

Imaging the North Anatolian Fault

Using the Scattered Teleseismic Wavefield



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Victoria Lane and David Hawthorn - SEIS-UK

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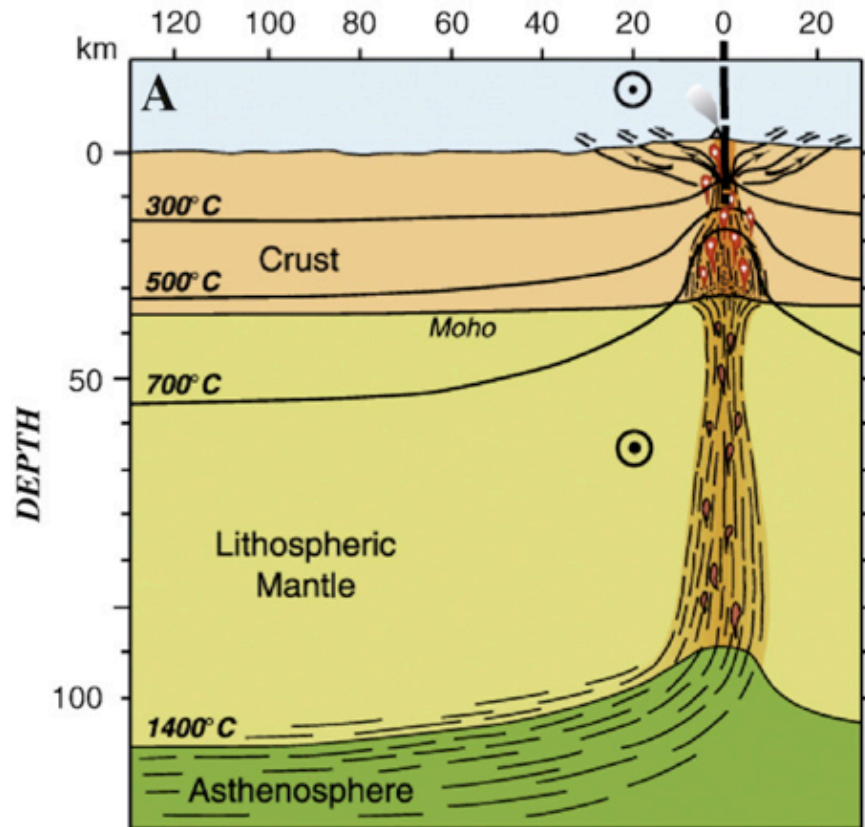
³ Boğaziçi Üniversitesi, Kandilli Earth Observatory and Earthquake Research Institute, Istanbul, Turkey

⁴ Department of Geophysical Engineering, Sakarya University, Sakarya, Turkey

⁵ Department of Geological Sciences, University of Manitoba, Winnipeg, Canada

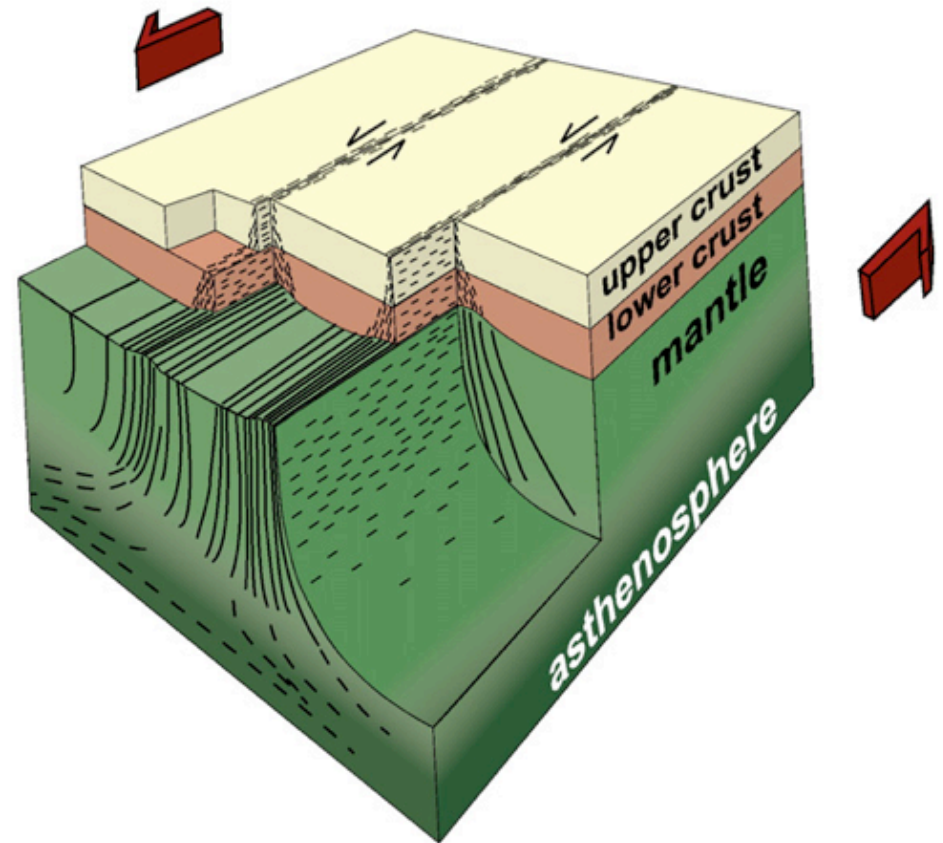
⁶ Department of Earth Science, University of Bergen, Bergen, Norway

Aims



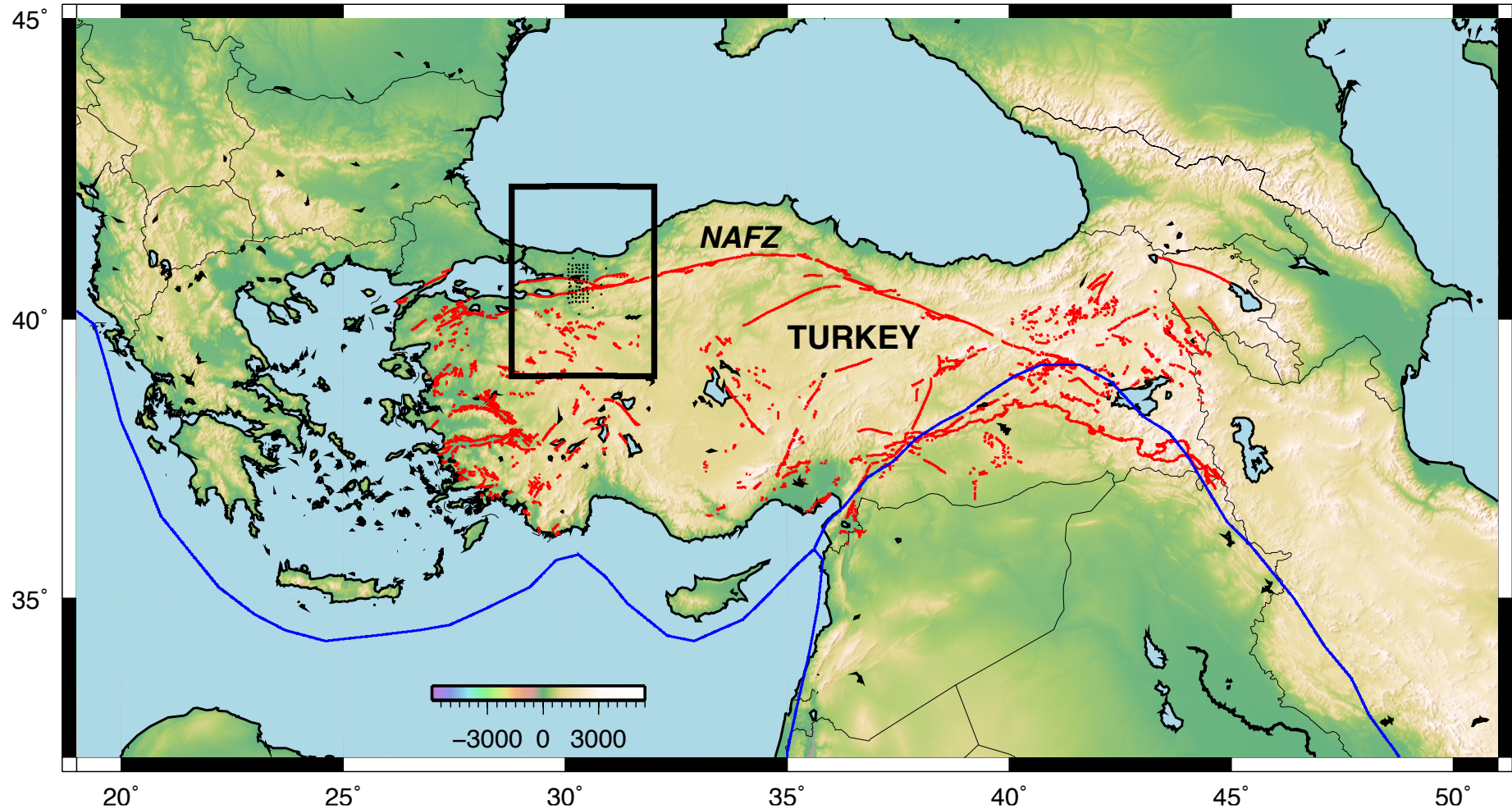
B

Lithosphere

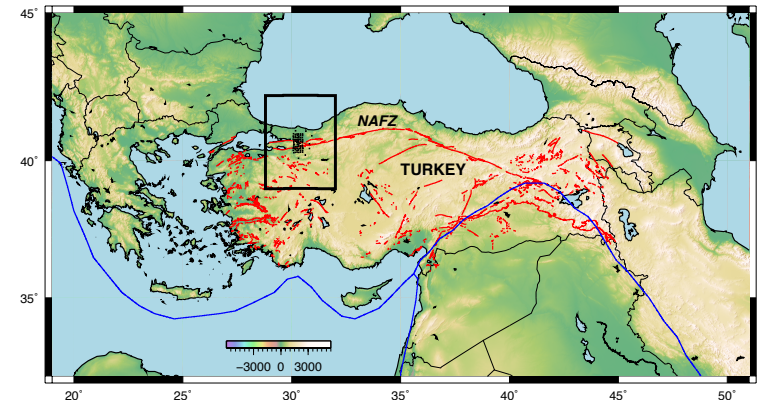
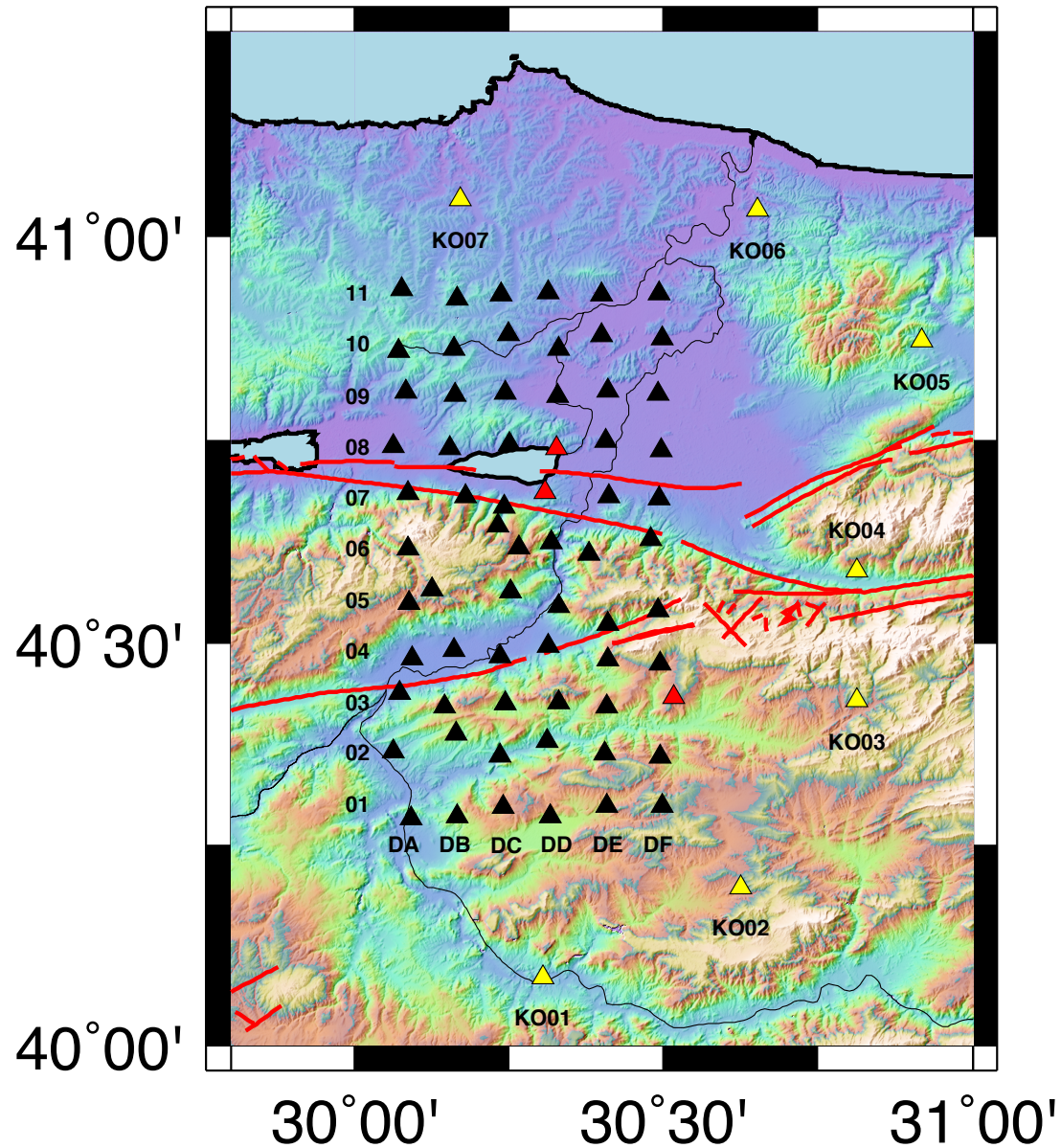


