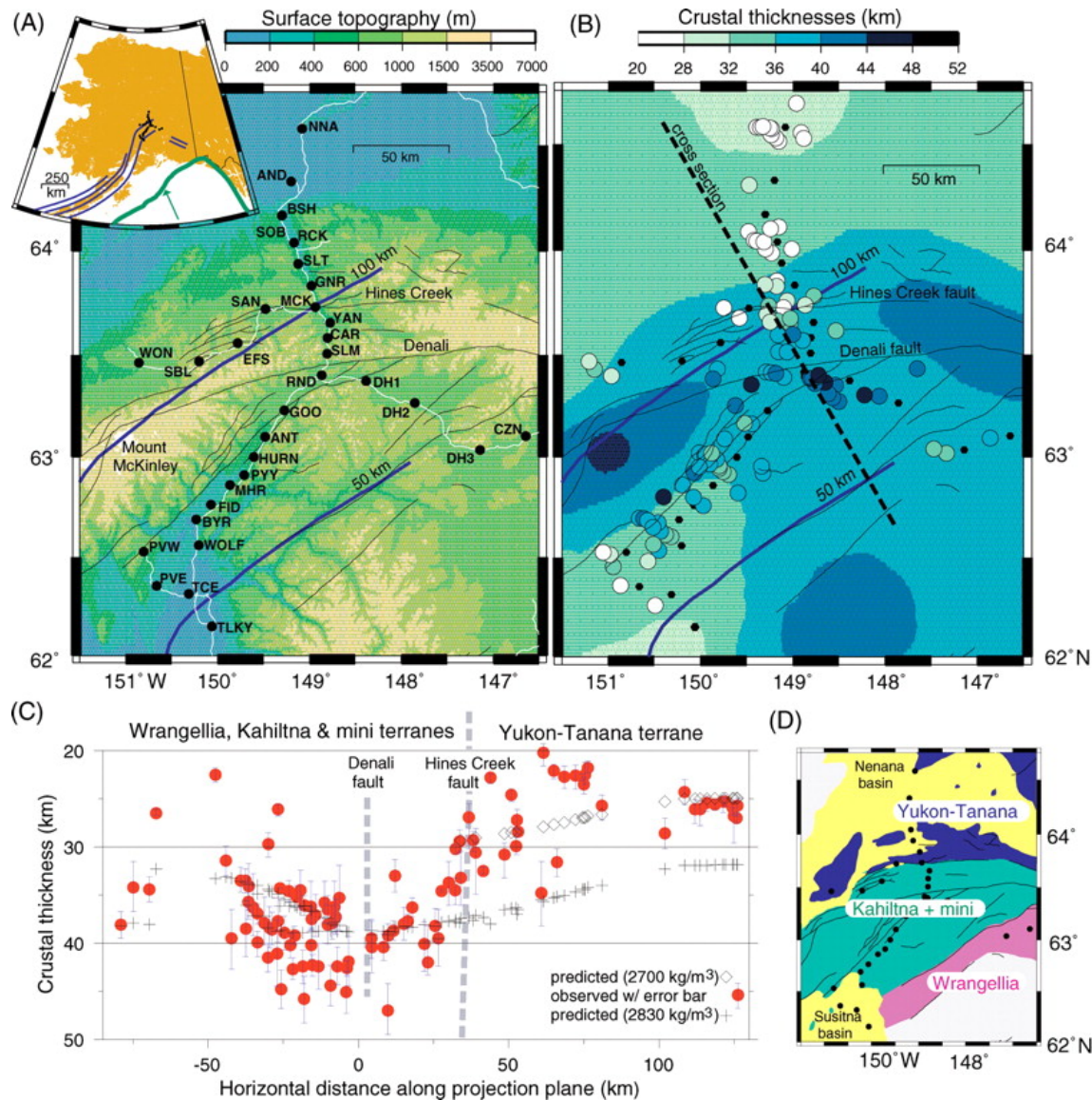
# Moho picks with major faults



# CCP volume cross-section A



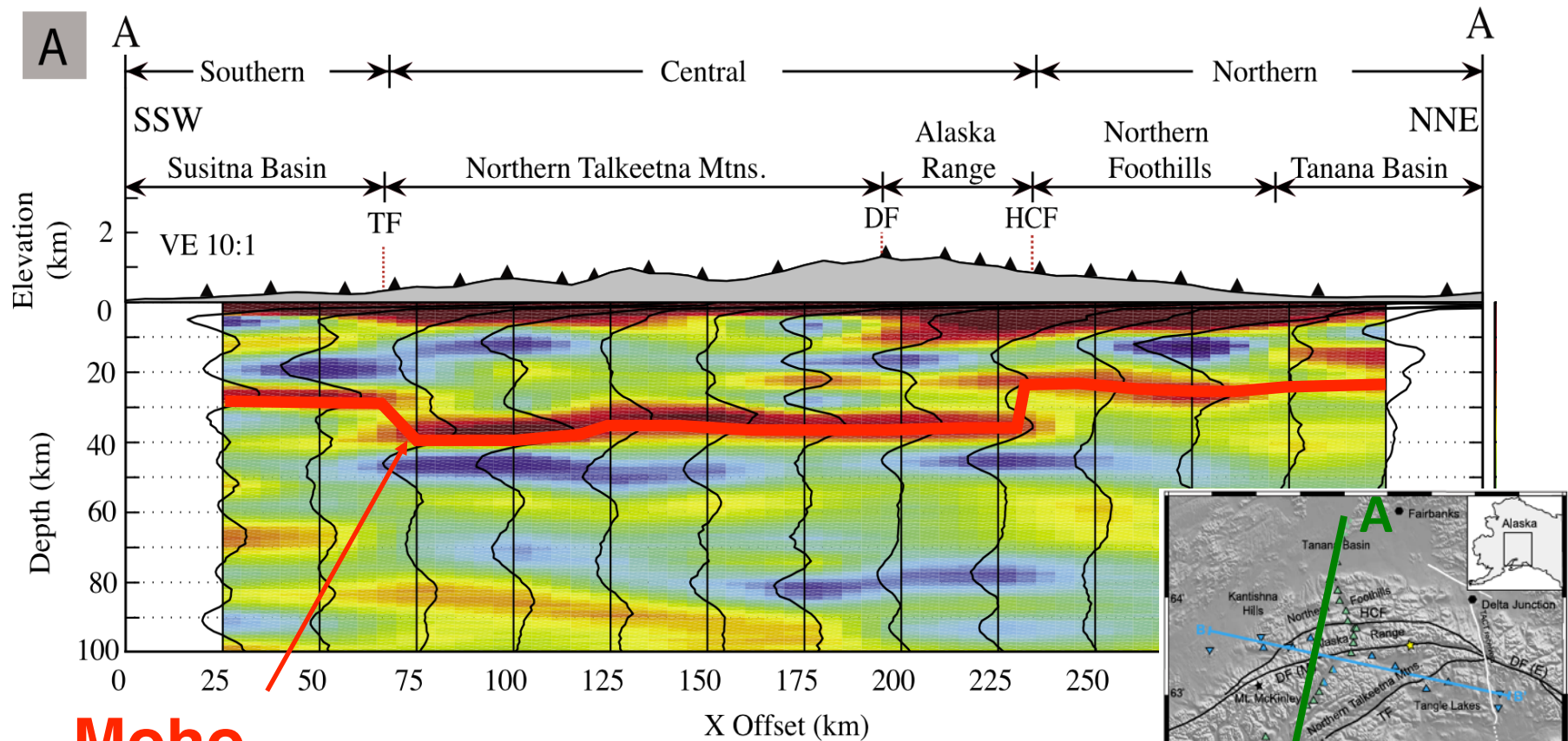
# BEAAR array: crossing the Alaska Range



