

Body-wave extraction and tomography from ambient noise

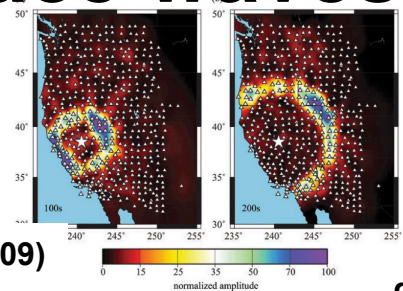
Nori Nakata,

Jason P. Chang &
Jesse F. Lawrence
Stanford University

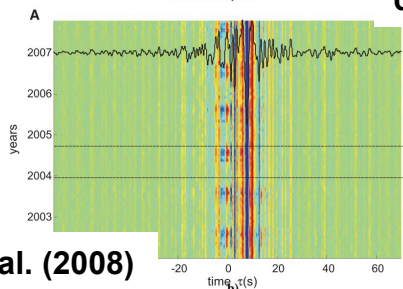


From ambient noise...

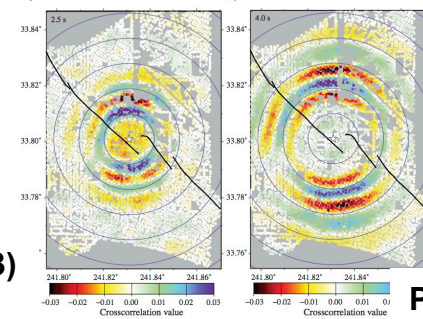
Surface waves



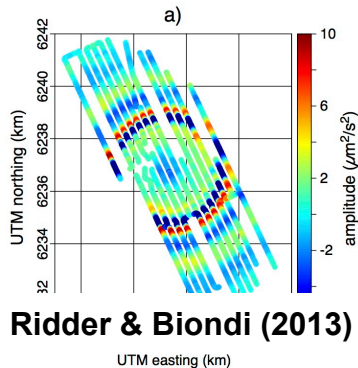
Lin et al. (2009)



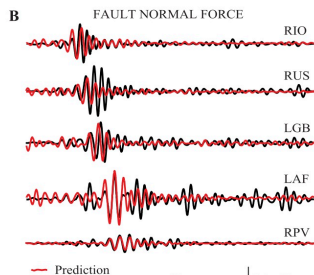
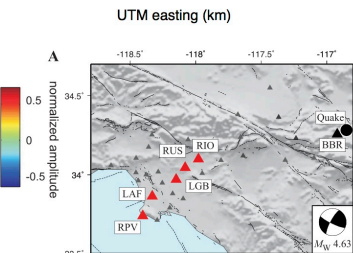
Brenguier et al. (2008)



Lin et al. (2013)

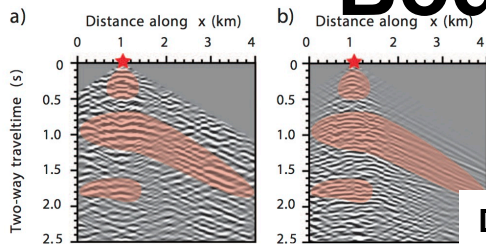


de Ridder & Biondi (2013)

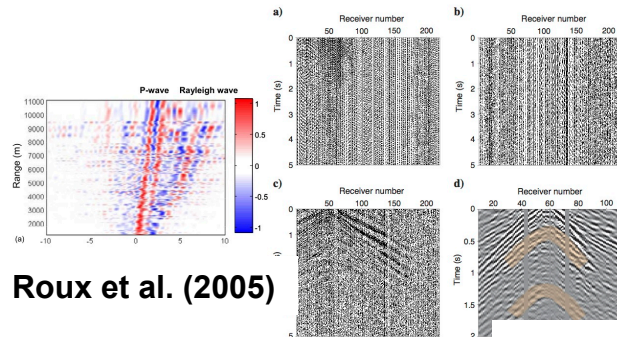


Prieto and Beroza (2008)

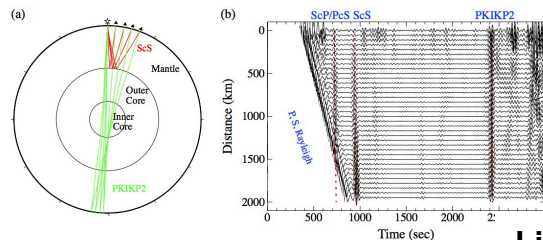
Body waves



Draganov et al. (2009)



Roux et al. (2005)



Nakata et al. (2011)

Lin et al. (2013)

Survey

- 8 x 4.5 km²
- ~2500 receivers
(vertical comp)
- 100-m spacing
- 10-day data
- provided by Signal Hill
Petroleum