Vaucher et. al (2012)

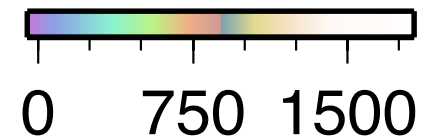
Dense Array for North Anatolia (DANA)



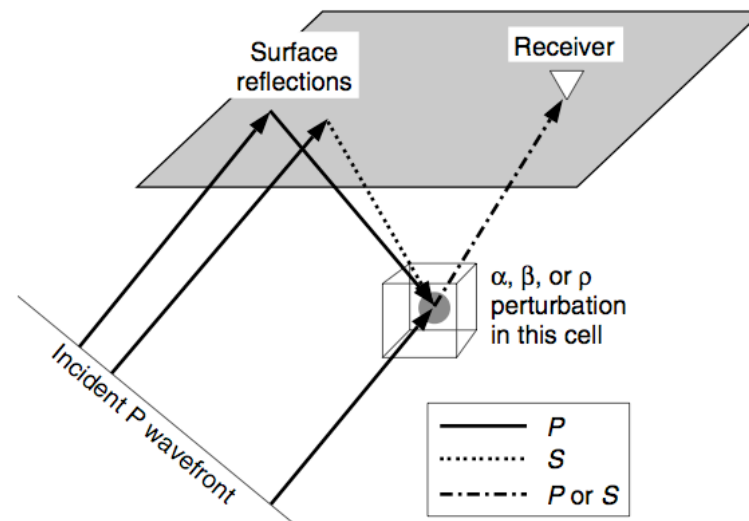
Dense Array for North Anatolia (DANA)



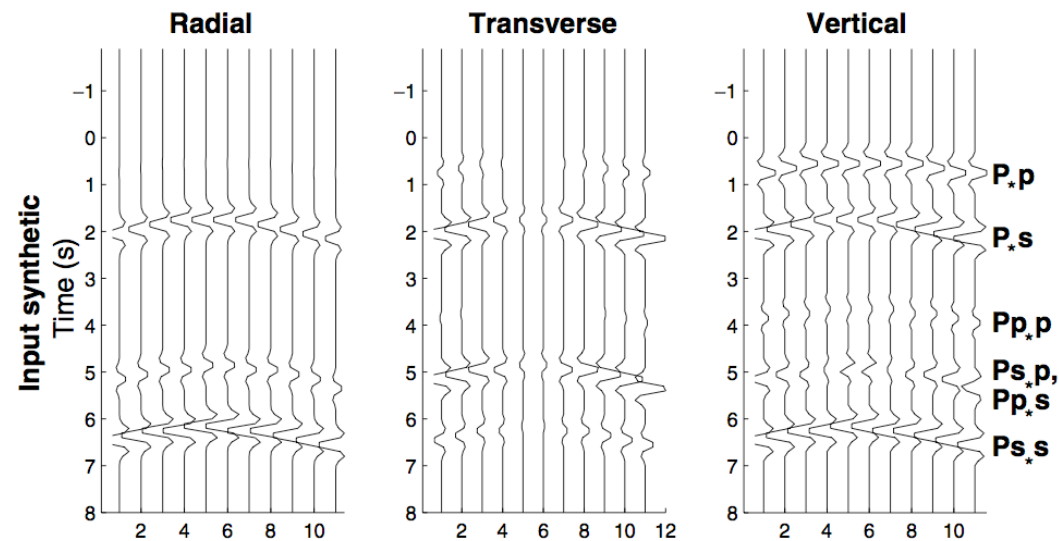
Elevation [m]



Scattering Methodology

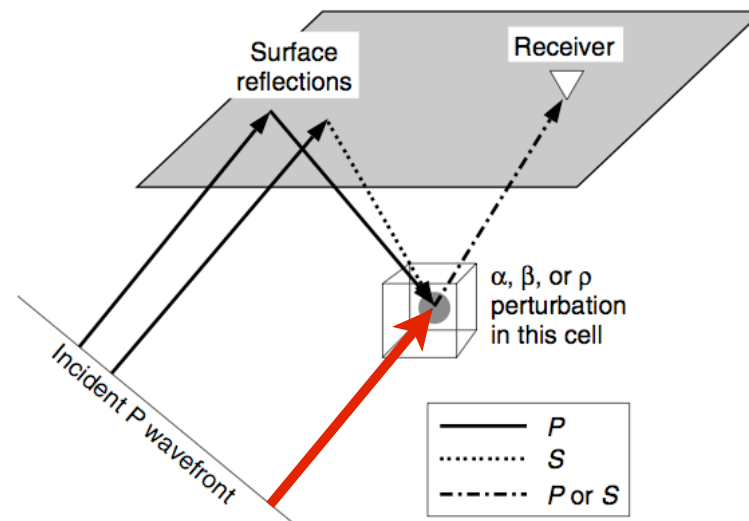


$$a \approx \lambda$$

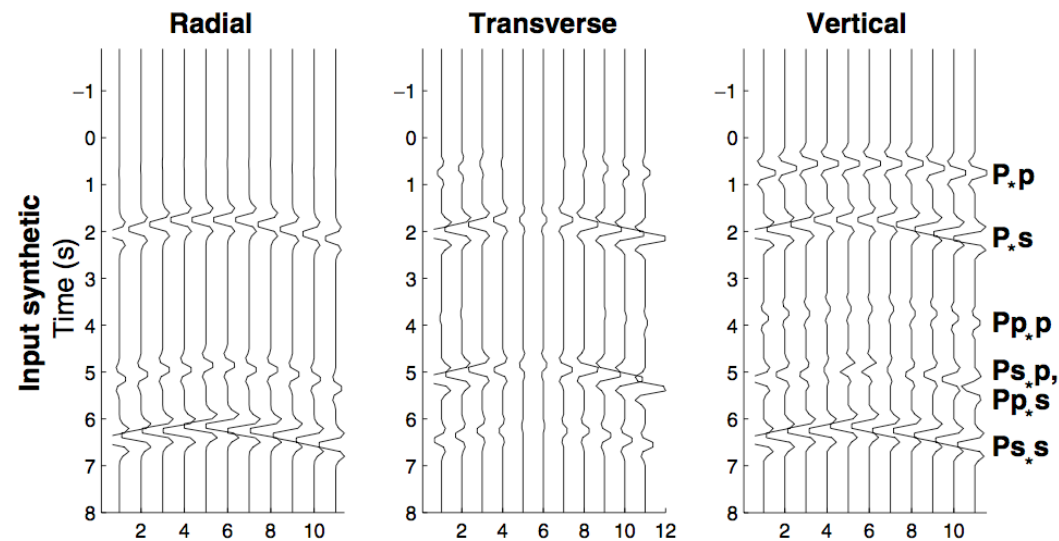


Frederiksen and Revenaugh (2004)

Scattering Methodology

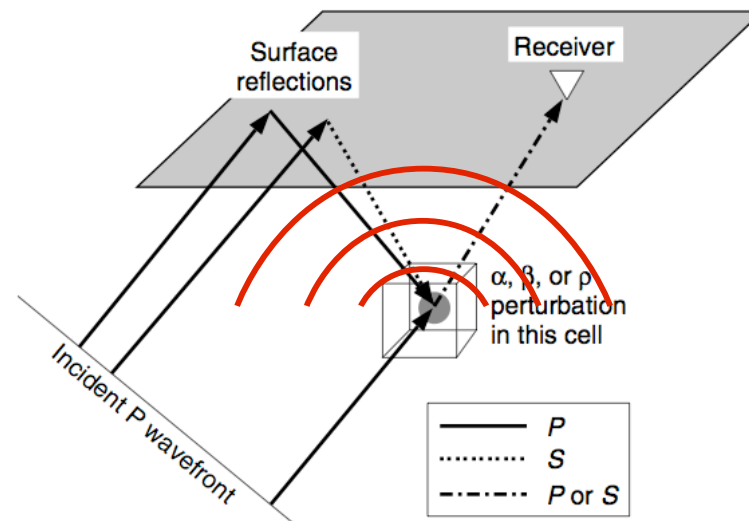


$$a \approx \lambda$$

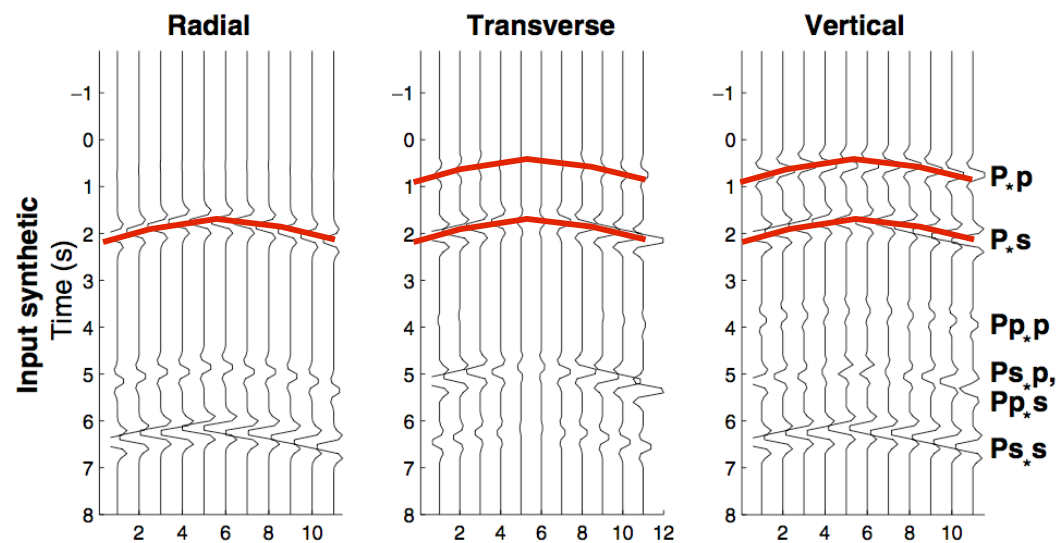


Frederiksen and Revenaugh (2004)