Veenstra et al. (2006)



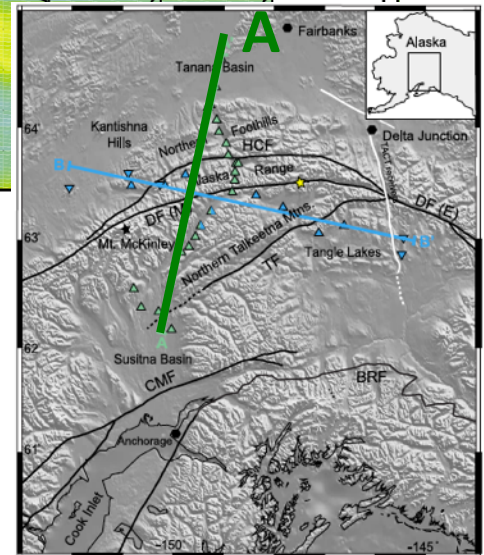
# BEAAR array: crossing the Alaska Range



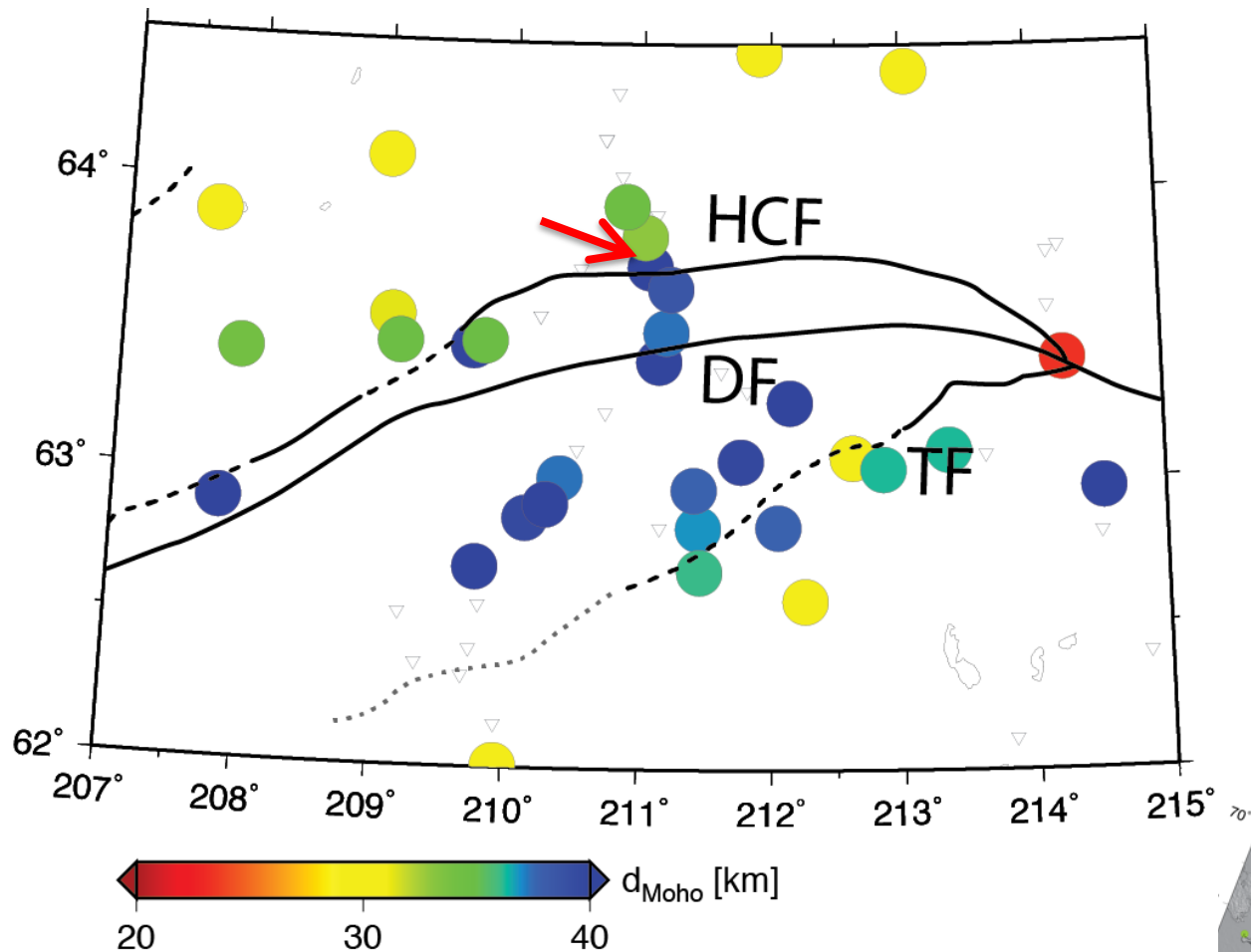
## Moho

The big Moho step: Thick crust below AK Range, thin to the north of the Denali Fault system – Hines Creek Fault??