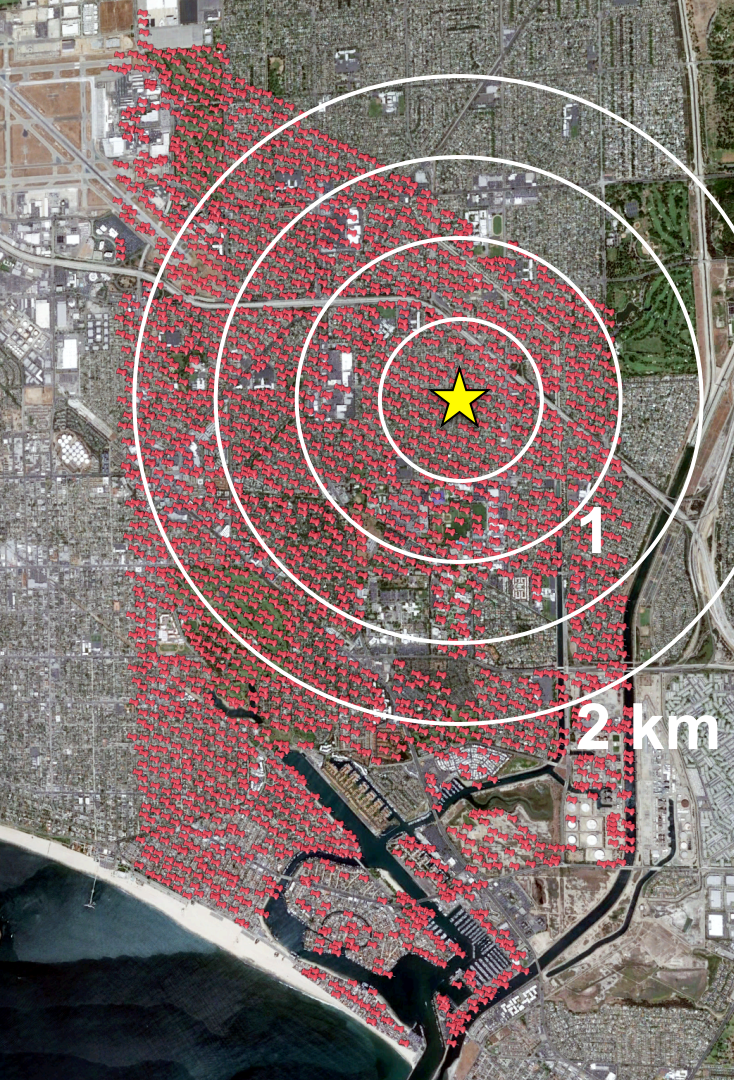


Survey



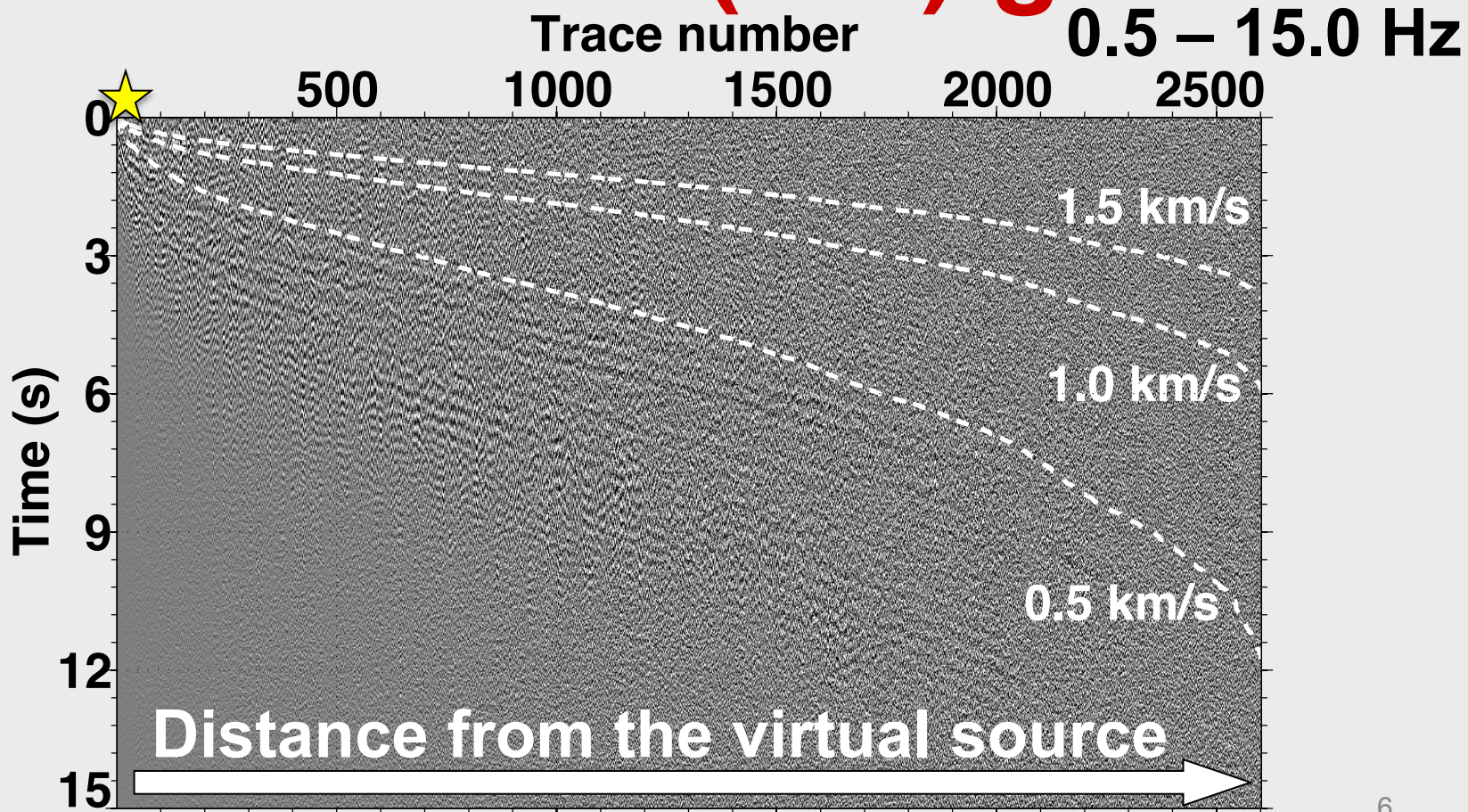
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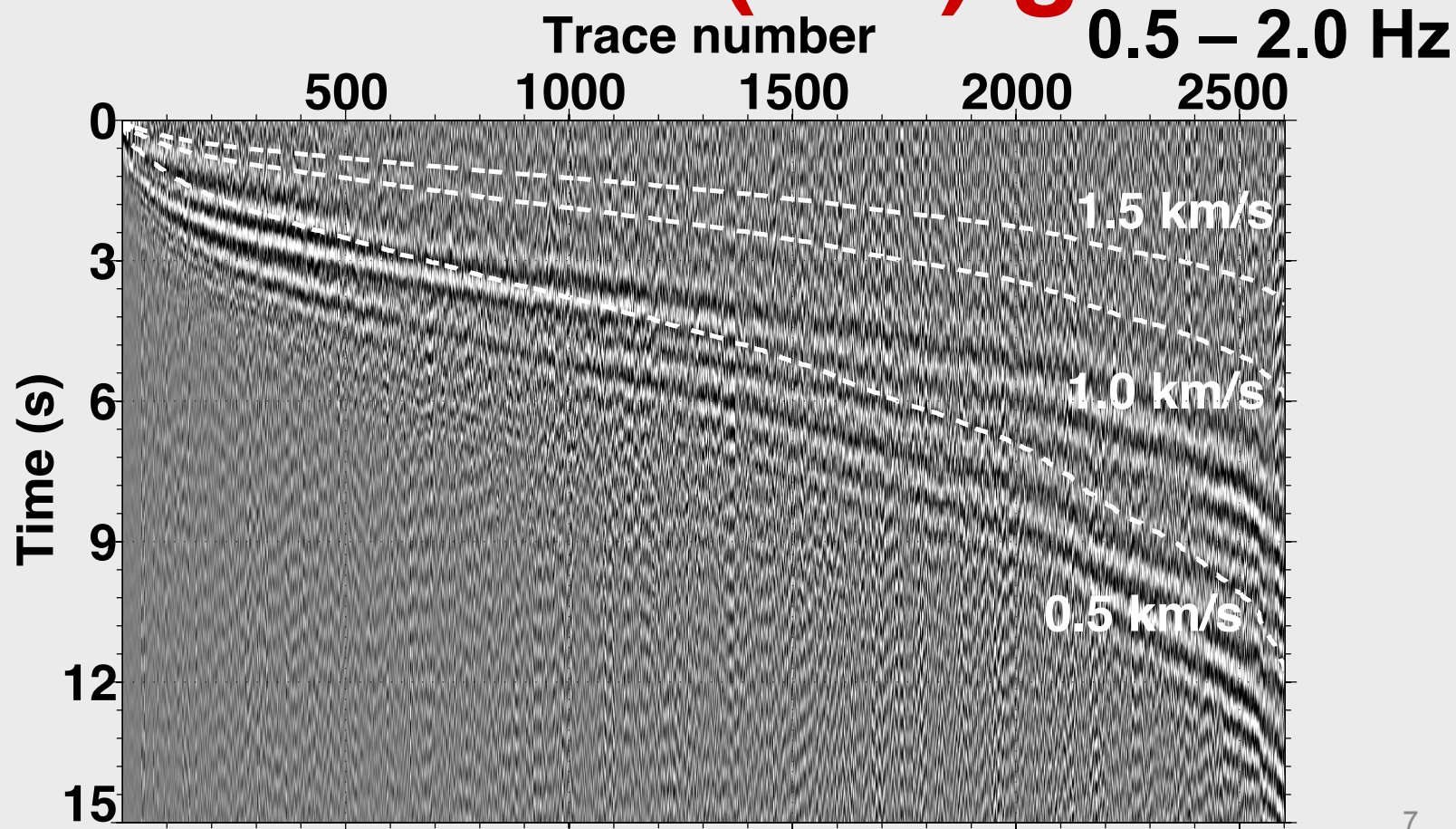


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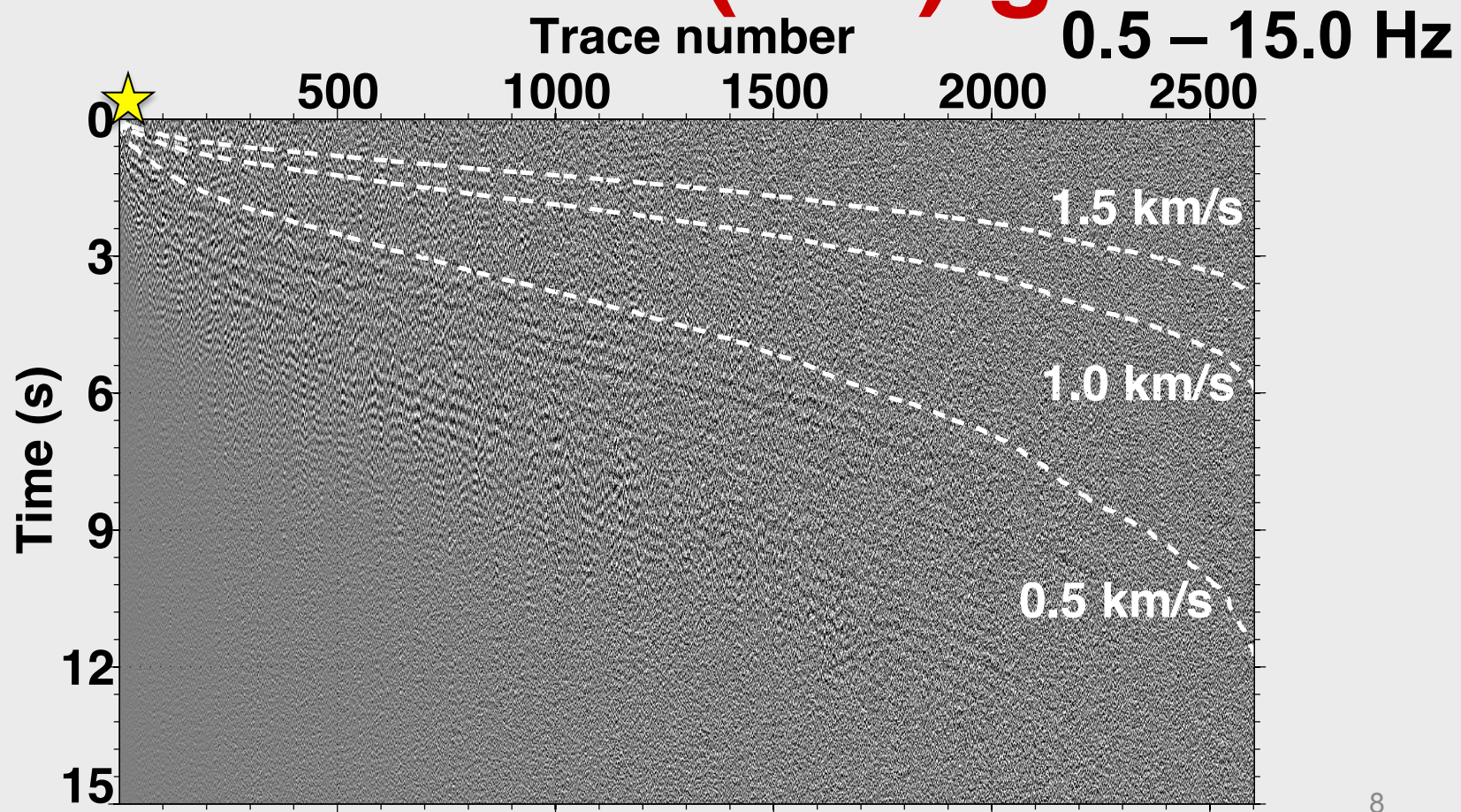
A virtual-shot (v.s.) gather