Scattering Methodology

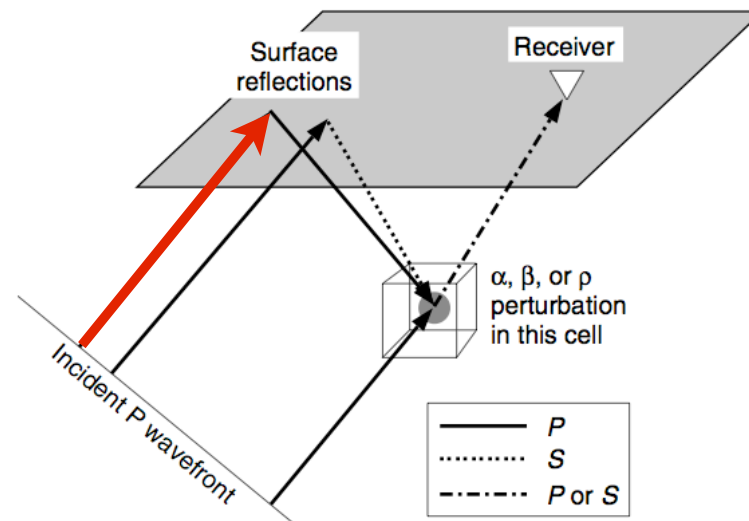


$$a \approx \lambda$$

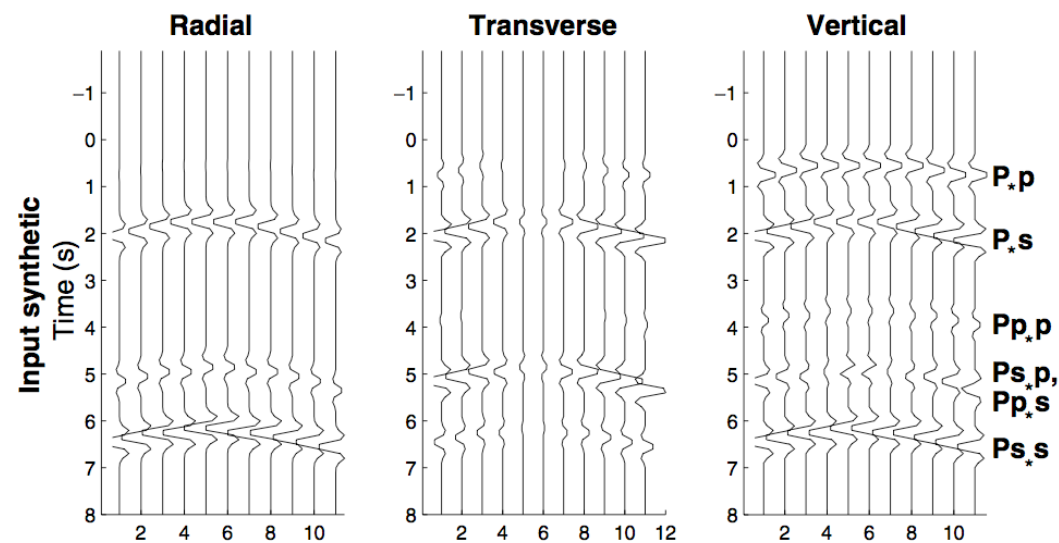


Frederiksen and Revenaugh (2004)

Scattering Methodology

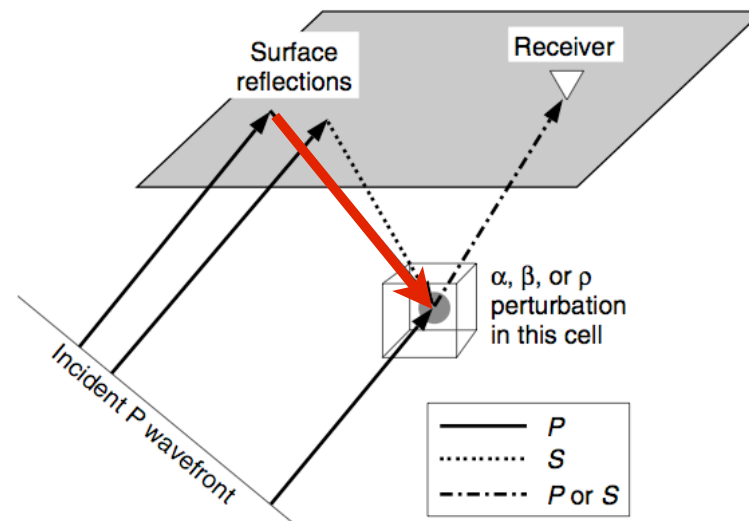


$$a \approx \lambda$$

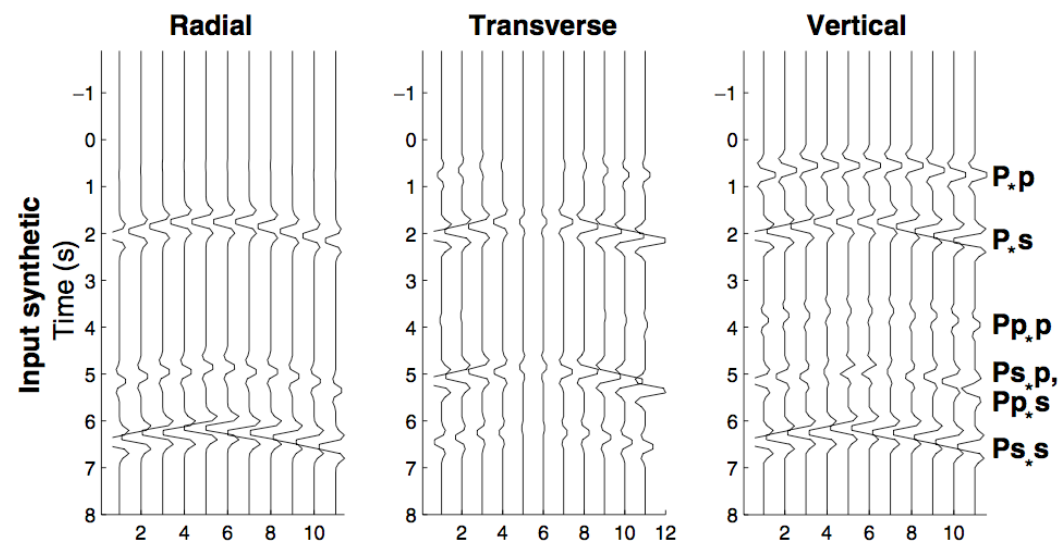


Frederiksen and Revenaugh (2004)

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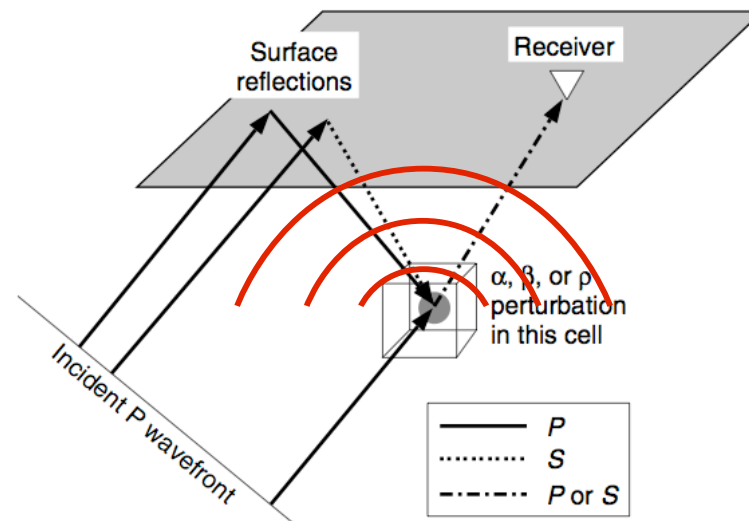


$$a \approx \lambda$$

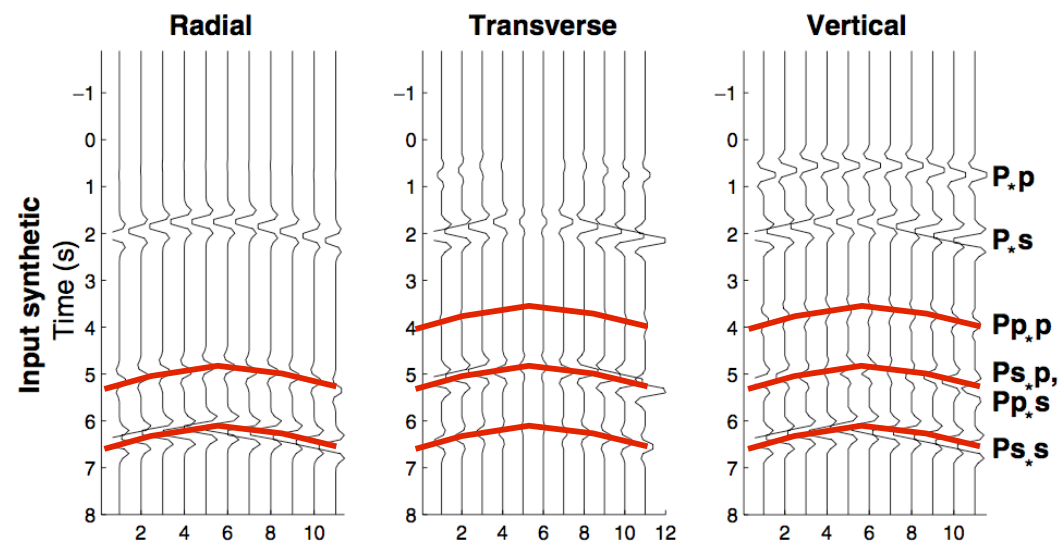


Frederiksen and Revenaugh (2004)

Scattering Methodology

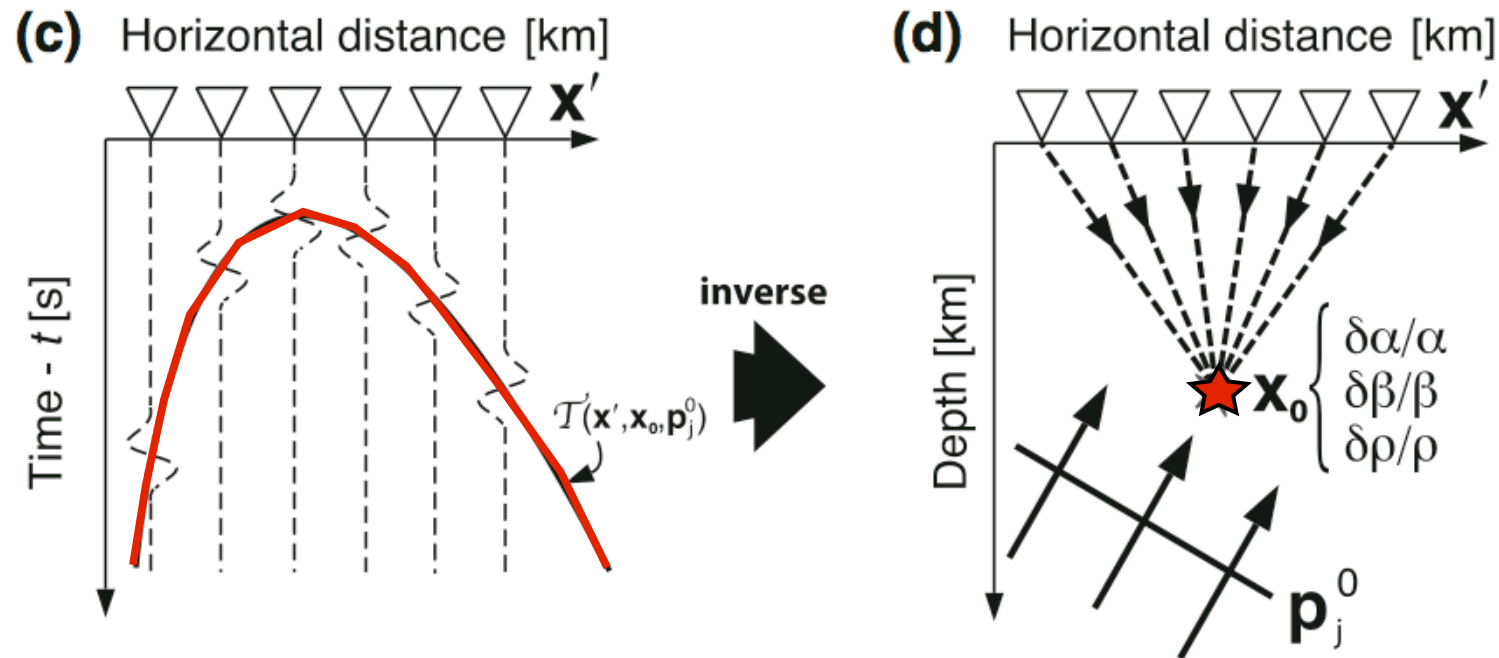


$$a \approx \lambda$$



Frederiksen and Revenaugh (2004)