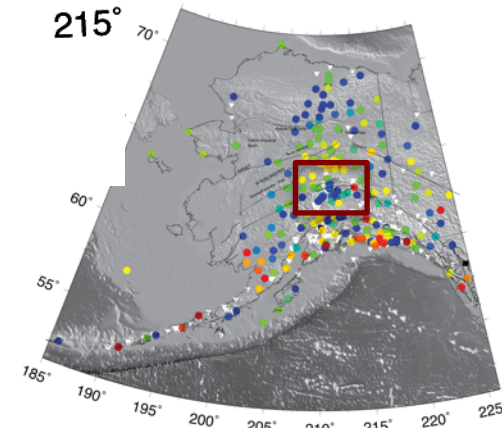
Brennan et al. (2011)



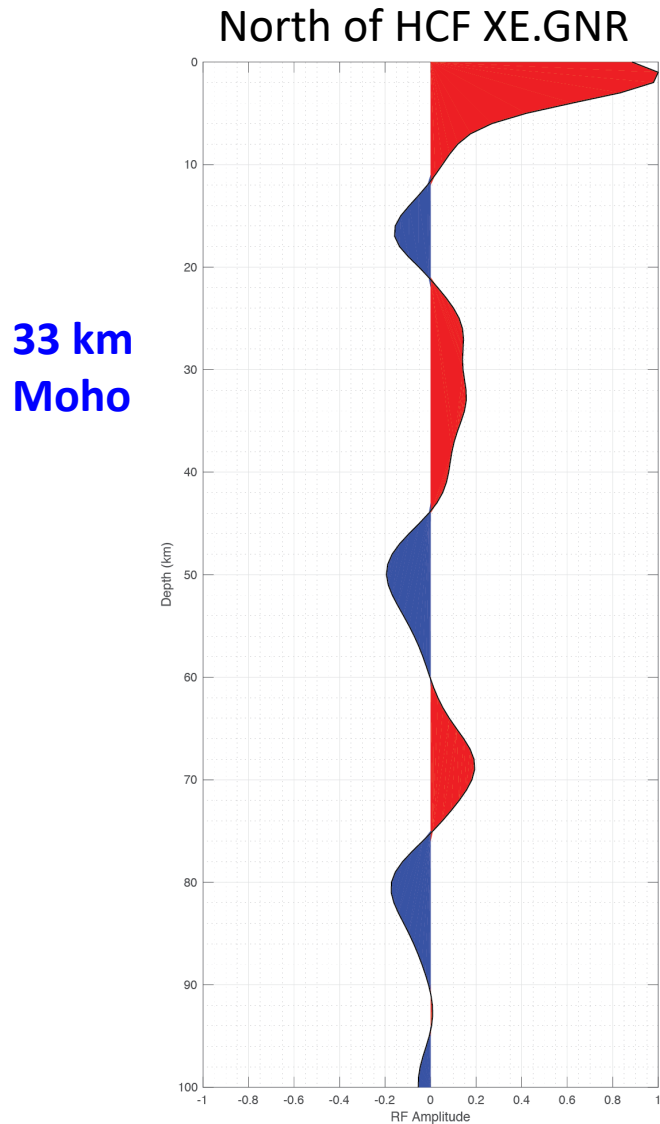
# Central Alaska Moho picks



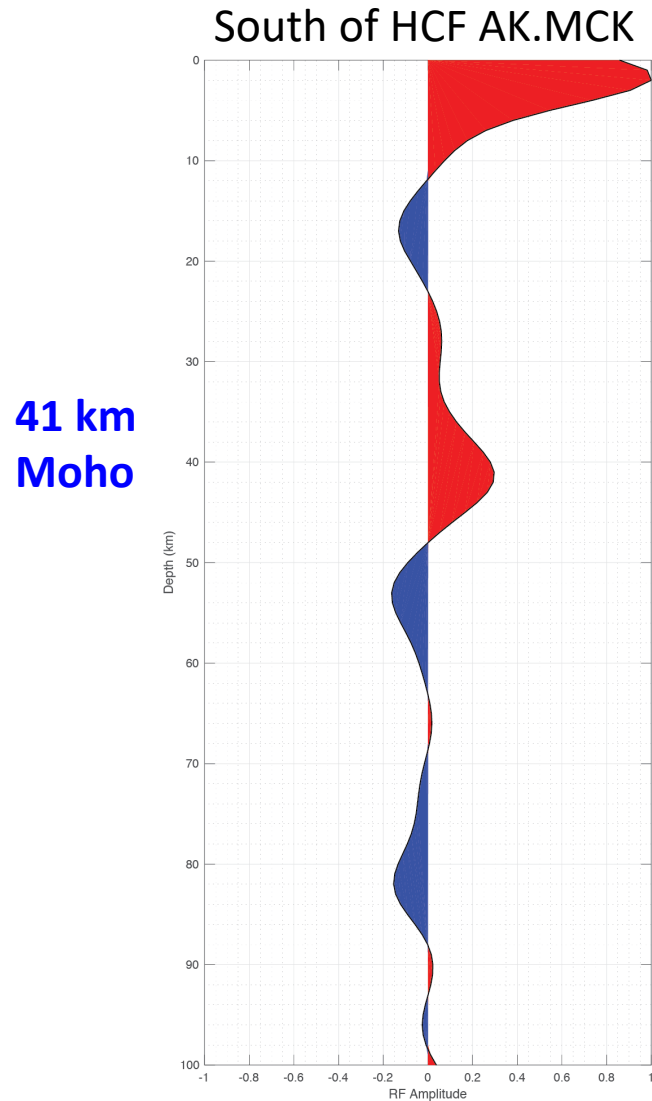
HCF = Hines Creek Fault  
DF = Denali Fault  
TF = Talkeetna Fault