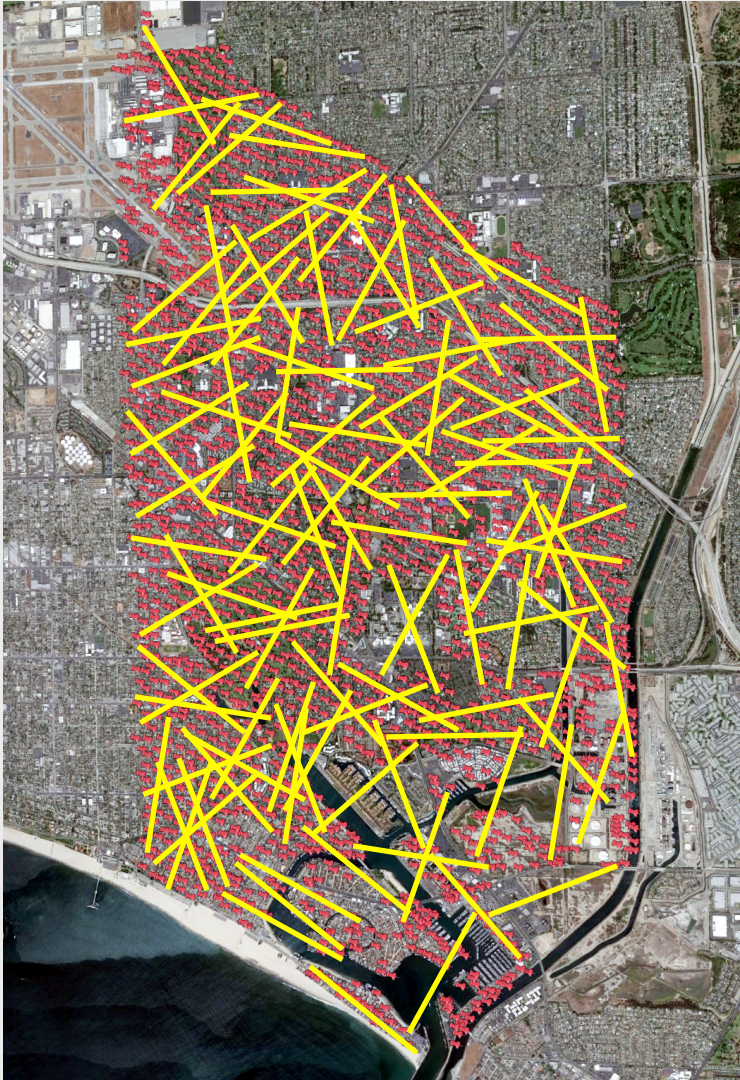


A virtual-shot (v.s.) gather

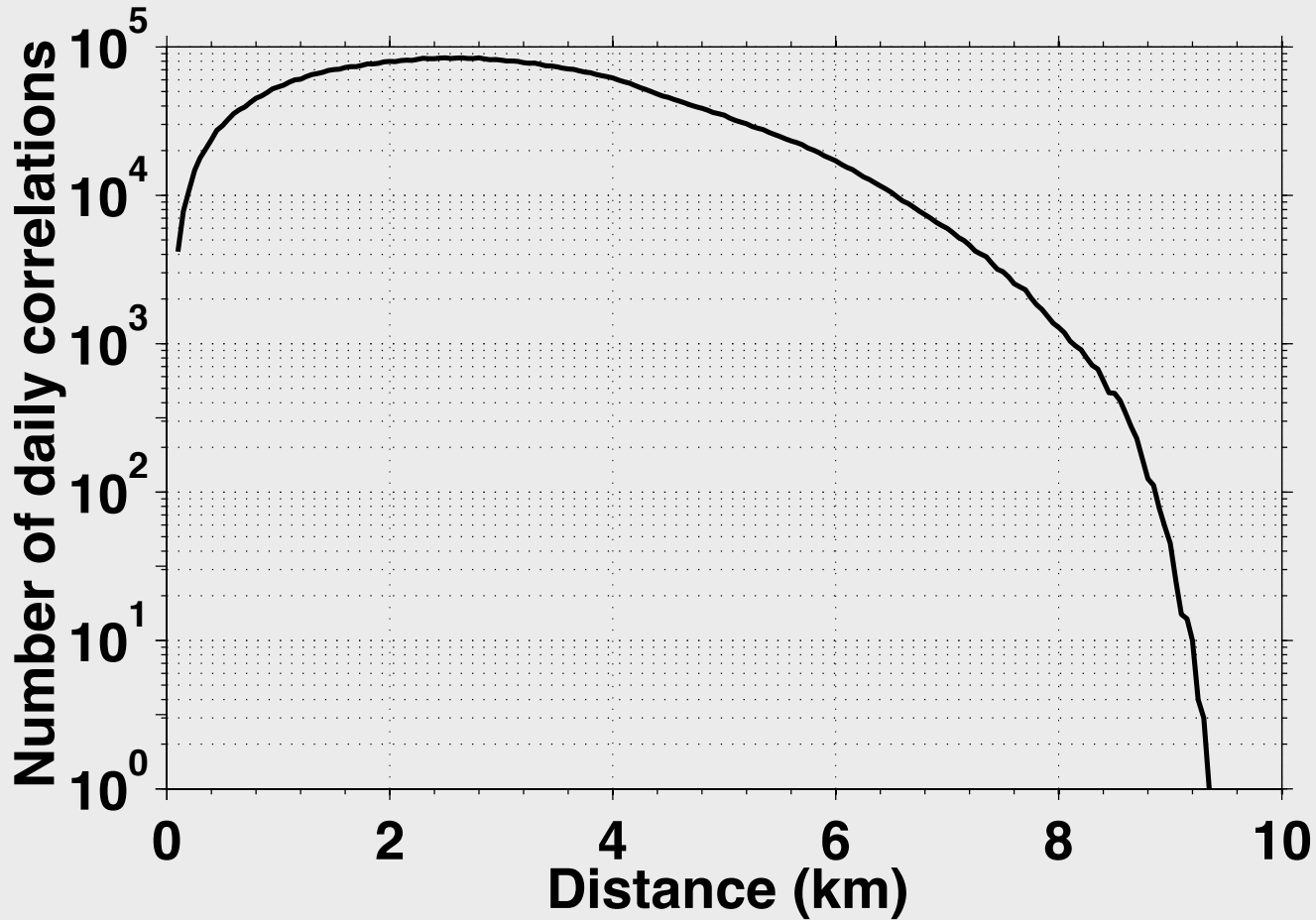


A virtual-shot (v.s.) gather

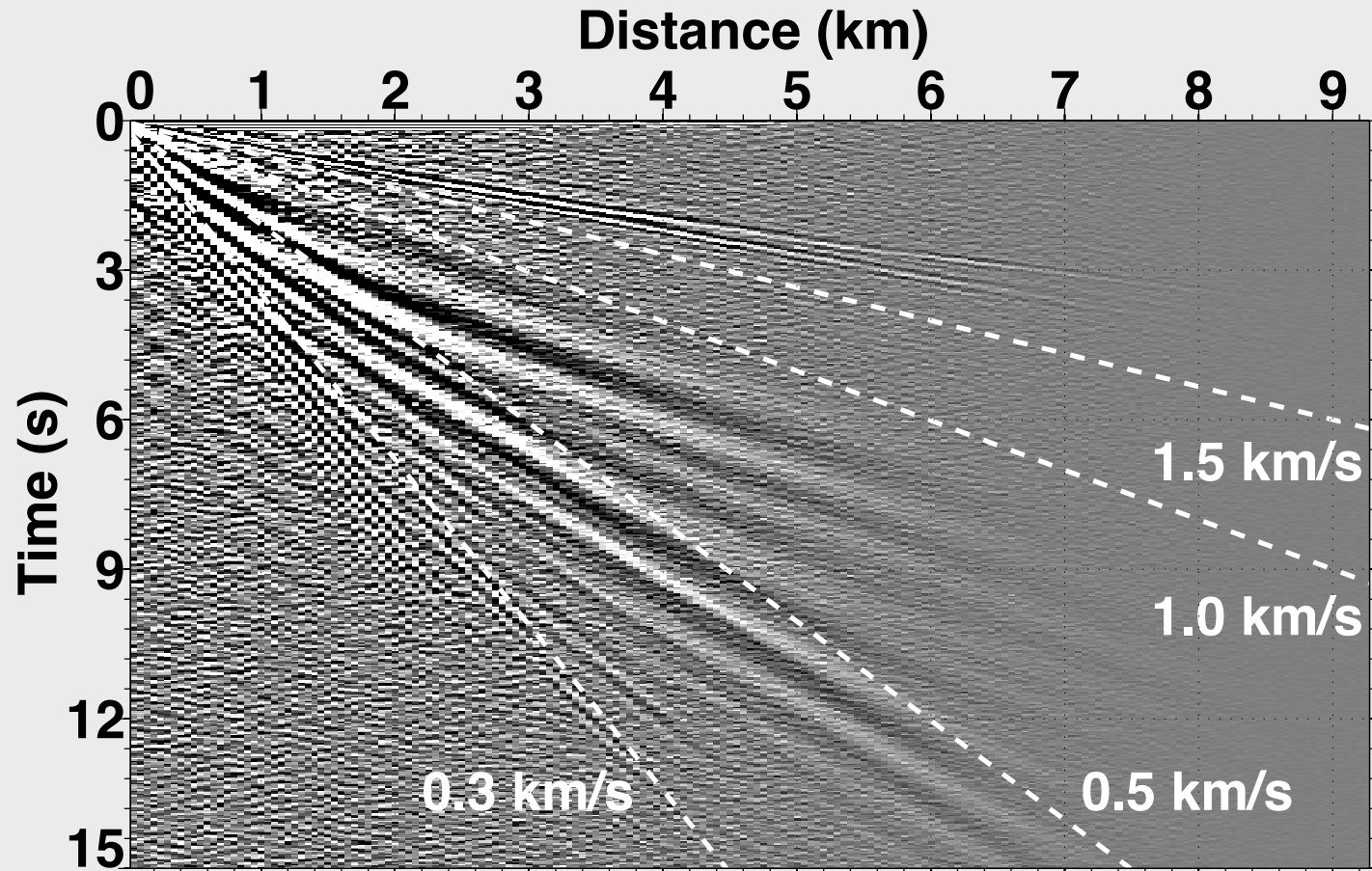




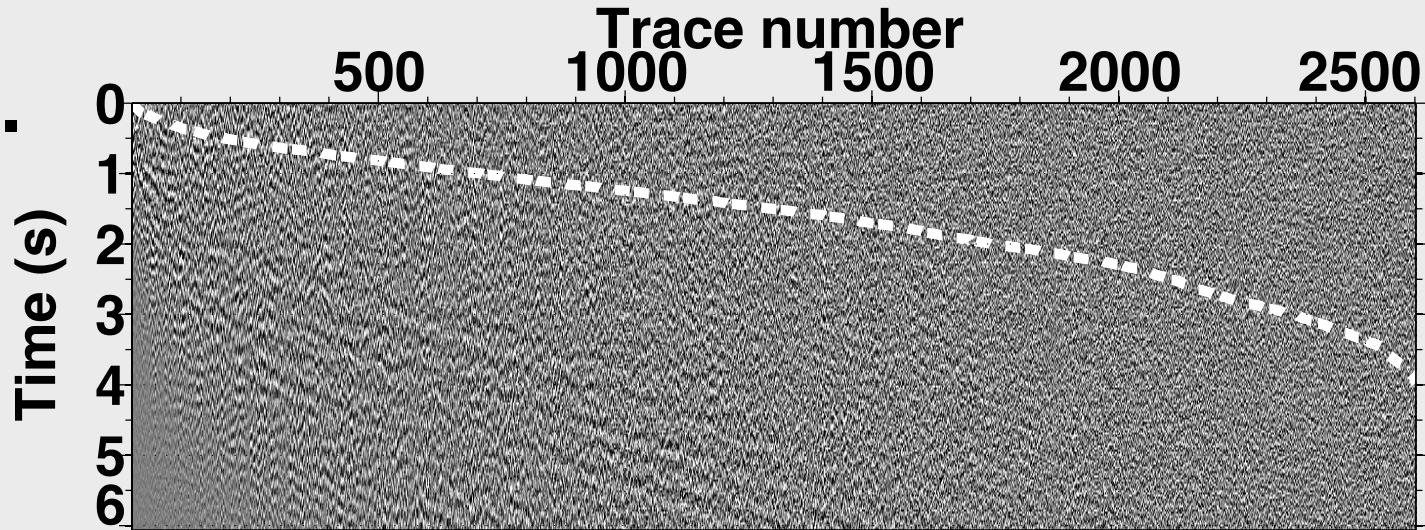