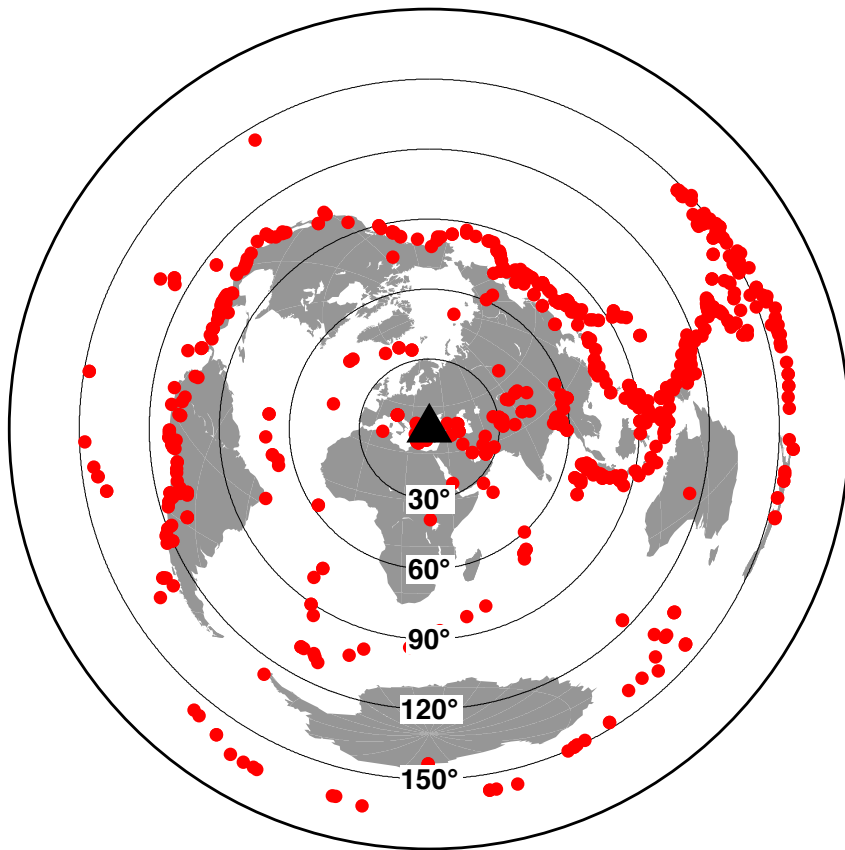
Scattering Migration



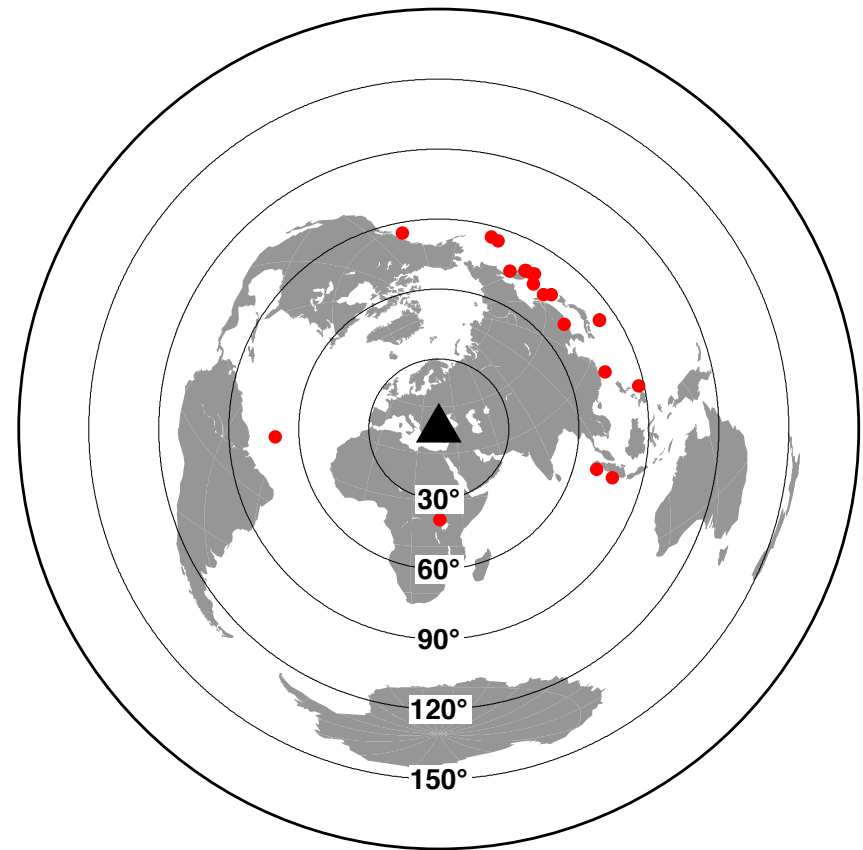
Rondenay (2009)

Data - Events

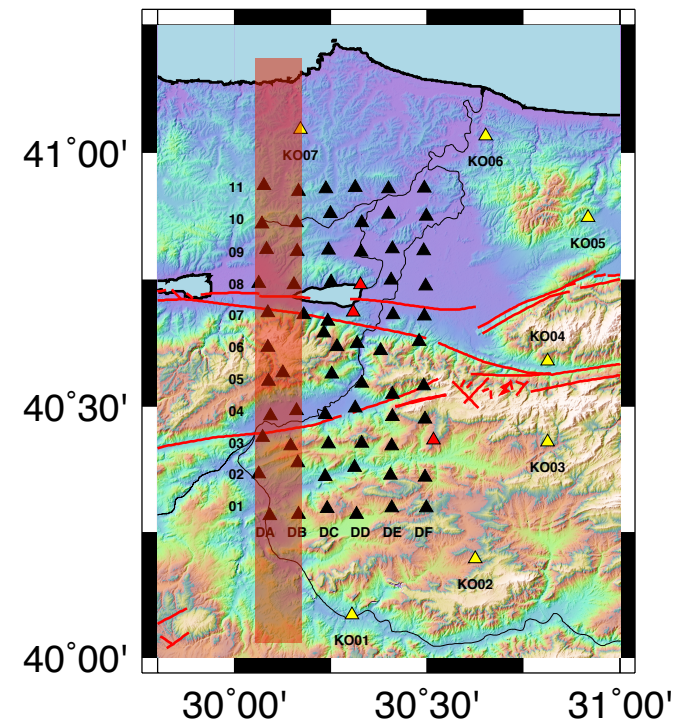
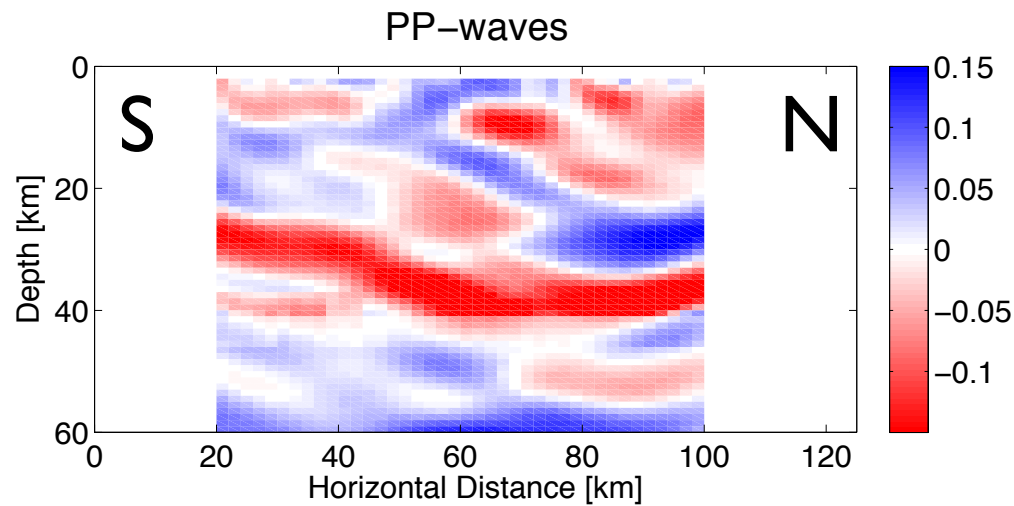
Recorded



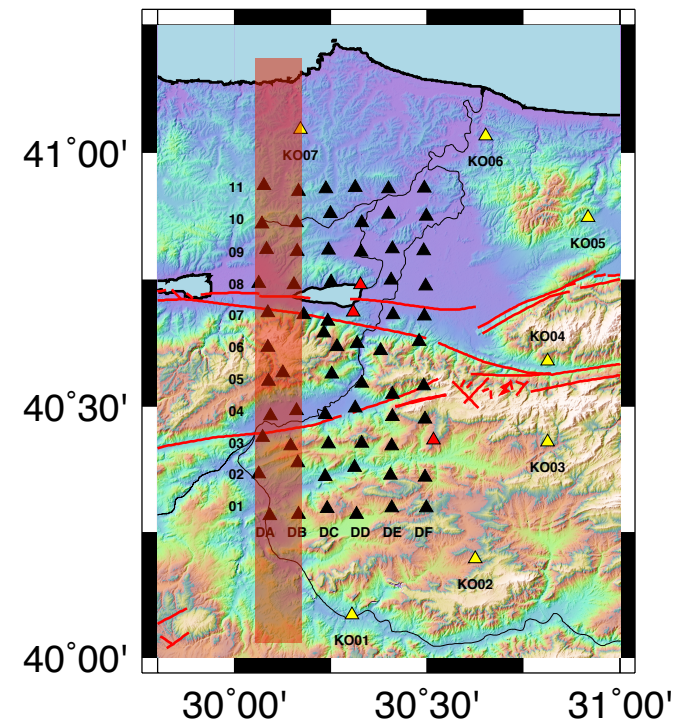
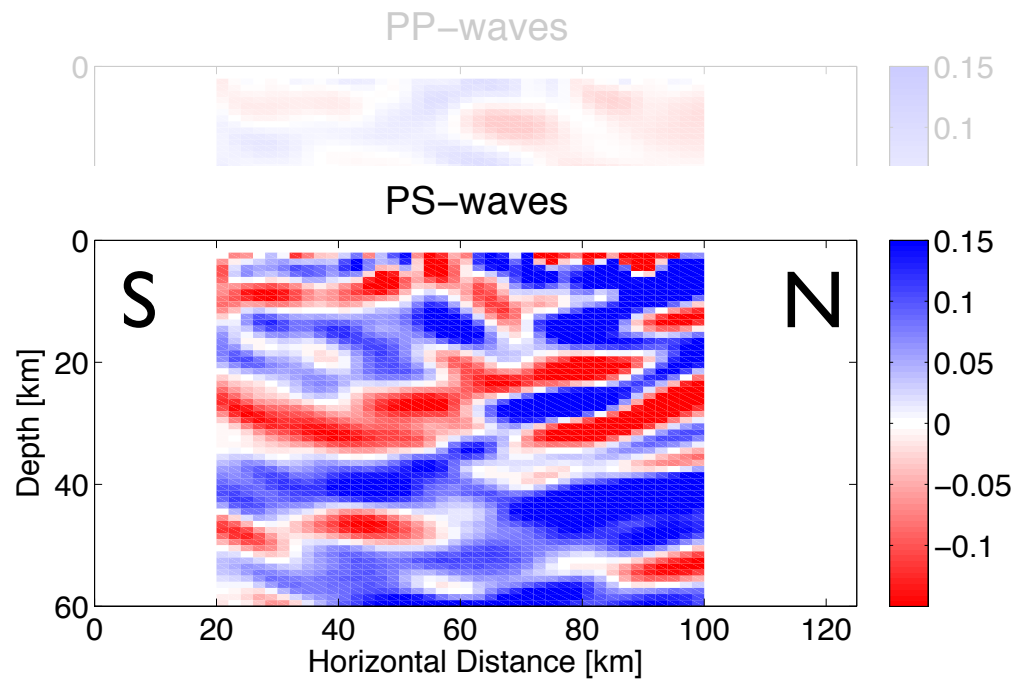
Used