# Receiver function stacks – in depth



41 receiver functions

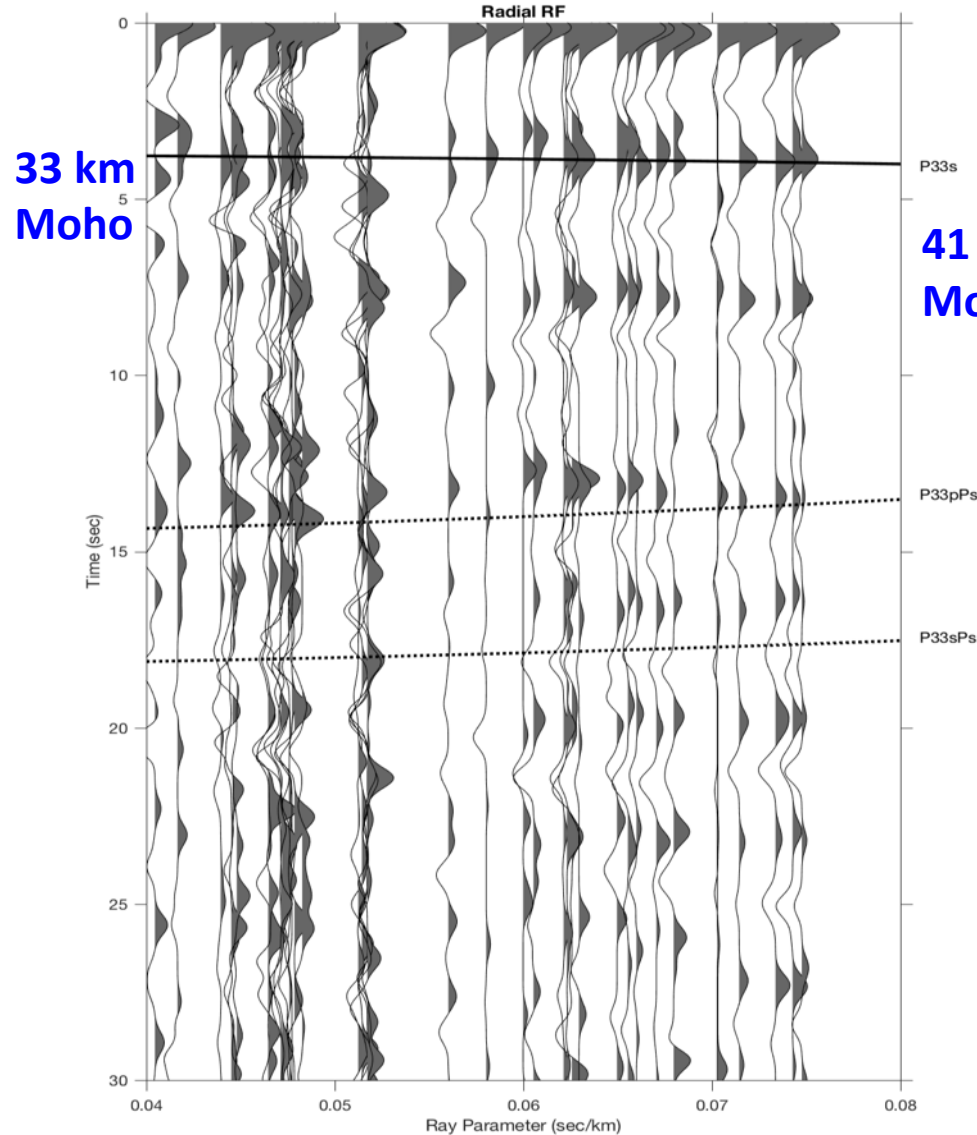


230 receiver functions

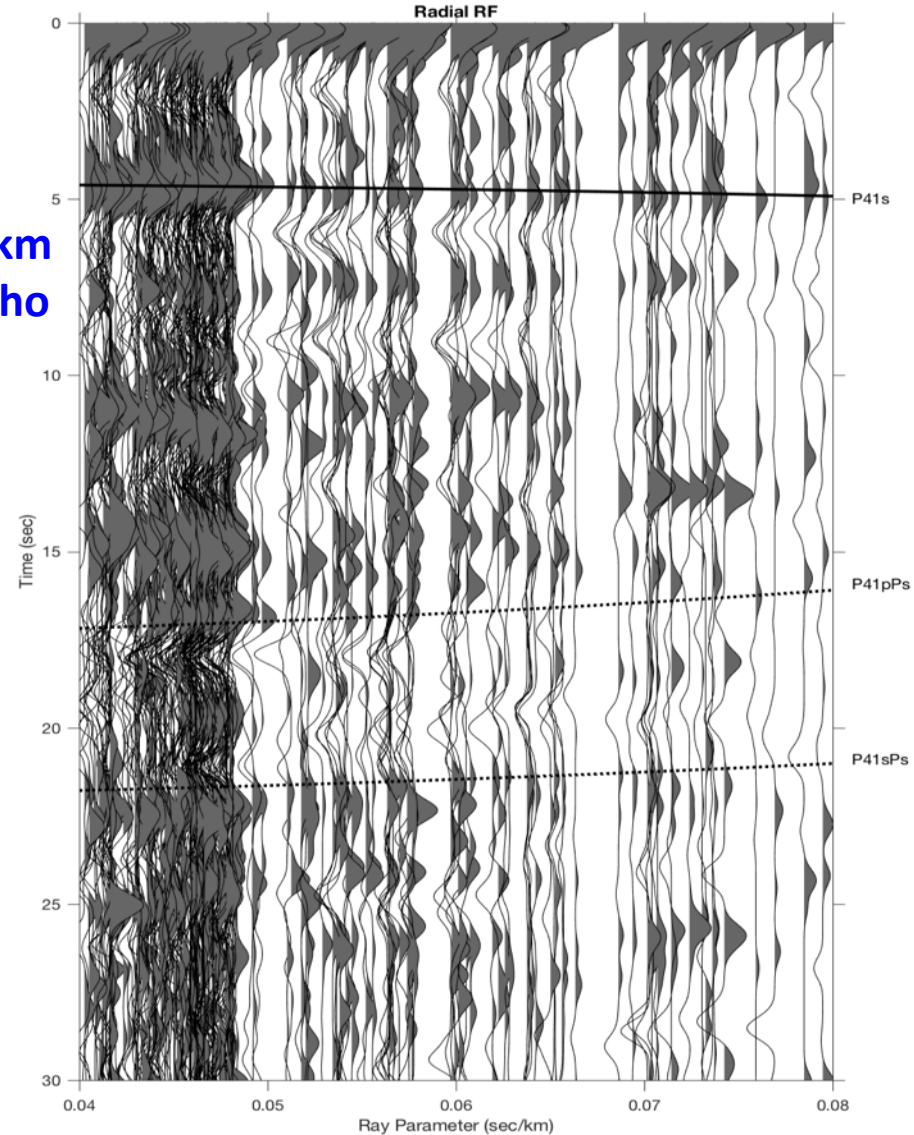


# Receiver gathers – sorted by moveout

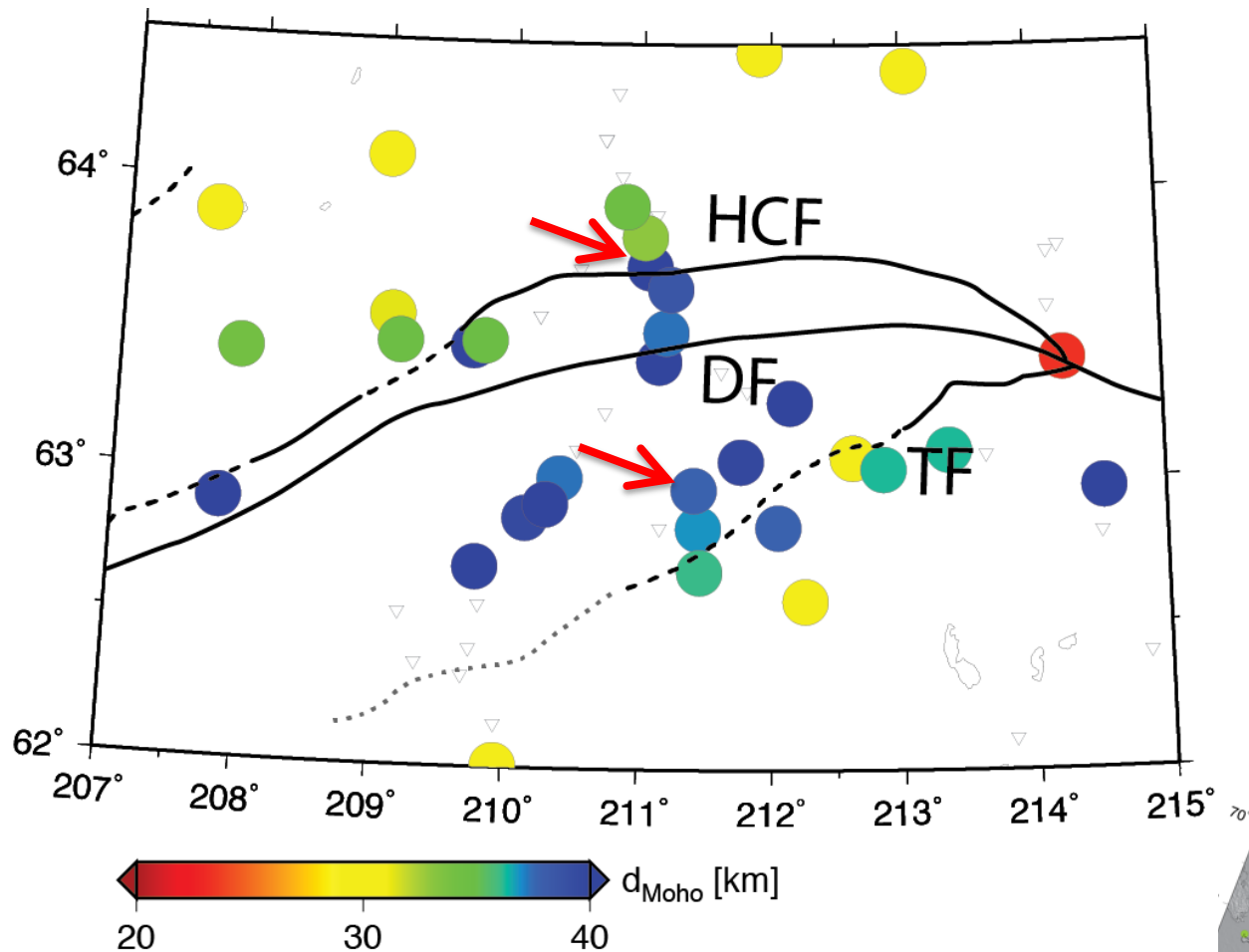
North of HCF XE.GNR



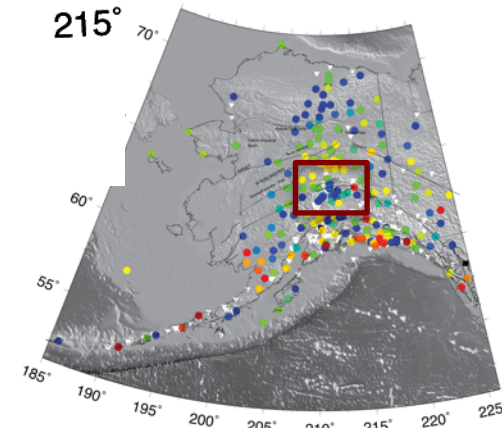