Number of traces



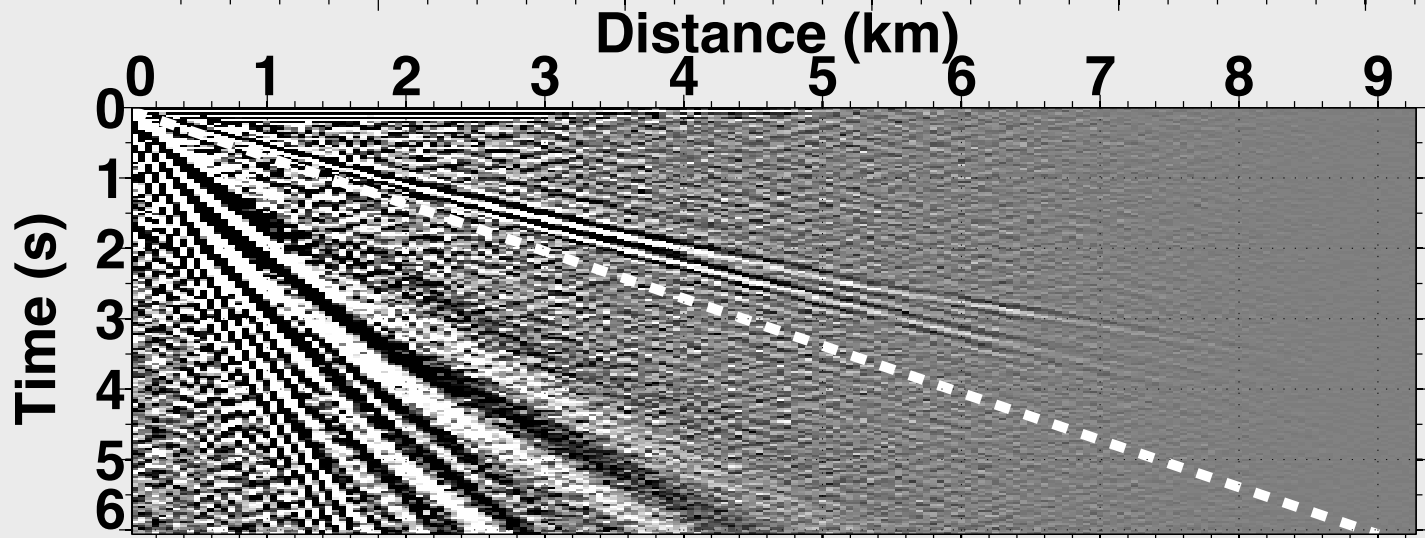
Stacked over all v.s.



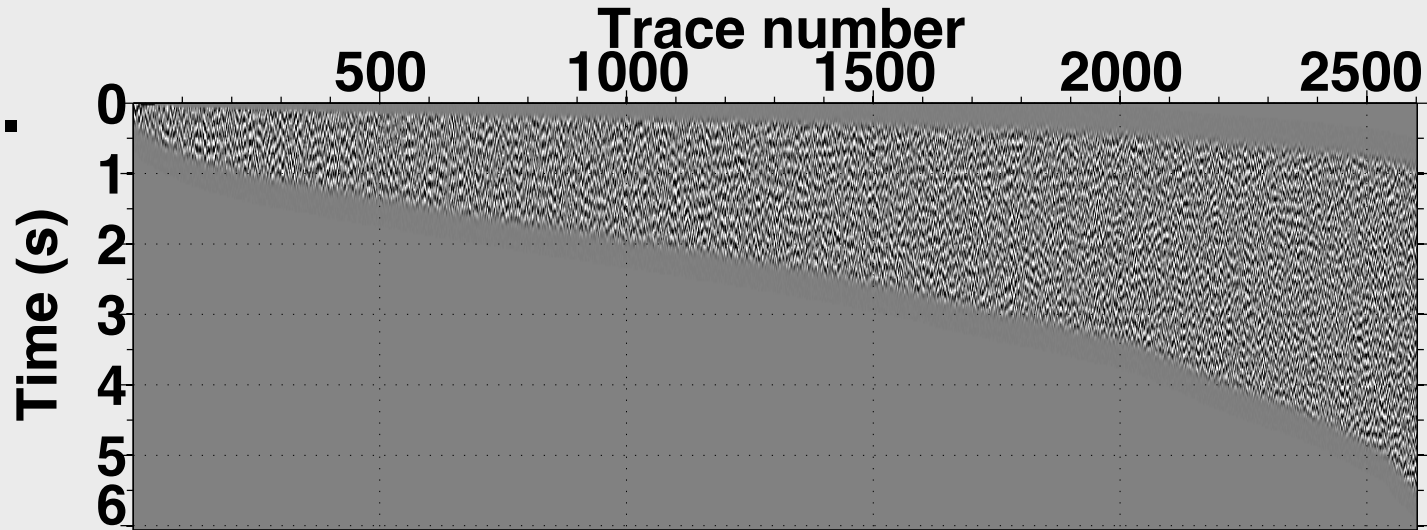
one v.s.



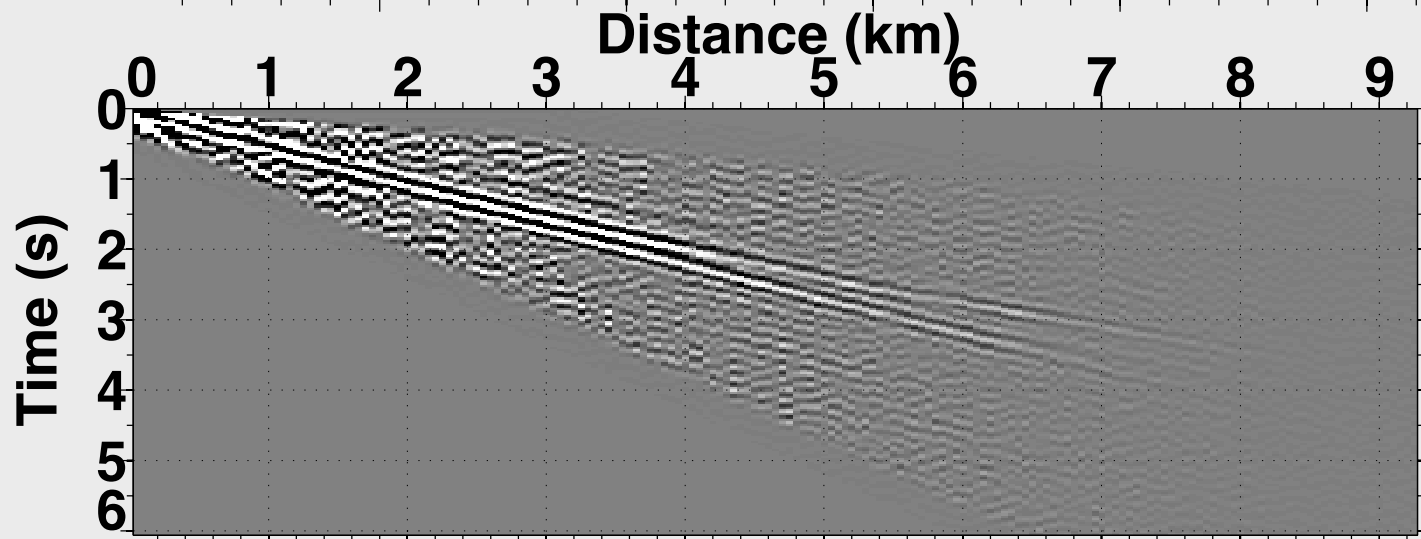
all v.s.



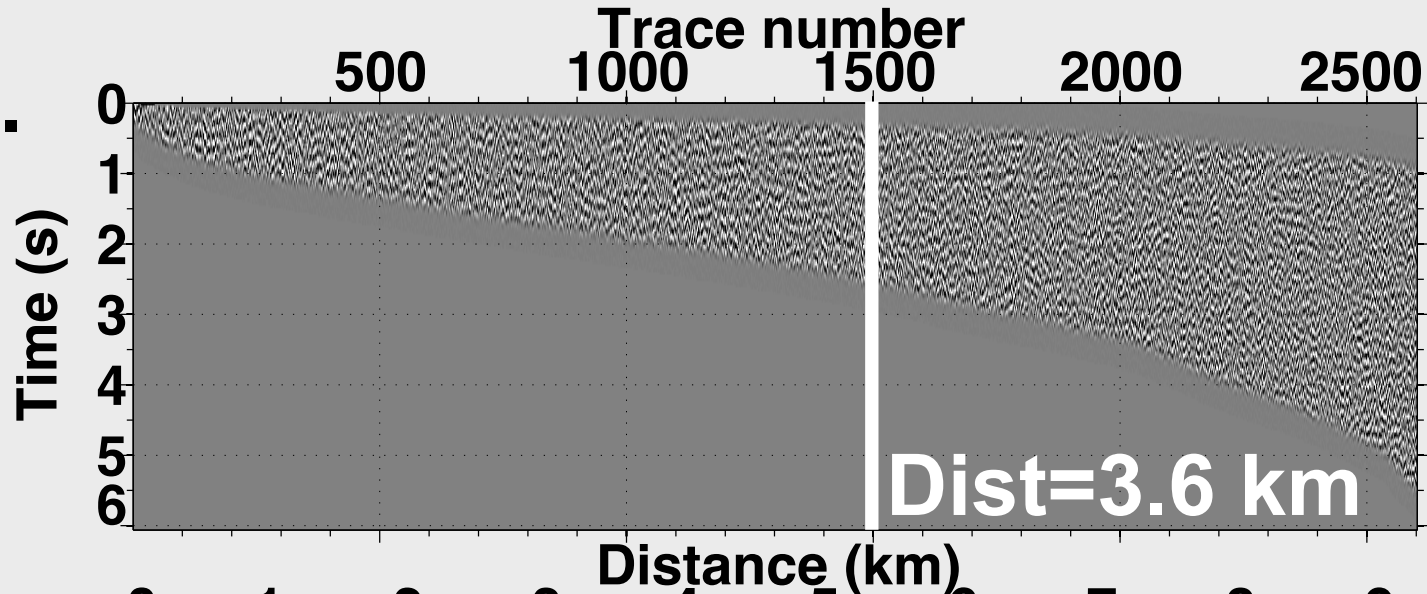
one v.s.