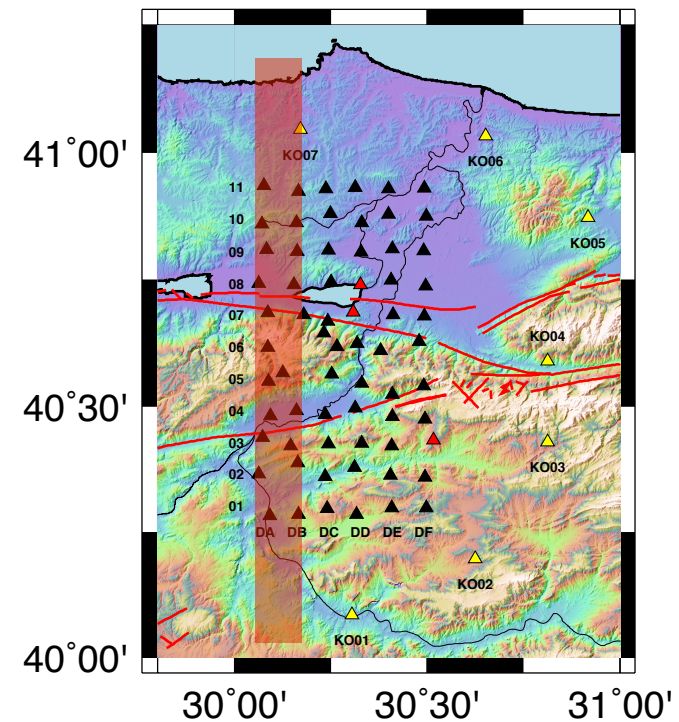
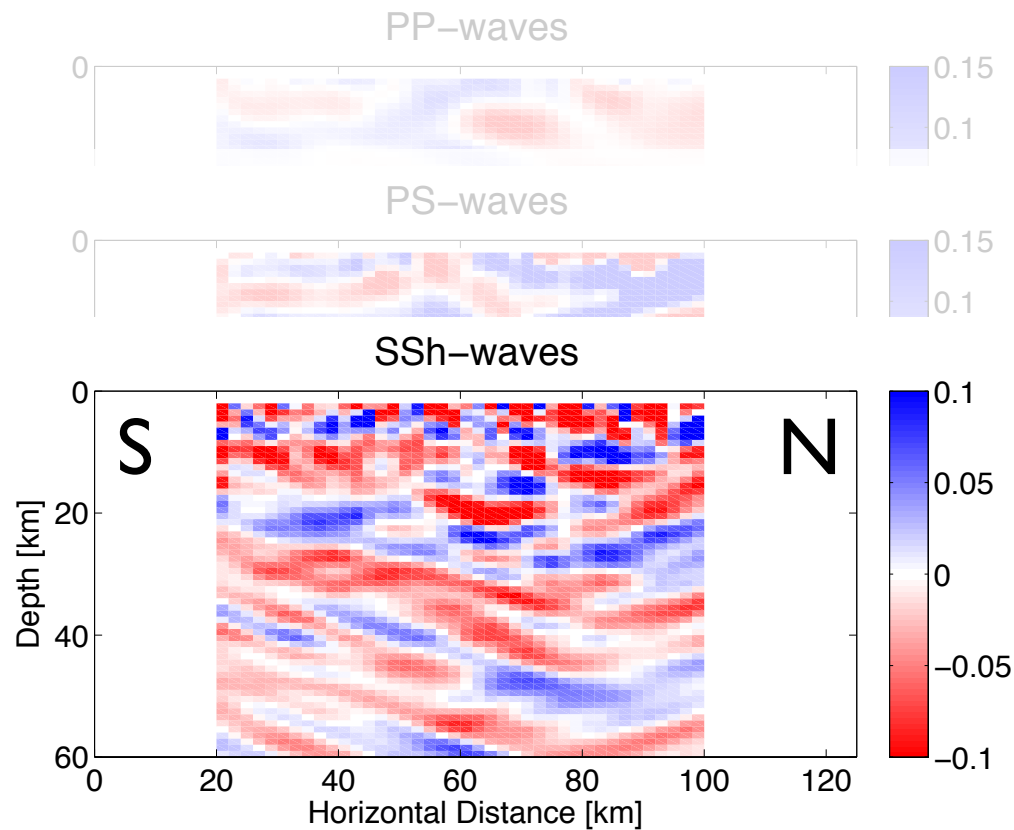
Scattering Migration



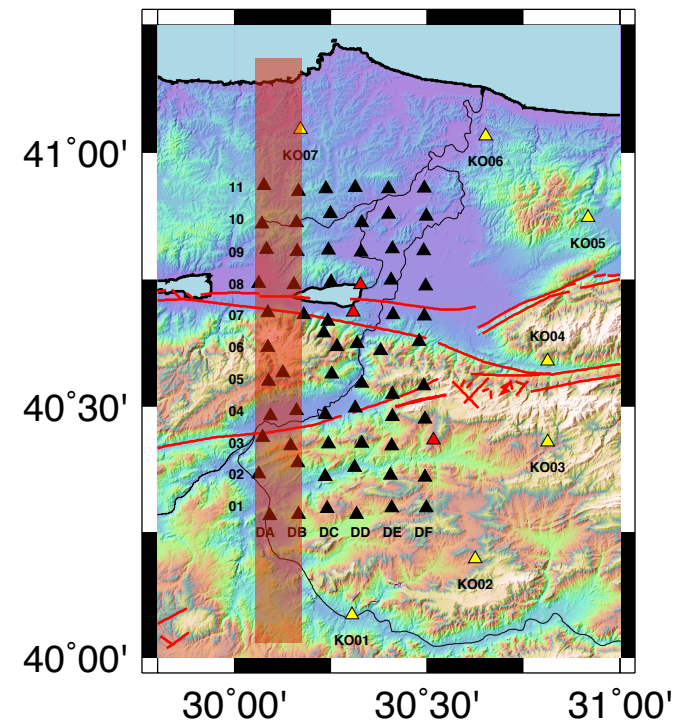
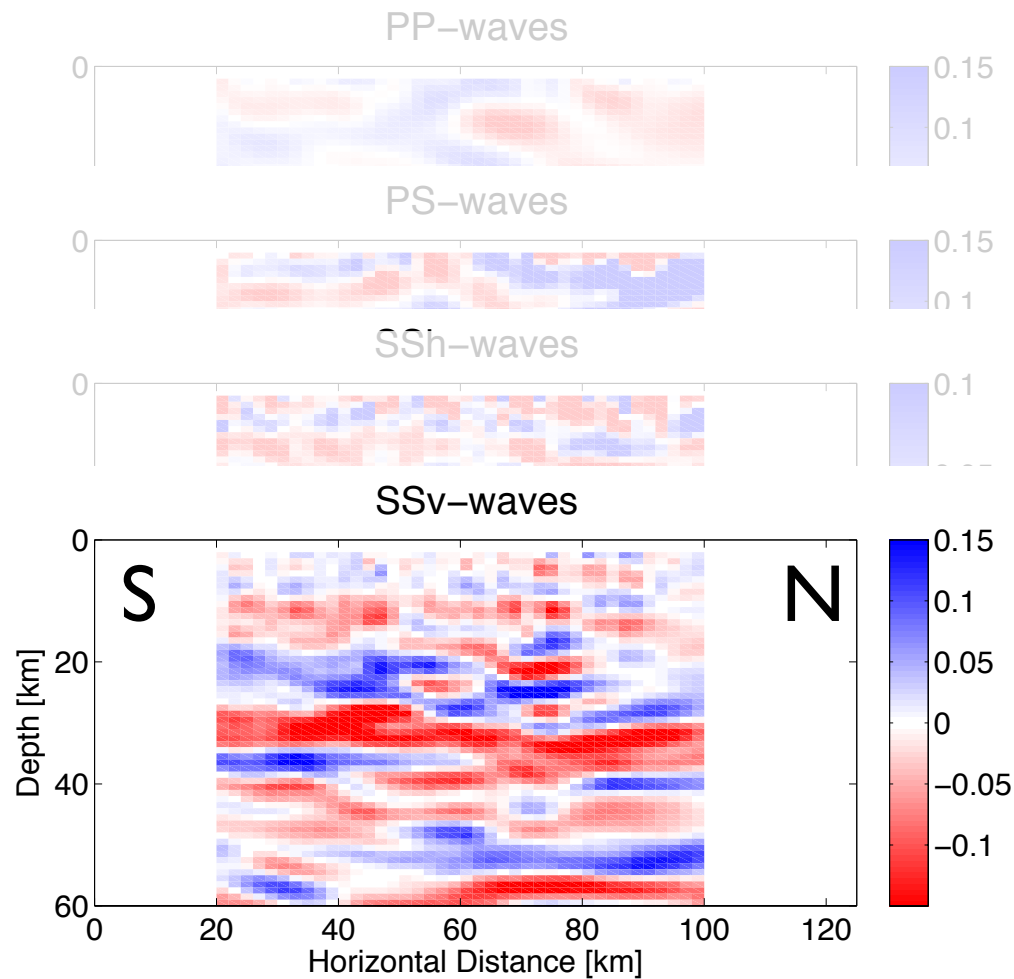
Scattering Migration