South of HCF AK.MCK



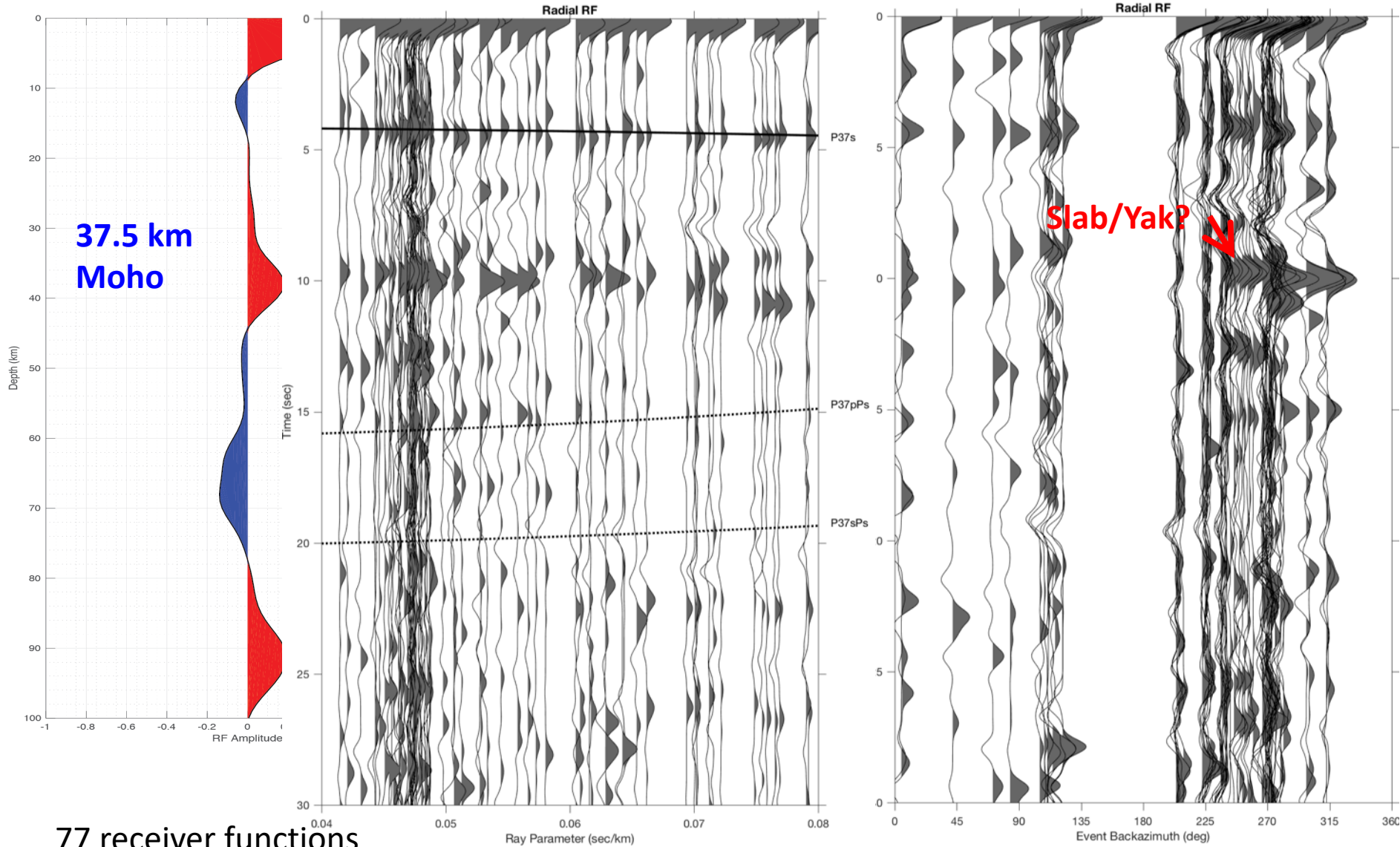
# Central Alaska Moho picks



HCF = Hines Creek Fault  
DF = Denali Fault  
TF = Talkeetna Fault



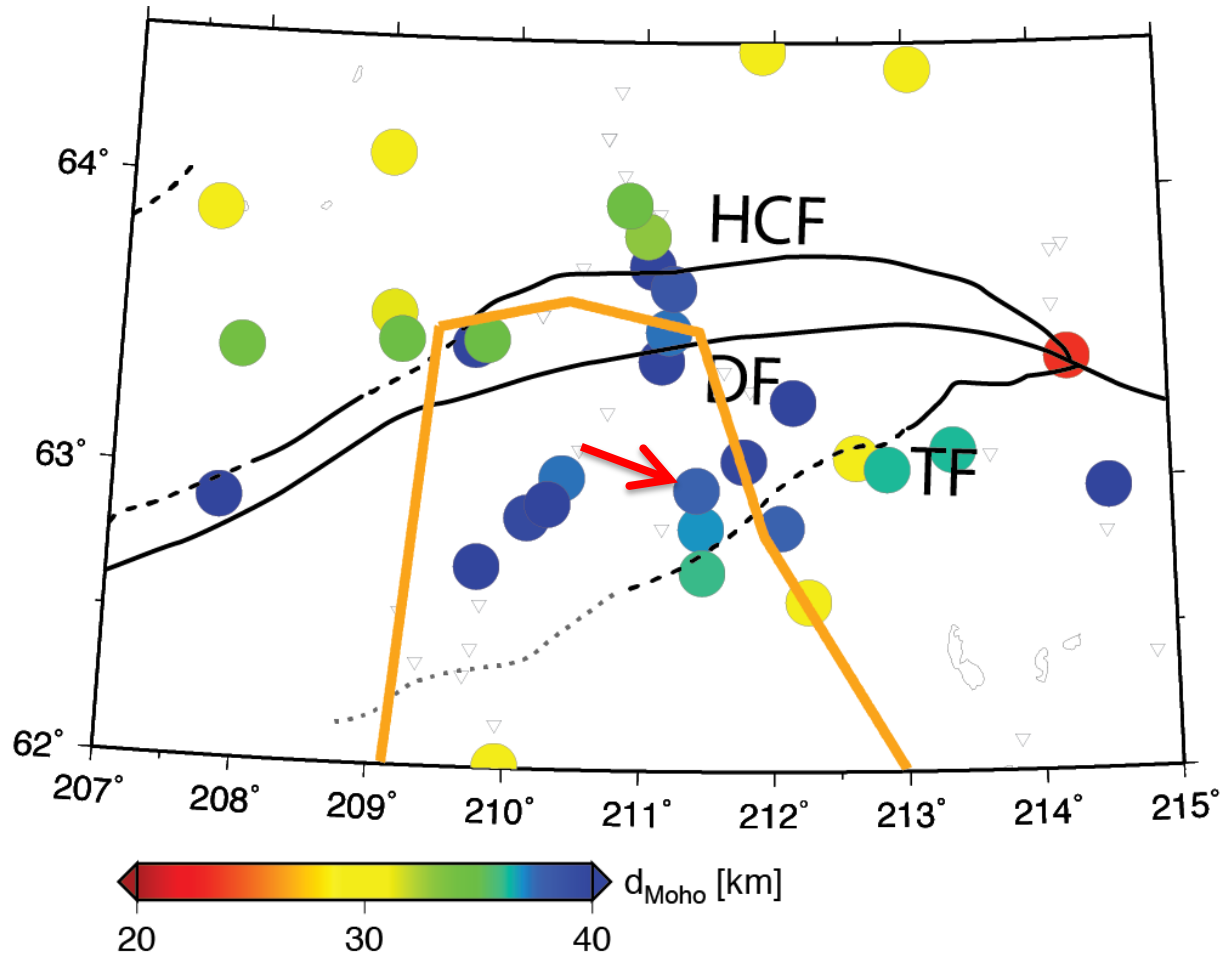
# AK.WAT2 station



77 receiver functions

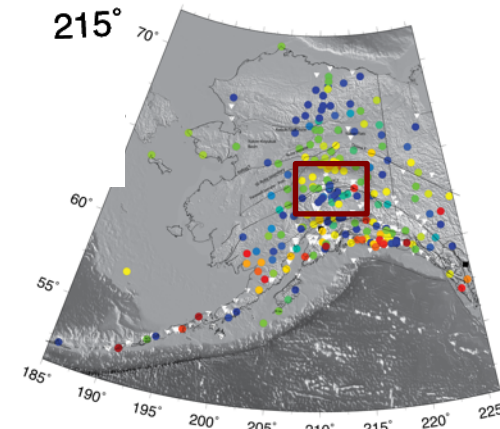