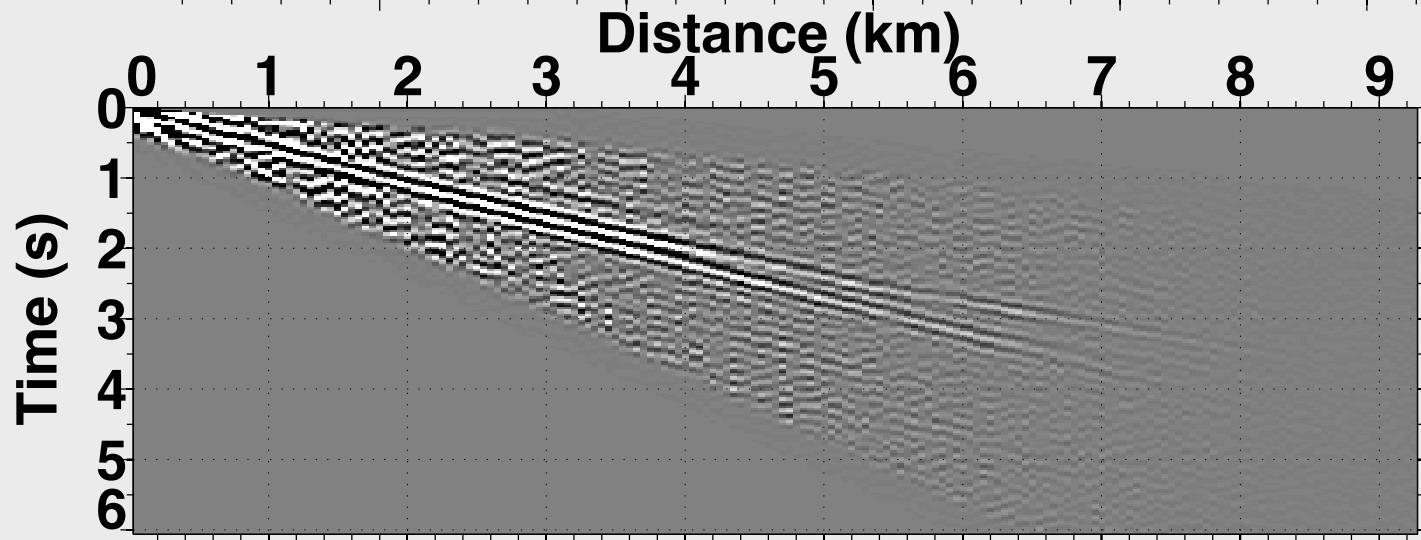
all v.s.



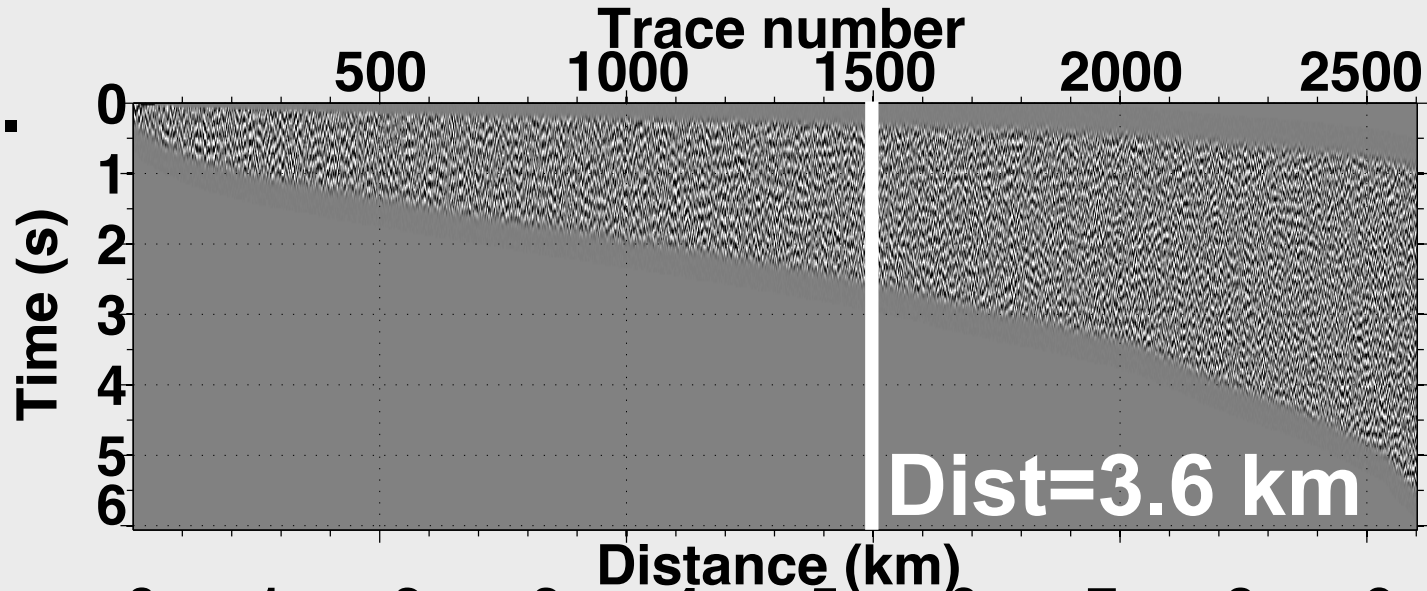
one v.s.



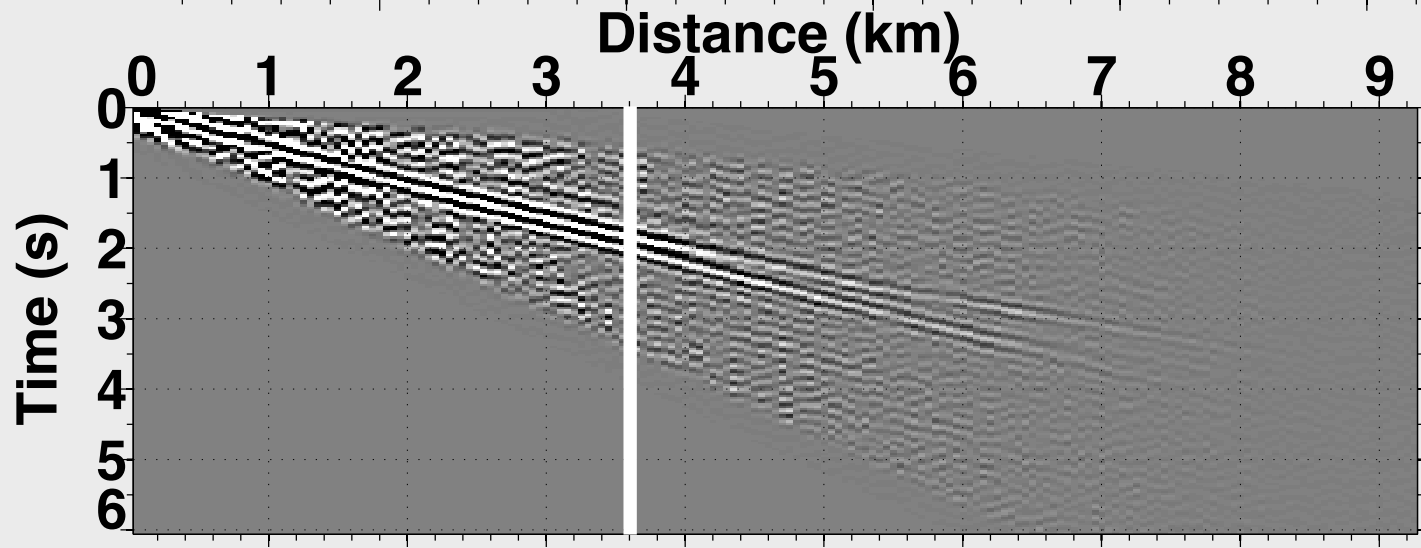
all v.s.



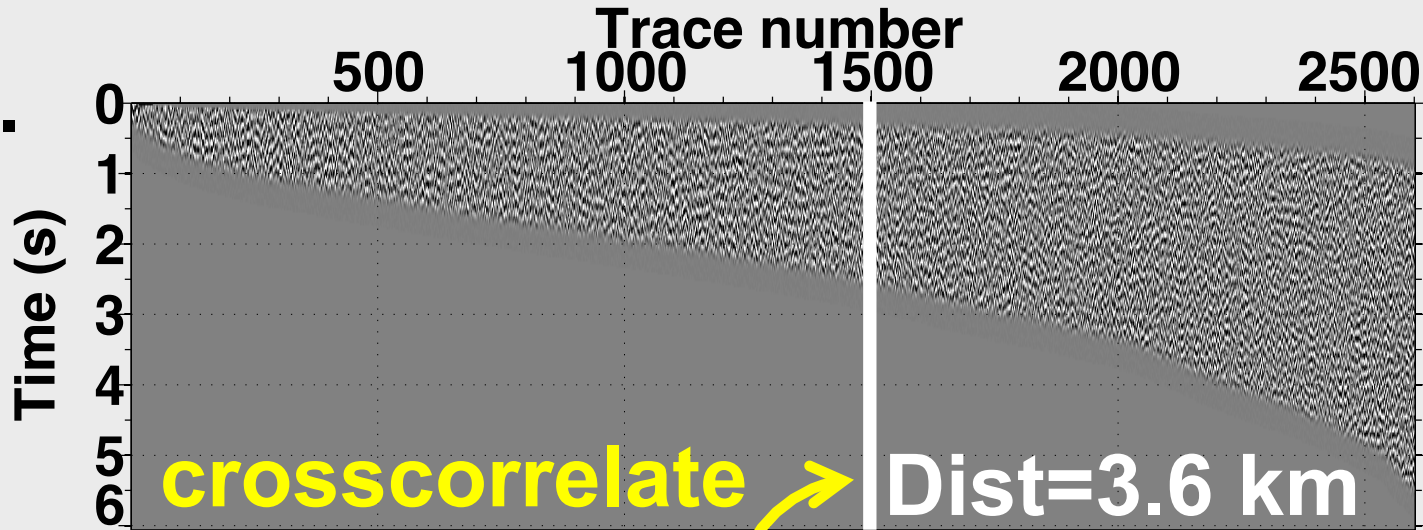
one v.s.