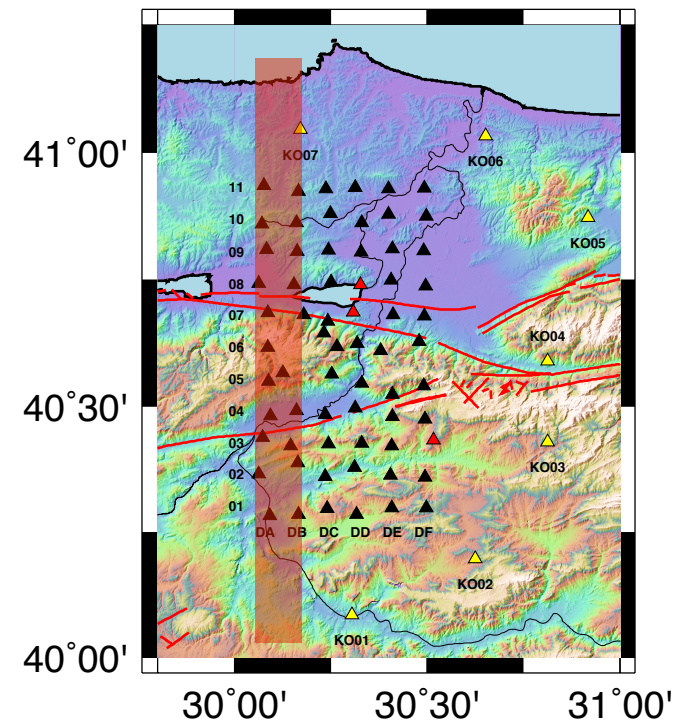
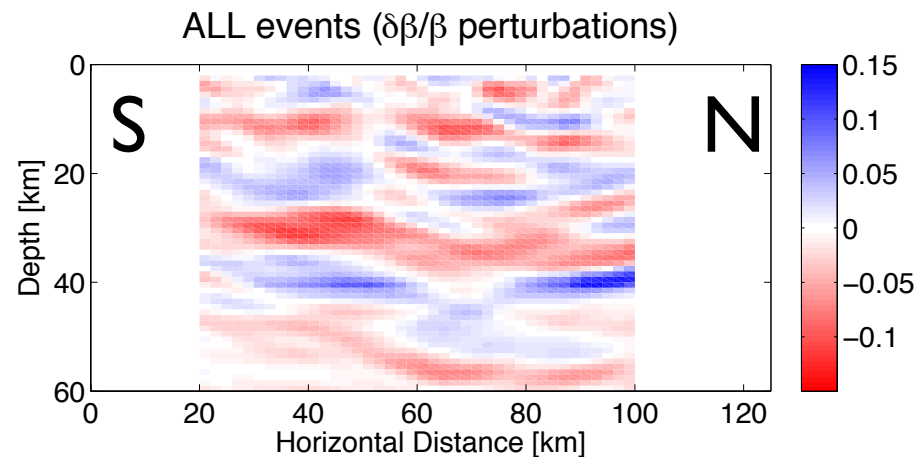
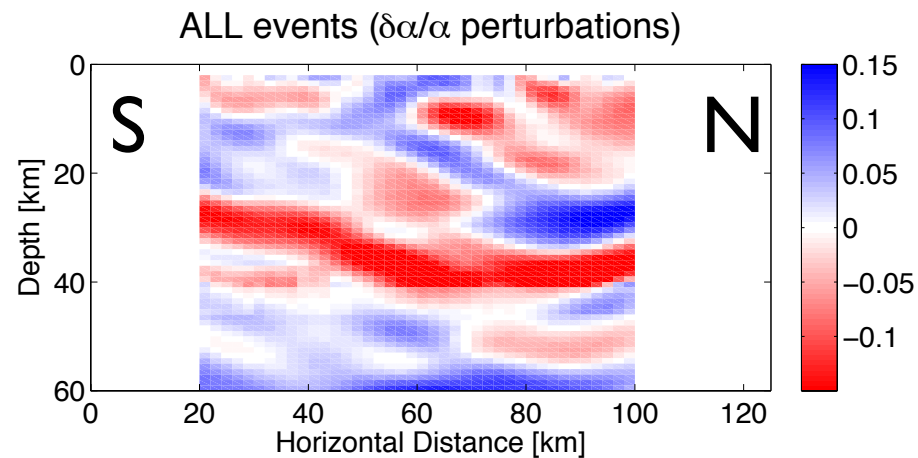
Scattering Migration



Scattering Migration

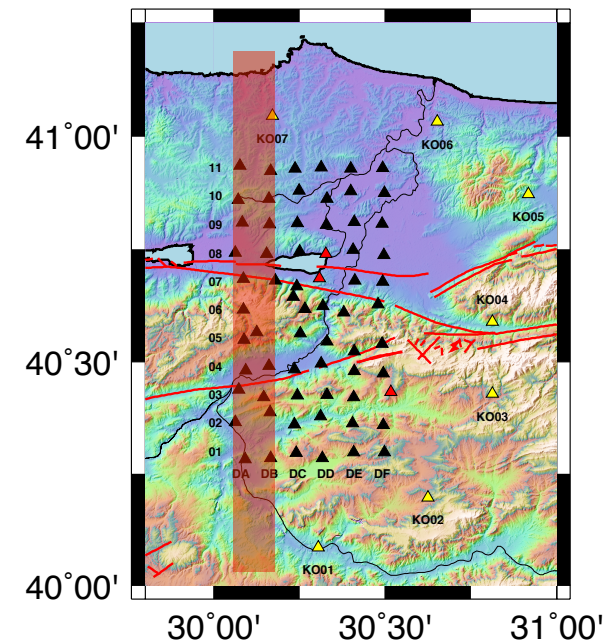
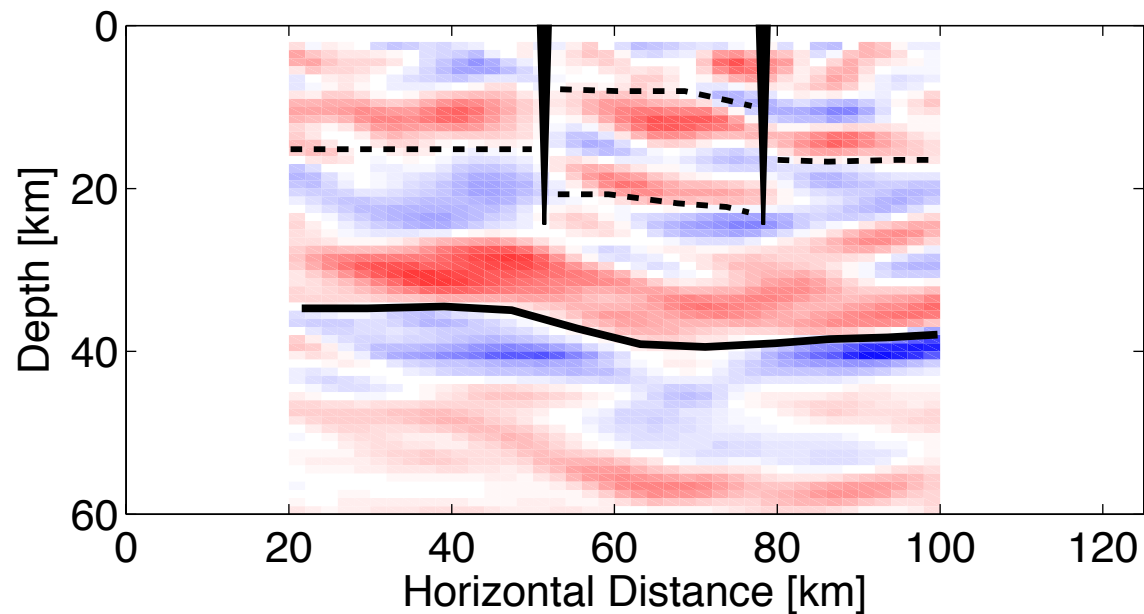


Scattering Migration



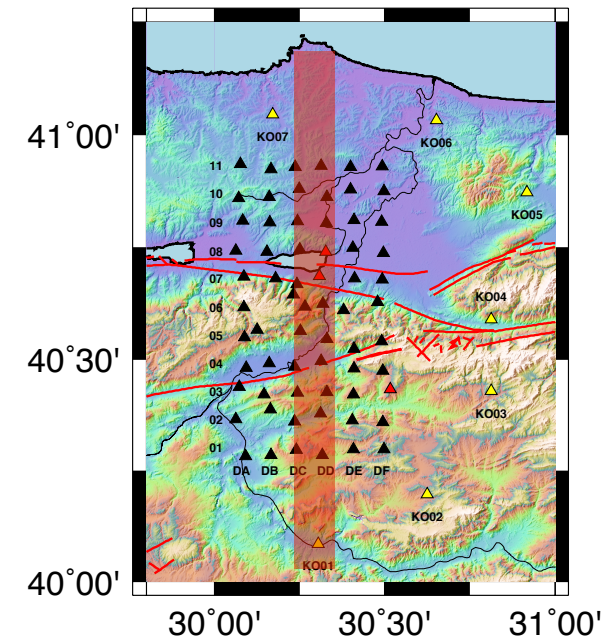
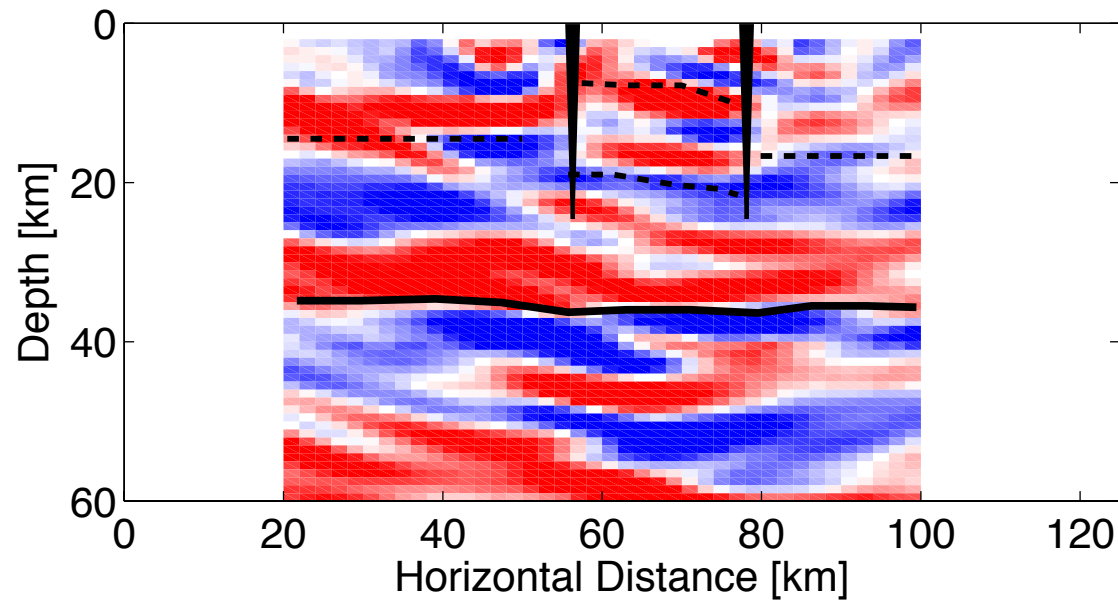
Scattering Migration

ALL events ($\delta\beta/\beta$ perturbations)



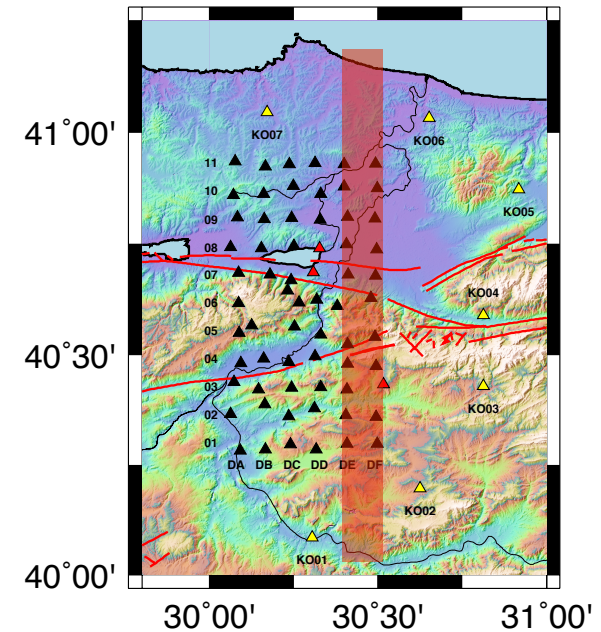
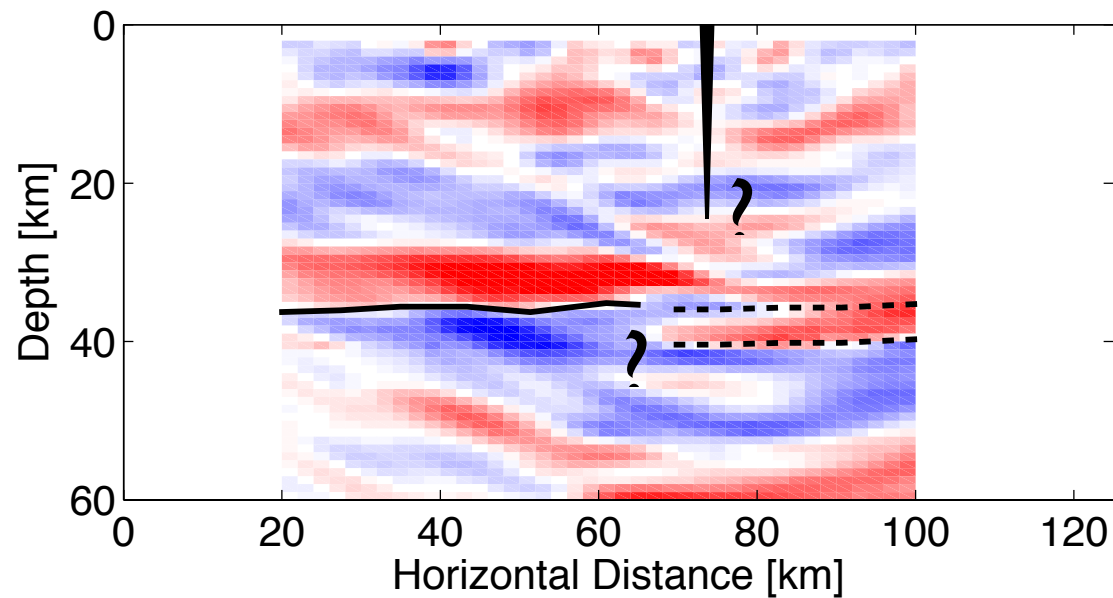
Scattering Migration