# Central Alaska Moho picks

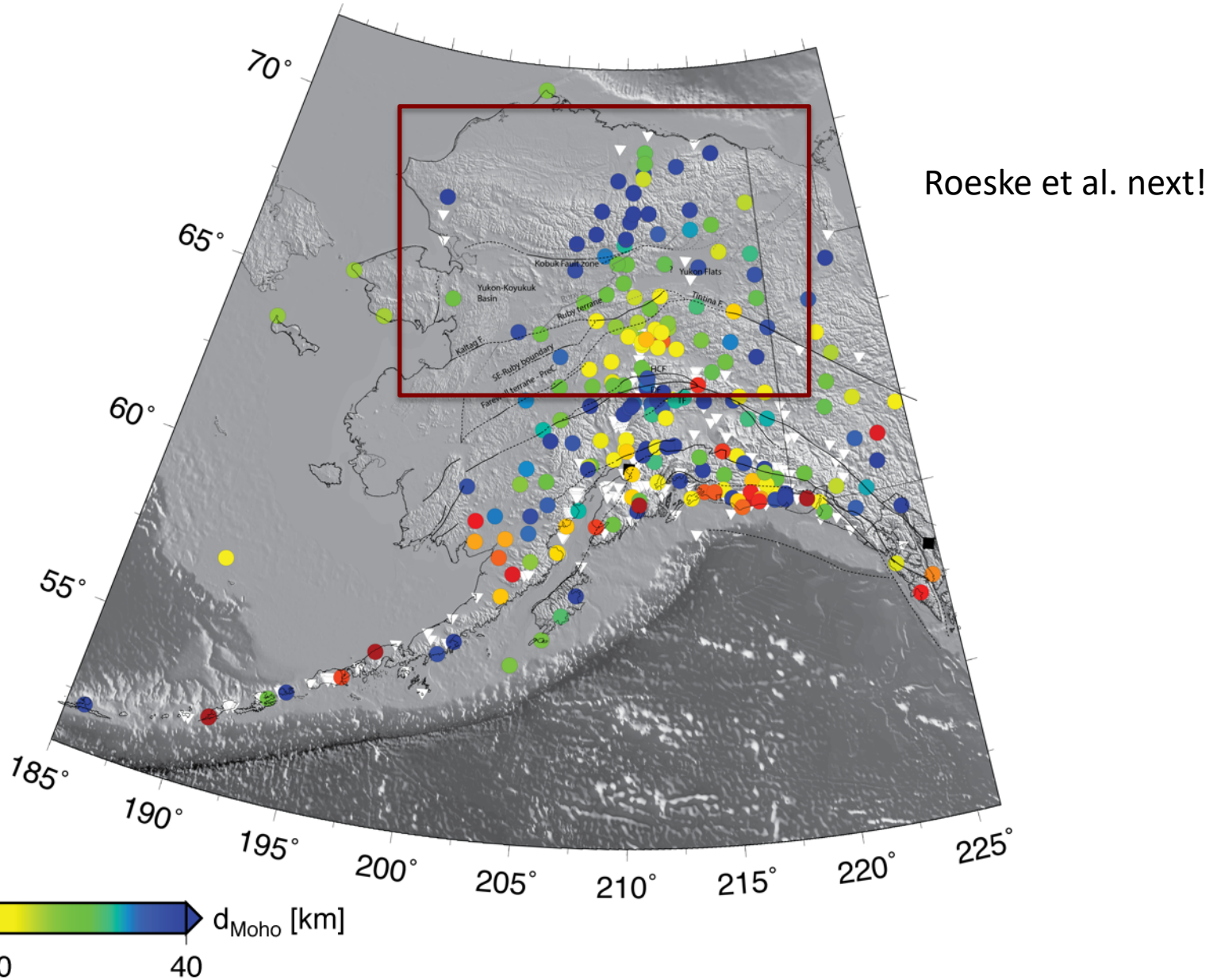


YAK  
outline at  
depth  
(Fuis et  
al., 2008)

HCF = Hines Creek Fault  
DF = Denali Fault  
TF = Talkeetna Fault



# Moho picks with major faults



# Thoughts ...

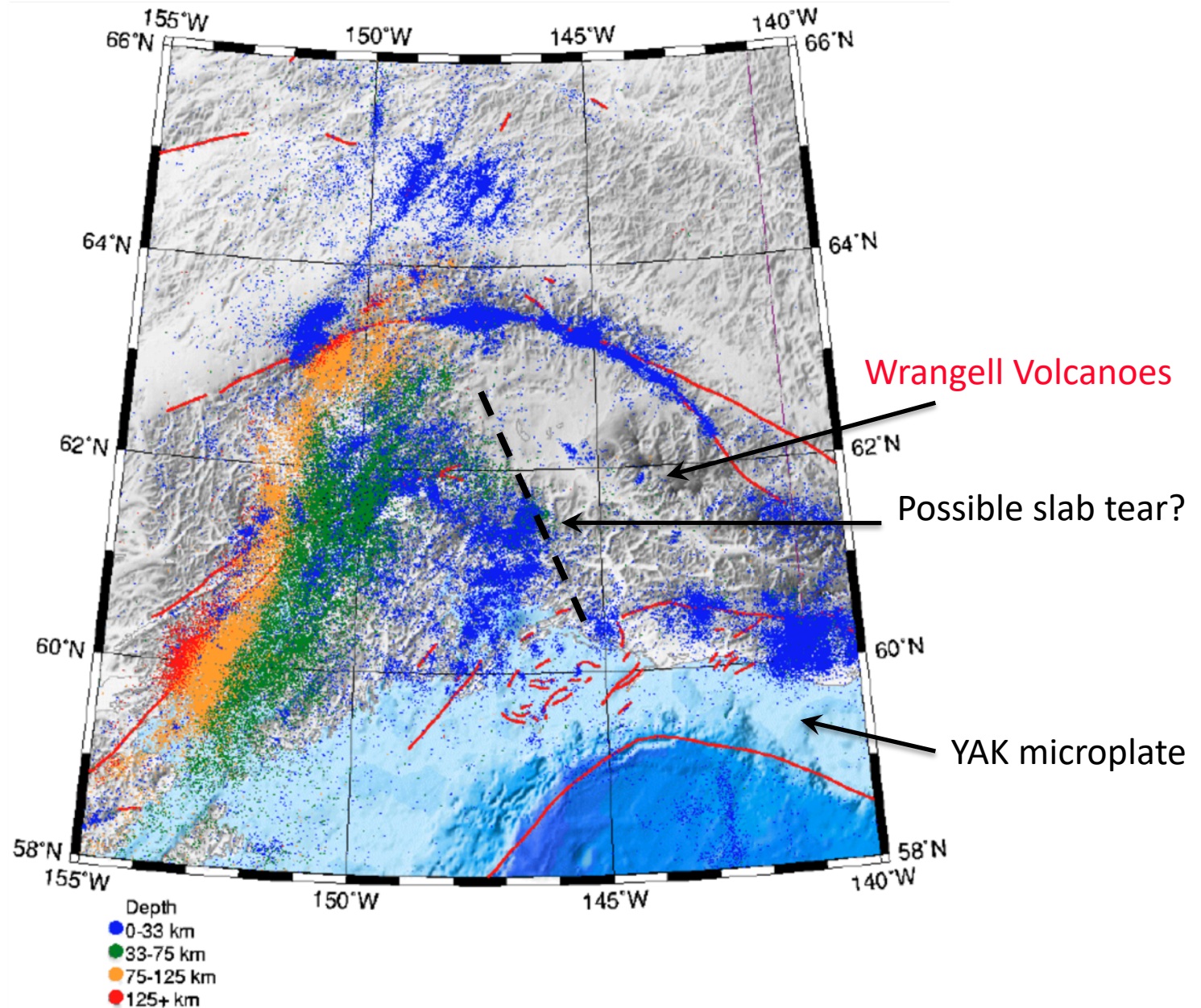
- Striking correspondence in observed crustal thickness and lithospheric structure with geologically mapped terranes & faults
- Abundance of data – tons to learn and exploit
  - Devil is in the details!
- Integration of geological observations and tectonics is going to continue to provide increased understanding and new discoveries