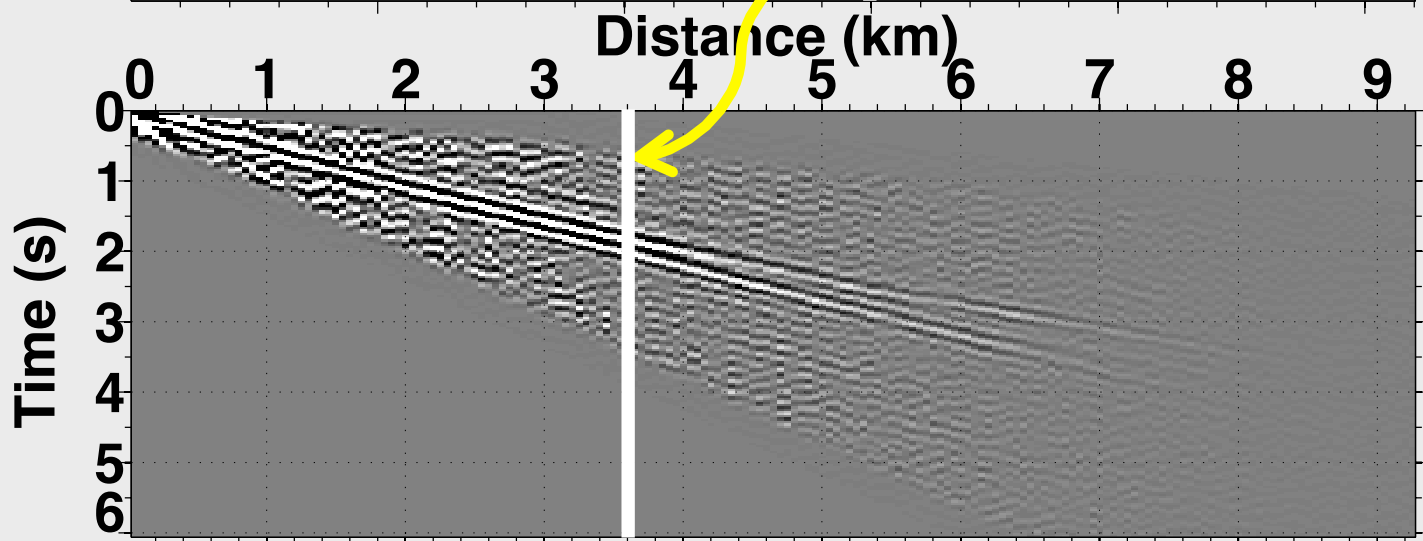
all v.s.



one v.s.



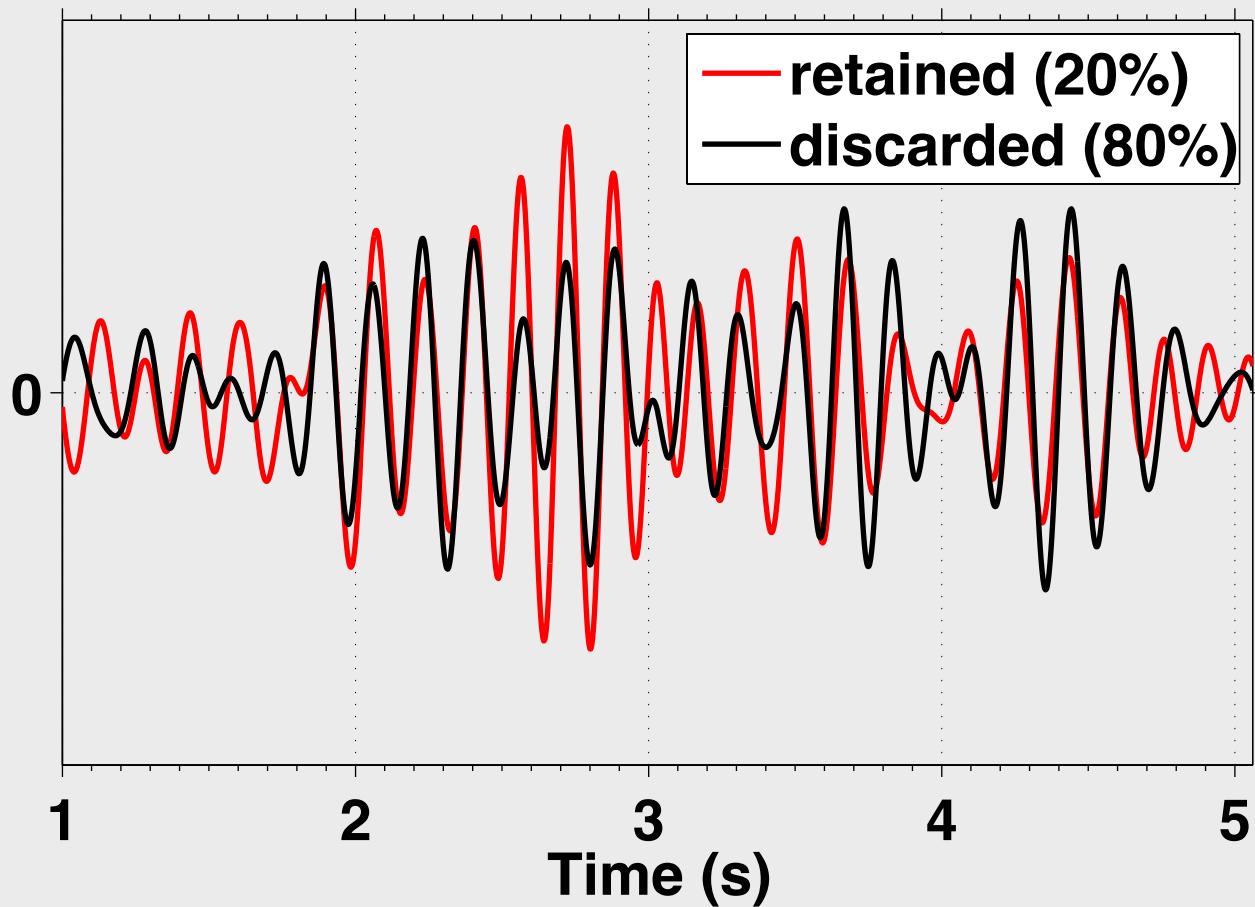
all v.s.