ALL events ($\delta\beta/\beta$ perturbations)



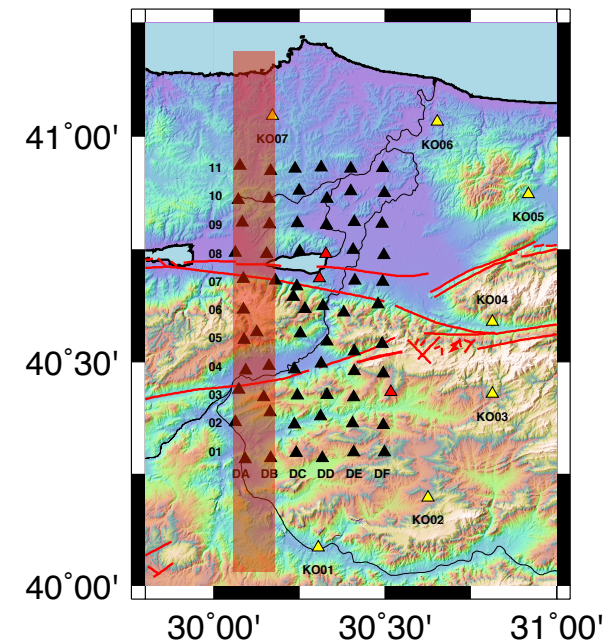
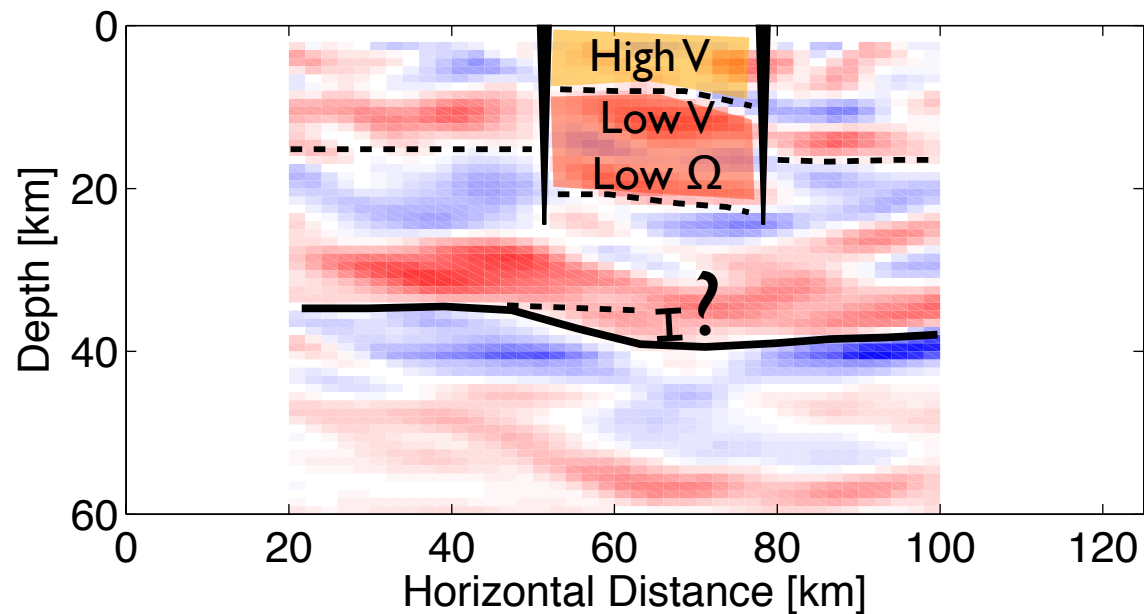
Scattering Migration

ALL events ($\delta\beta/\beta$ perturbations)

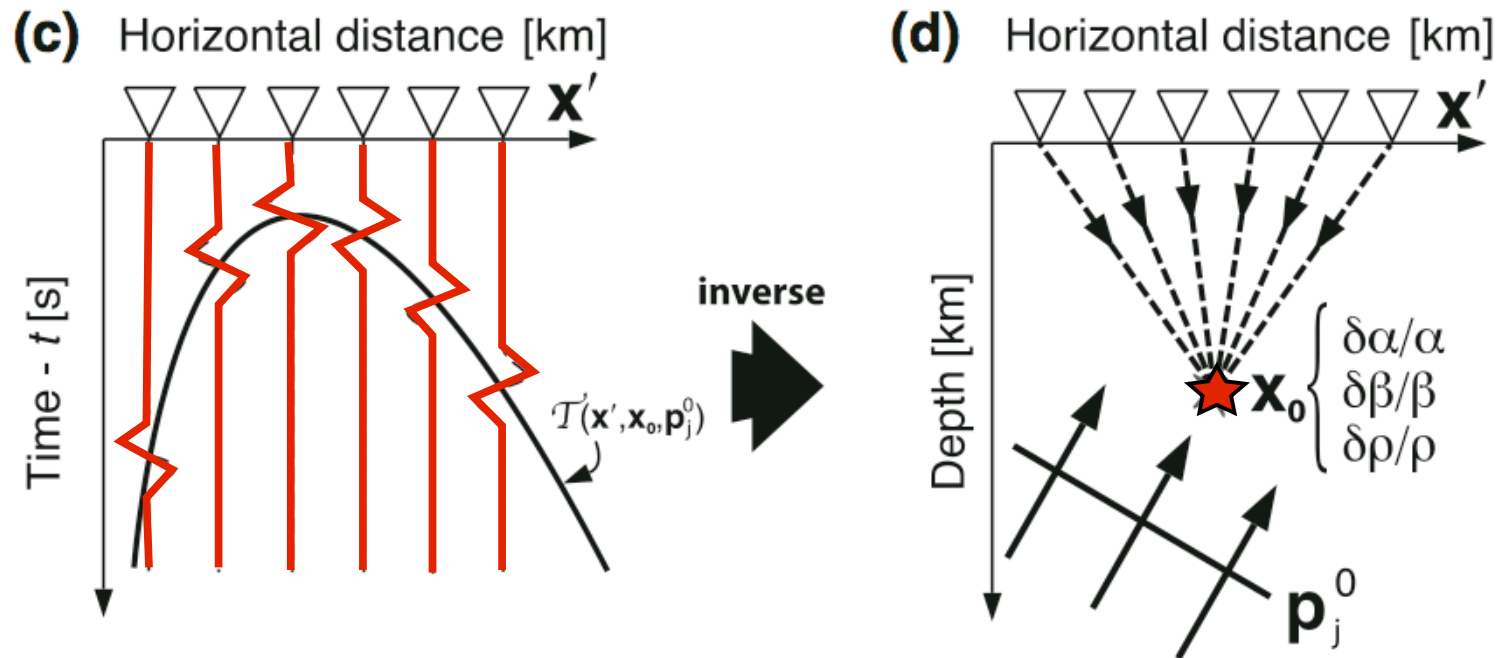


Scattering Migration

ALL events ($\delta\beta/\beta$ perturbations)



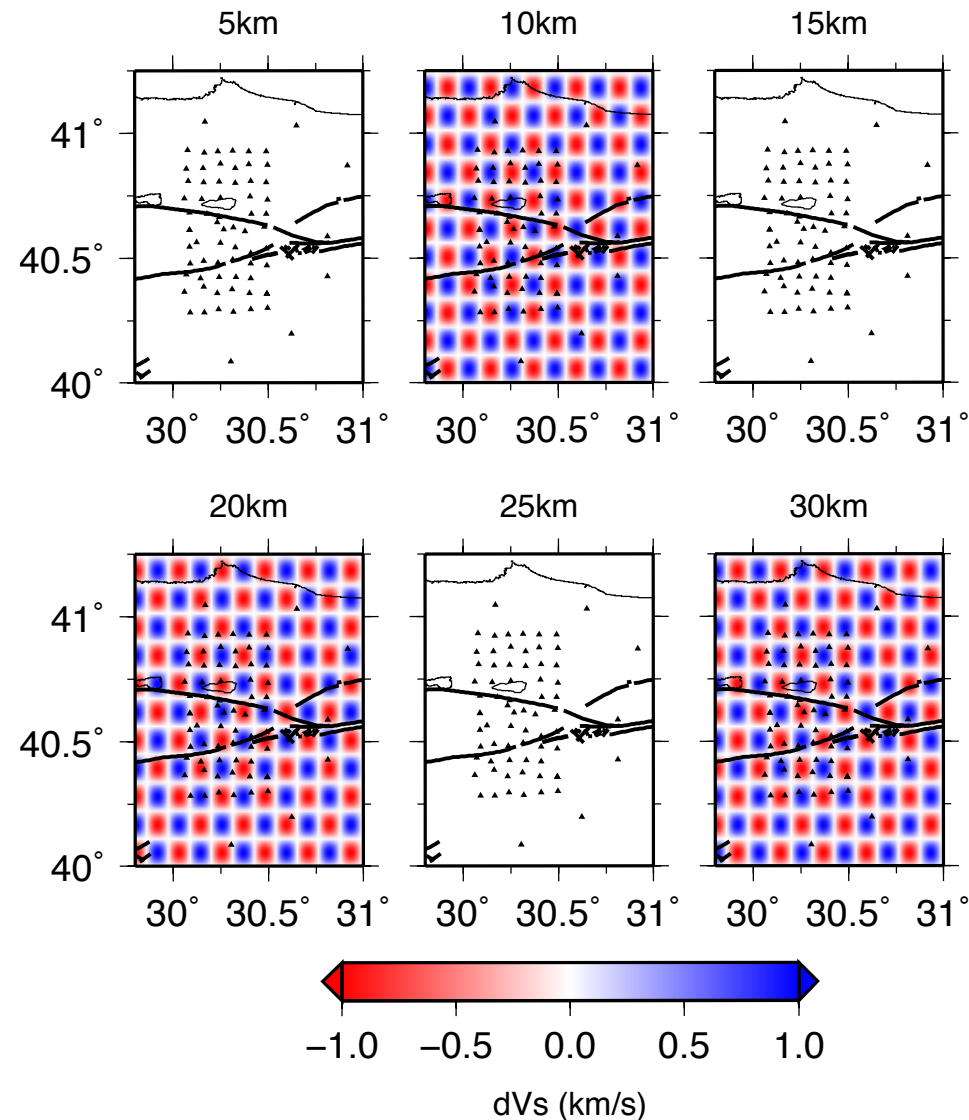
Scattering Tomography



Rondenay (2009)