**ACKNOWLEDGEMENTS - COLLABORATIONS**

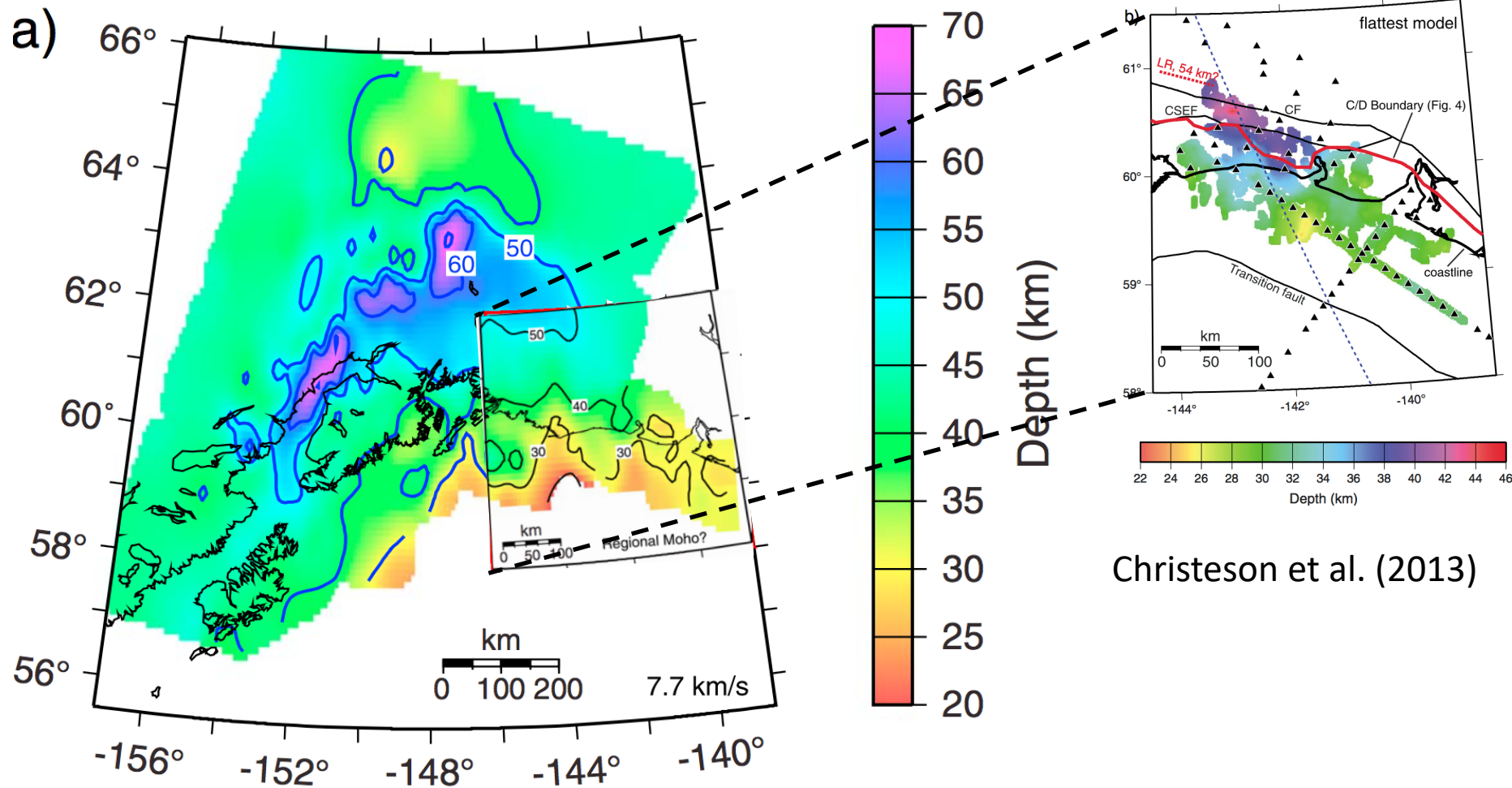


# EXTRA SLIDES

# Interior and Southern Alaska Plate Tectonics



# STEEP array: onshore-offshore



7.7 km/s velocity contour from Eberhart-Phillips et al. (2006) model

blue = Moho depth

blended with picks from PmP (Moho) reflection points (top right) from STEEP active source survey



# Broadband stations

468 stations  
2094 events  
(1999-April  
2017)  
117097 event -  
station pairs

**24220 RFs**