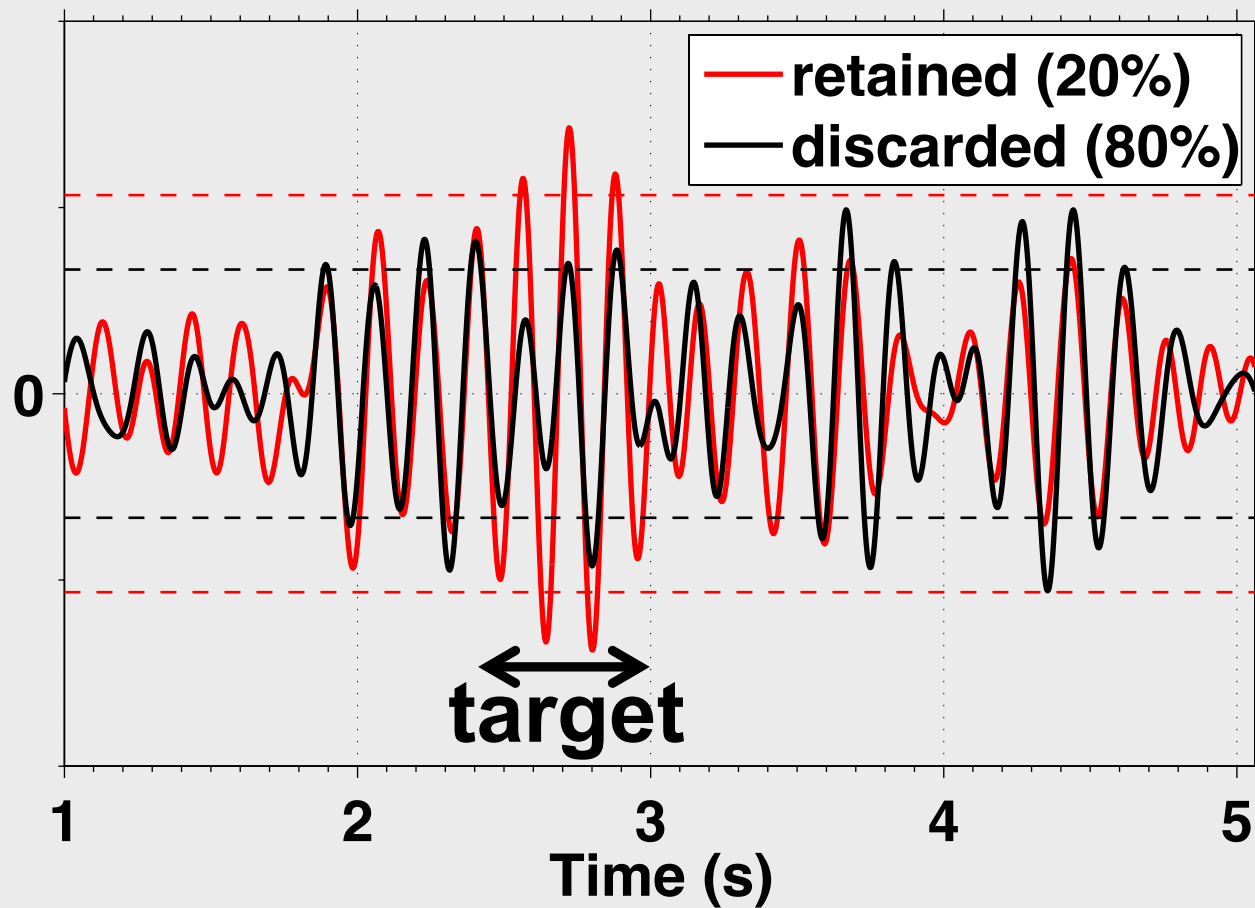
Number of traces



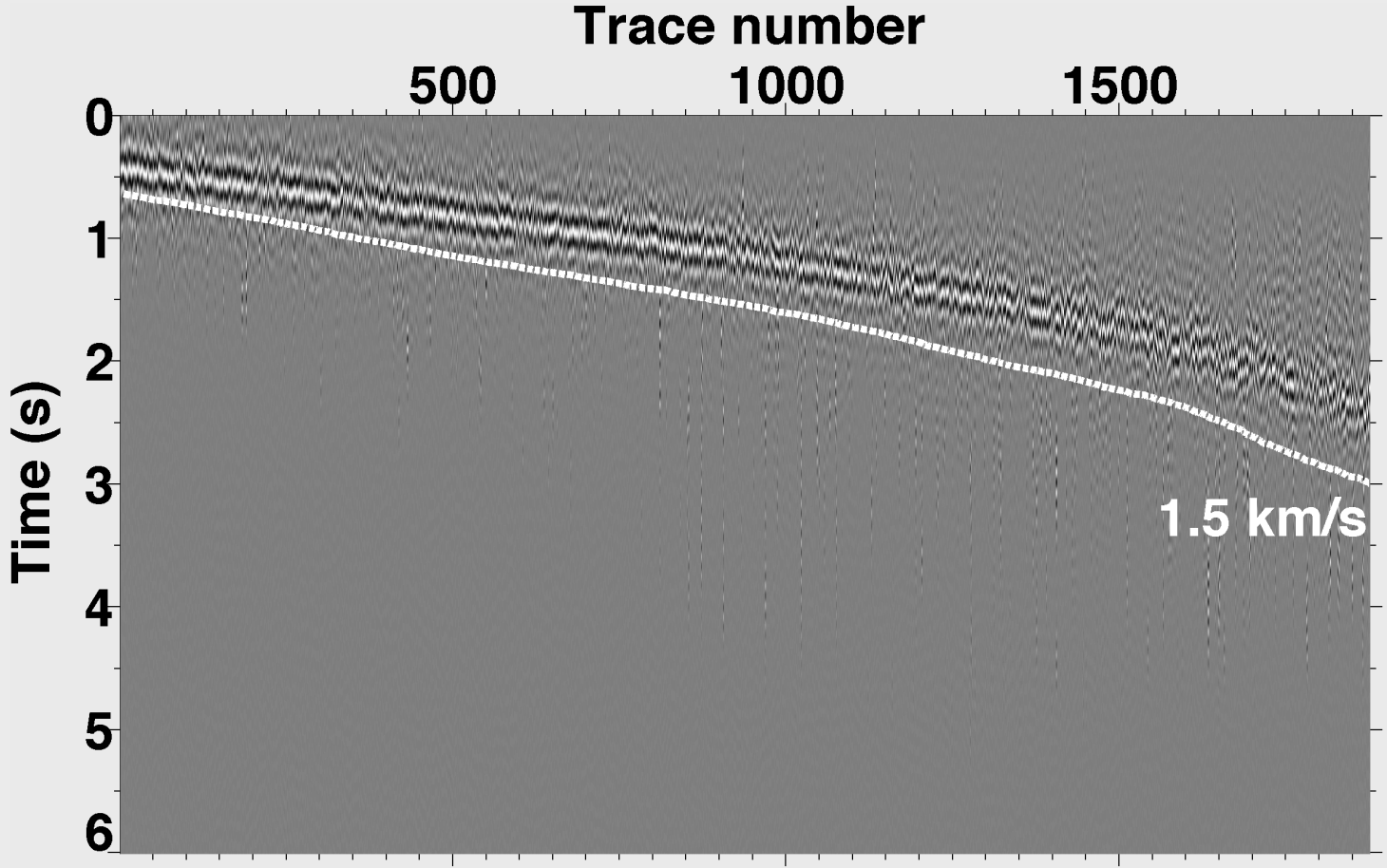
Retained vs. Discarded



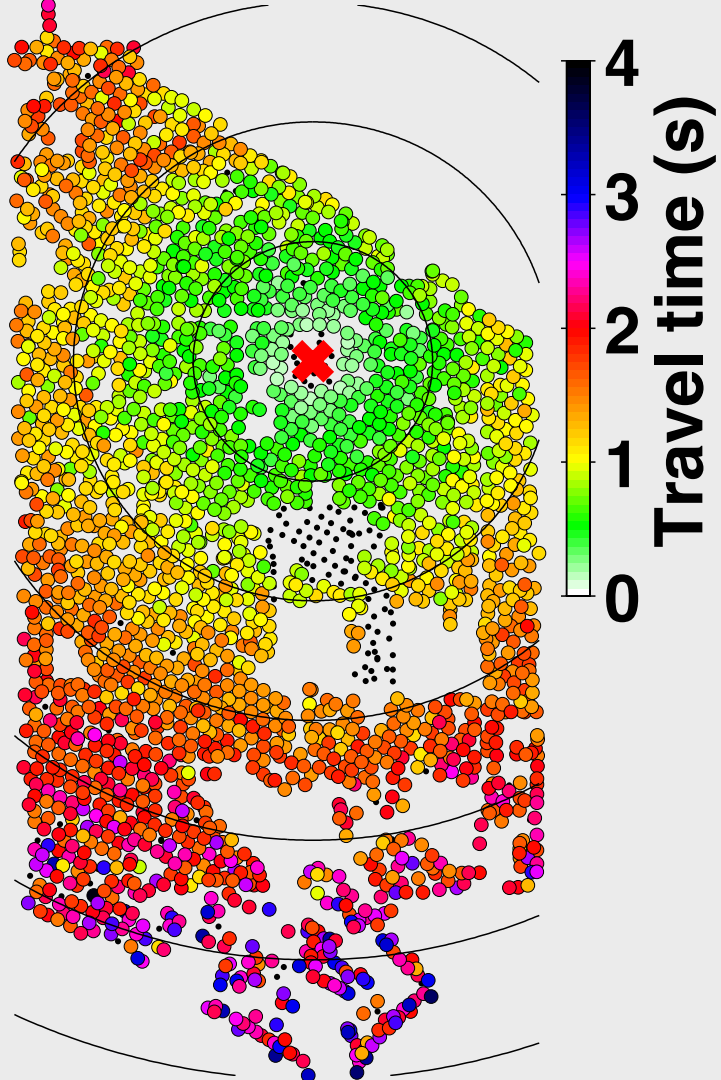
Retained vs. Discarded



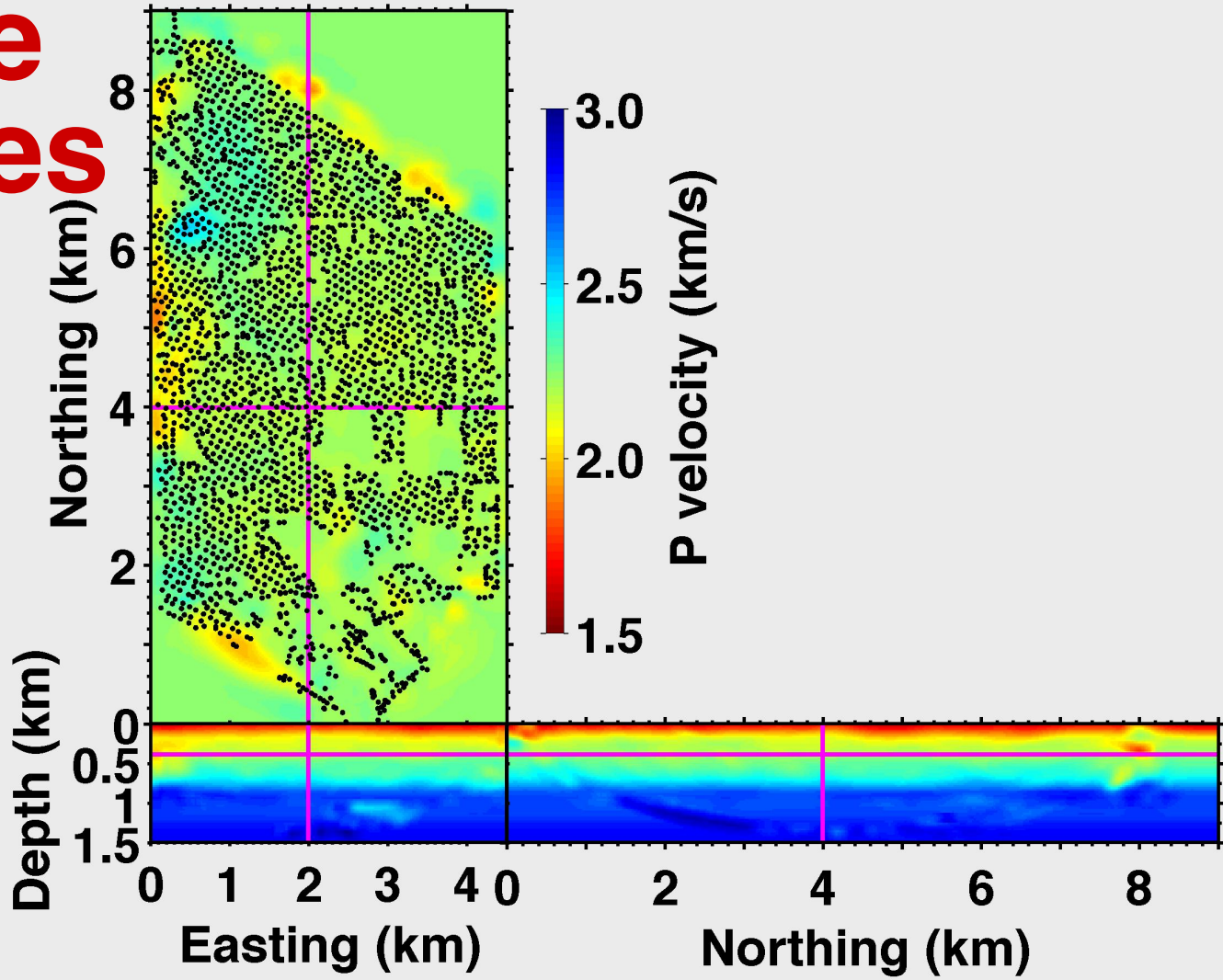