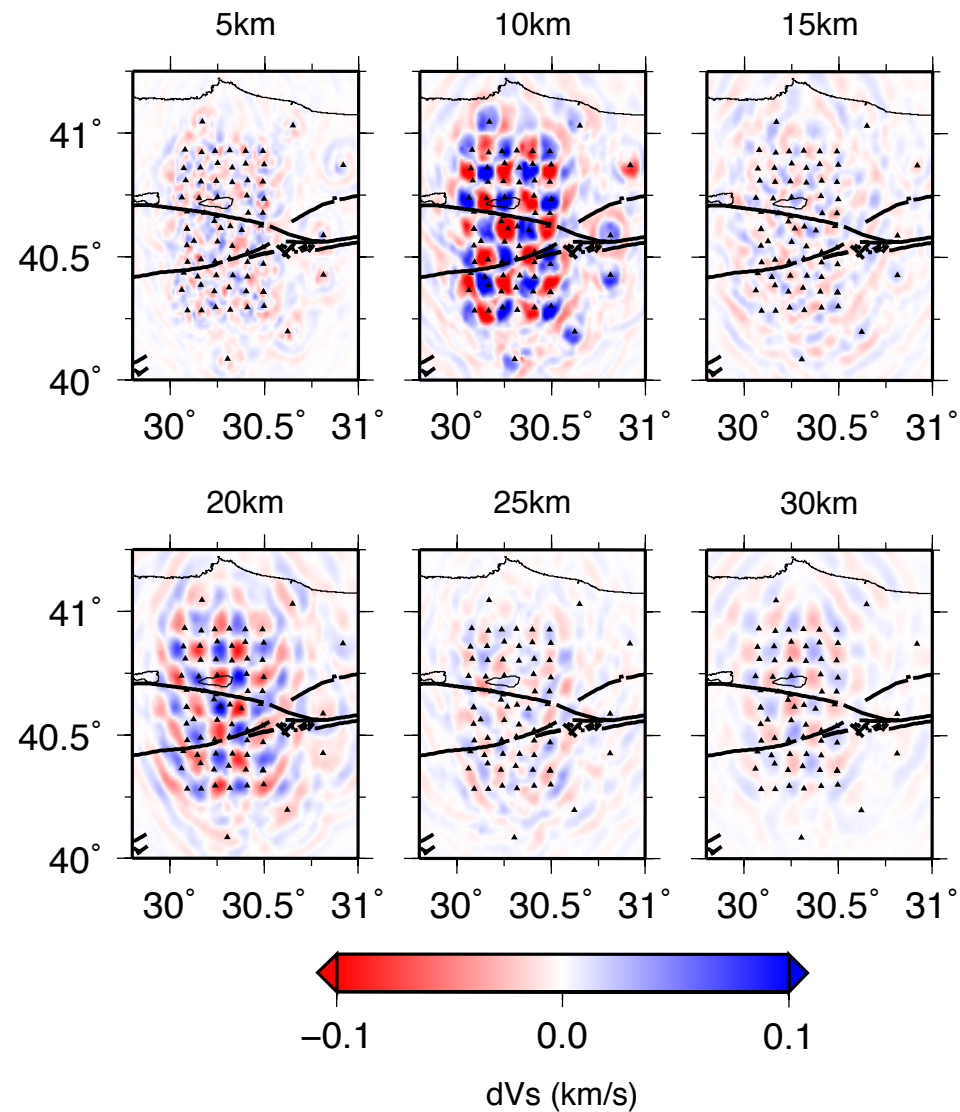
Scattering Tomography

Resolution - Input

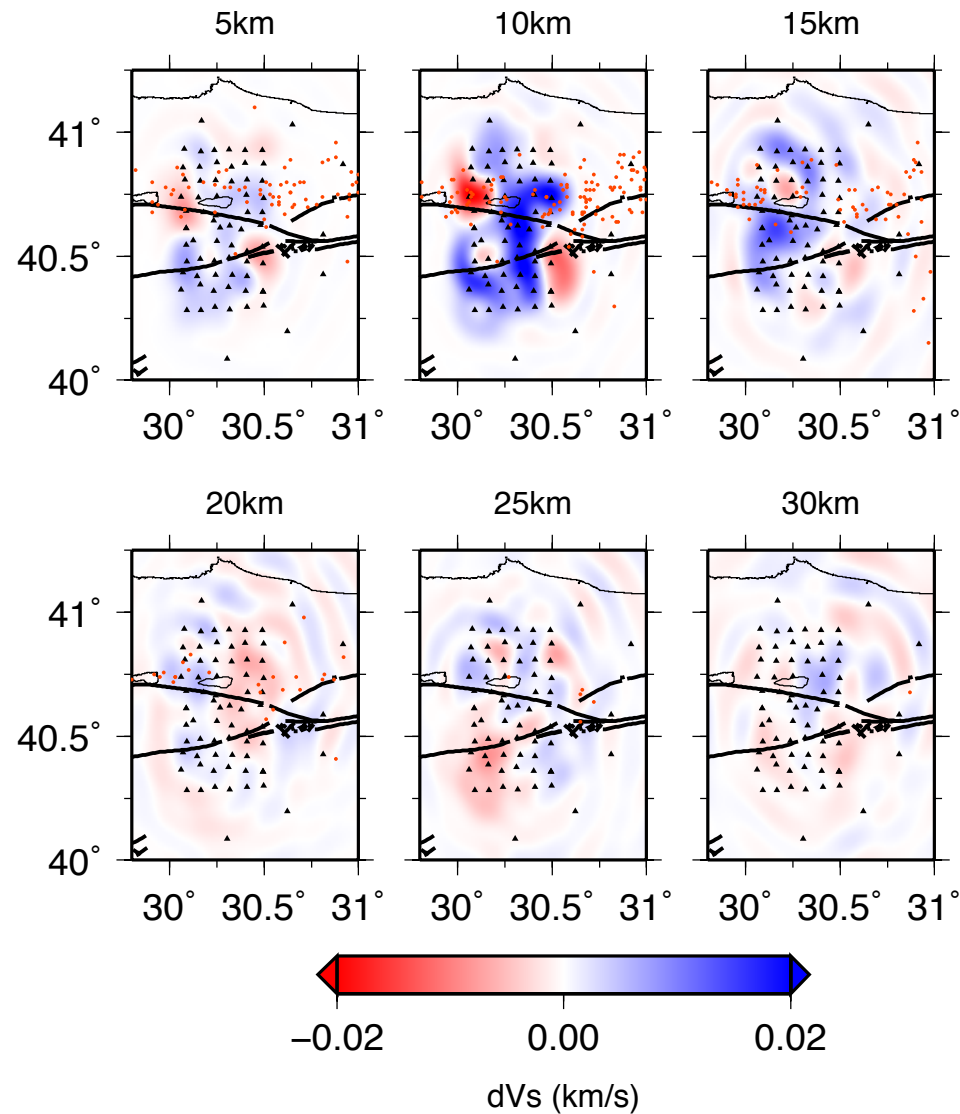


Scattering Tomography

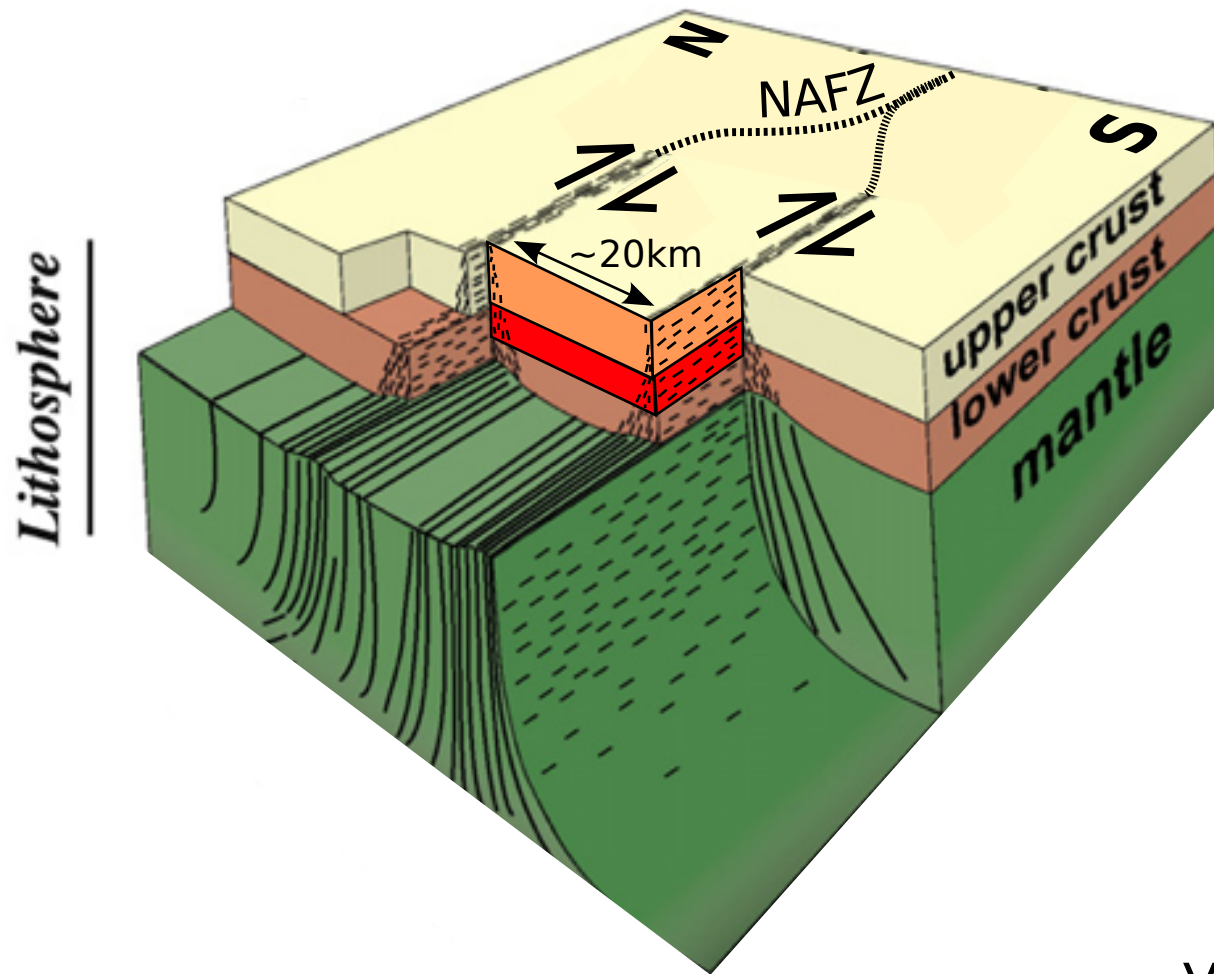
Resolution - Output



Scattering Tomography Results



Summary



redrawn after
Vauchez et. al (2012)

Summary

- Strong contrasts in structure across **both** branches of the NAF down to mid-to-lower crustal depths
- Structure between the two branches of the fault dominated by metamorphic lithologies/fluids
- Potential Moho offset across the northern branch of the NAF
- Scattering methods powerful in strike-slip fault settings with sufficient data coverage

More on FaultLab.....

- **T23E-2633. Detailed Northern Anatolian Fault Zone crustal structure from receiver functions**

David G. Cornwell; Metin Kahraman; David A. Thompson; Gregory A. Houseman; Sebastian Rost; Niyazi Turkelli; Ugur Teoman; Selda Altuncu Poyraz; Levent Gülen; Murat Utkucu

- **T23E-2634. Weak ductile shear zone beneath the western North Anatolian Fault Zone: inferences from earthquake cycle model constrained by geodetic observations**

Tadashi Yamasaki; Tim J. Wright; Gregory A. Houseman

www.see.leeds.ac.uk/faultlab