A virtual-shot gather after filter



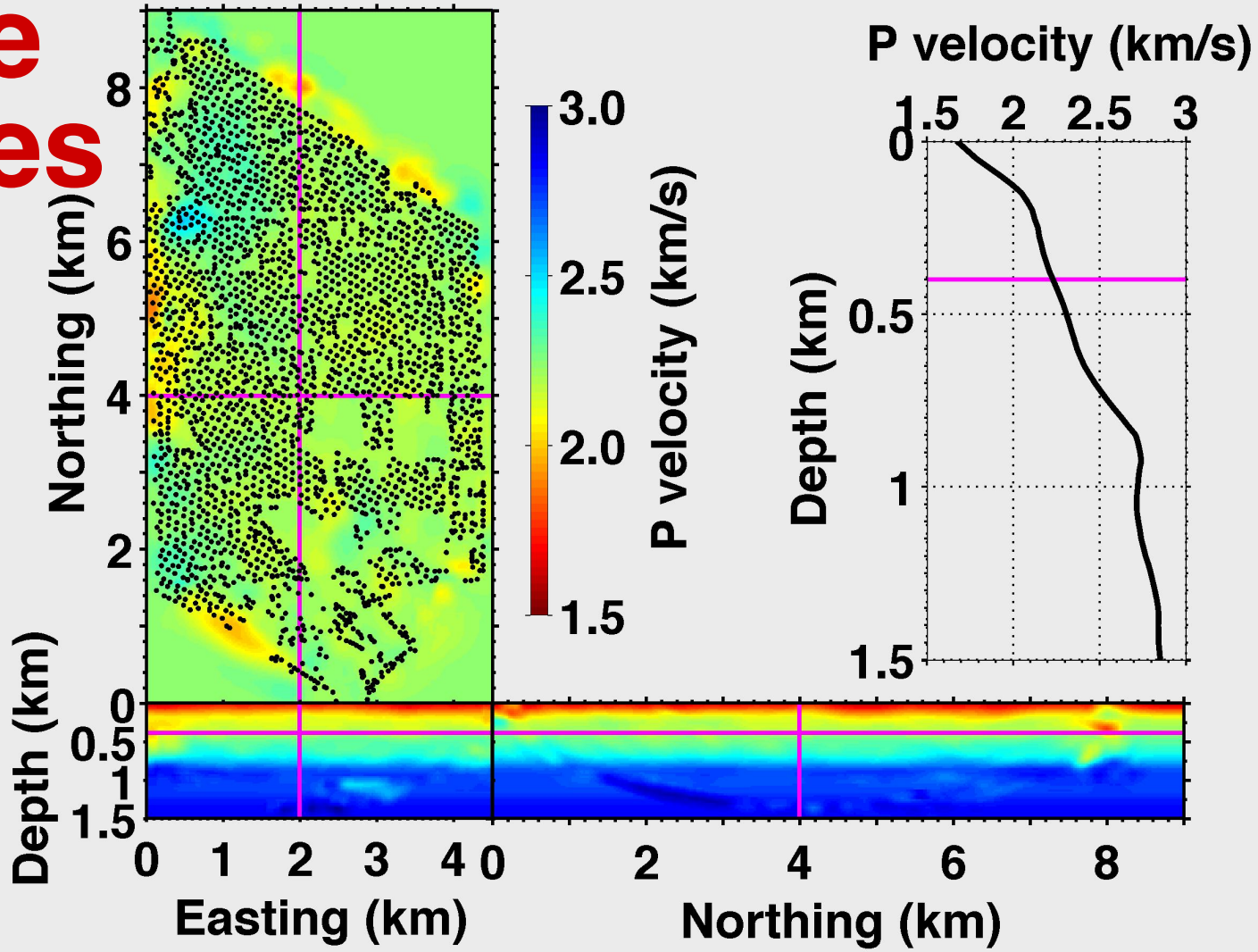
Travel time



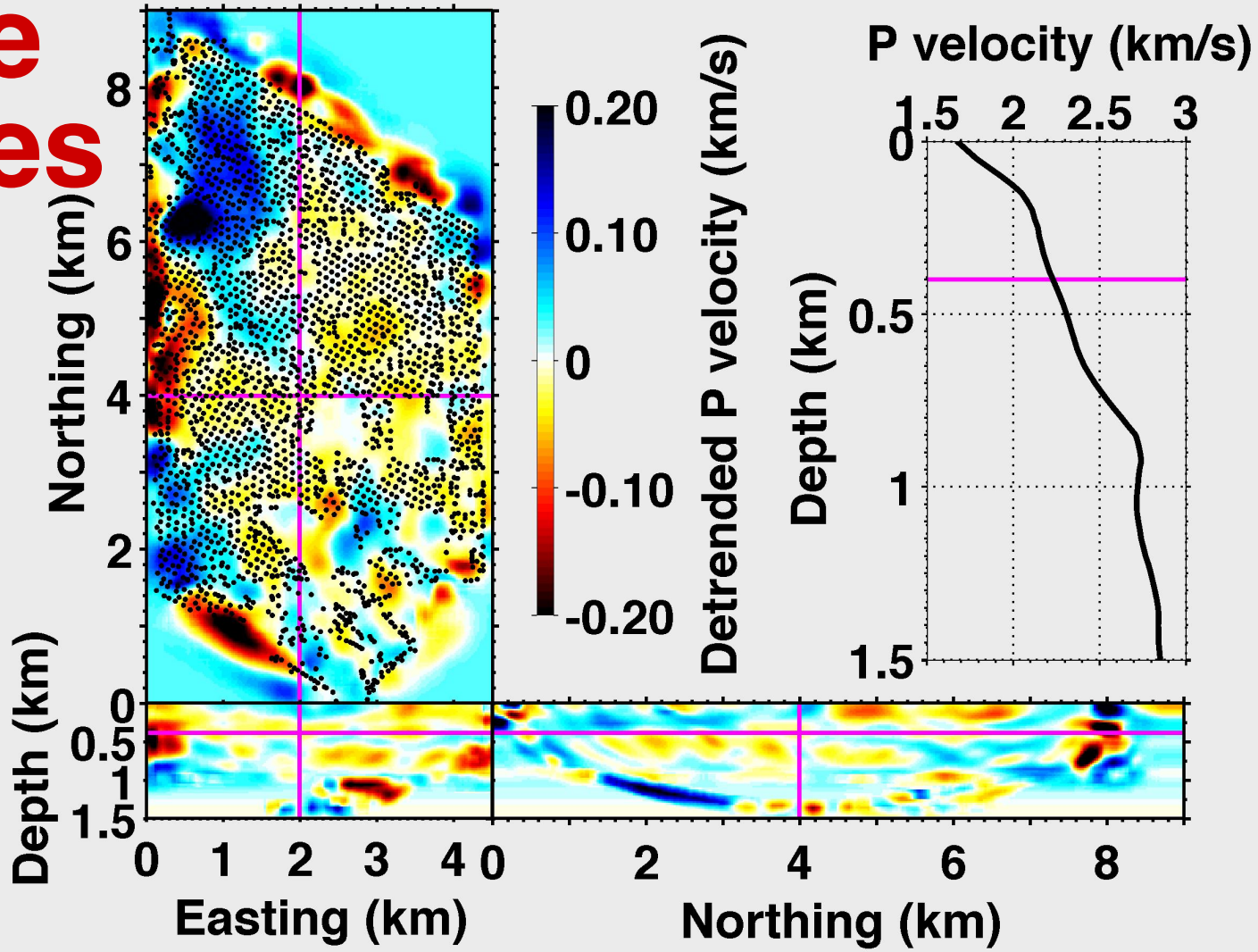
P-wave velocities



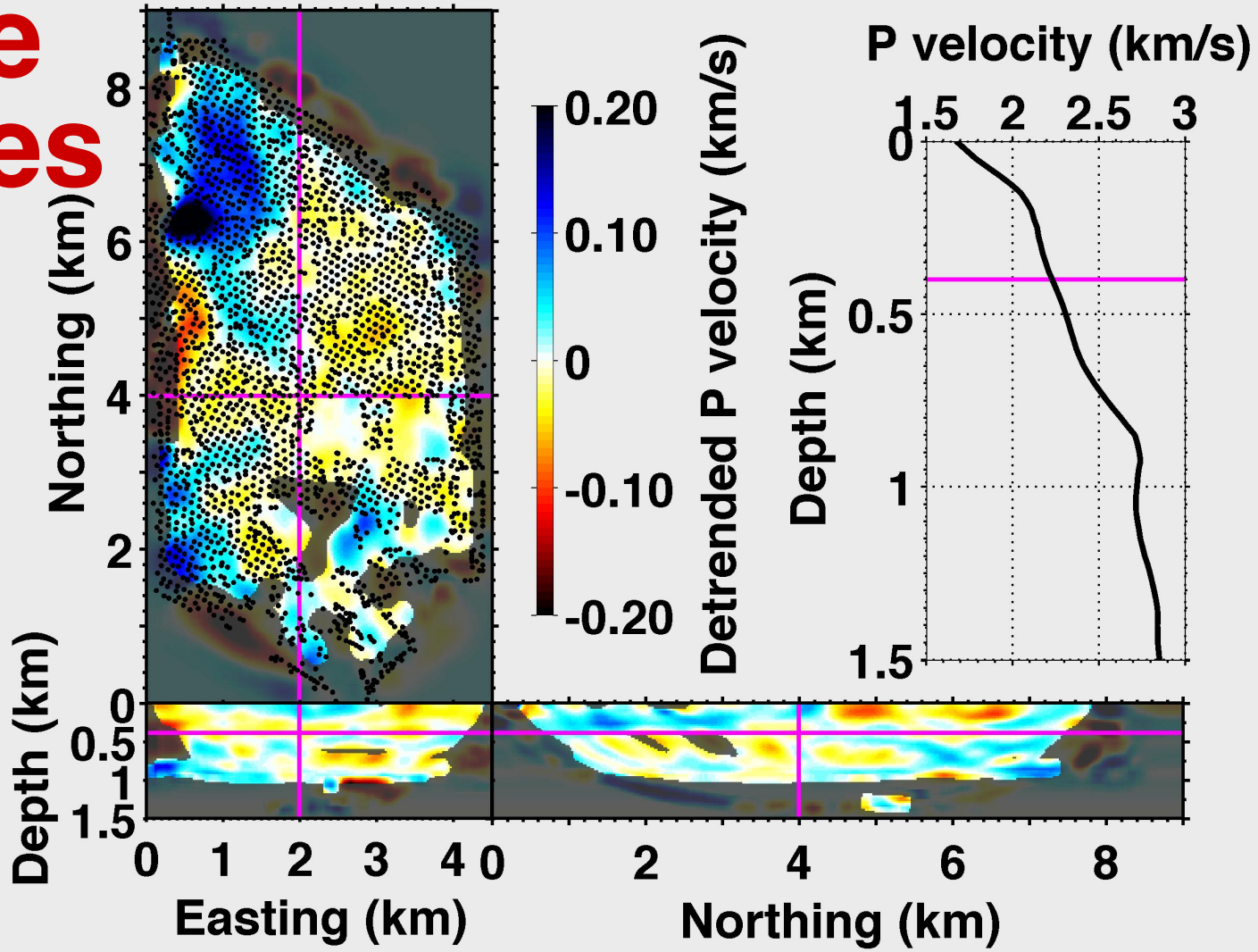
P-wave velocities



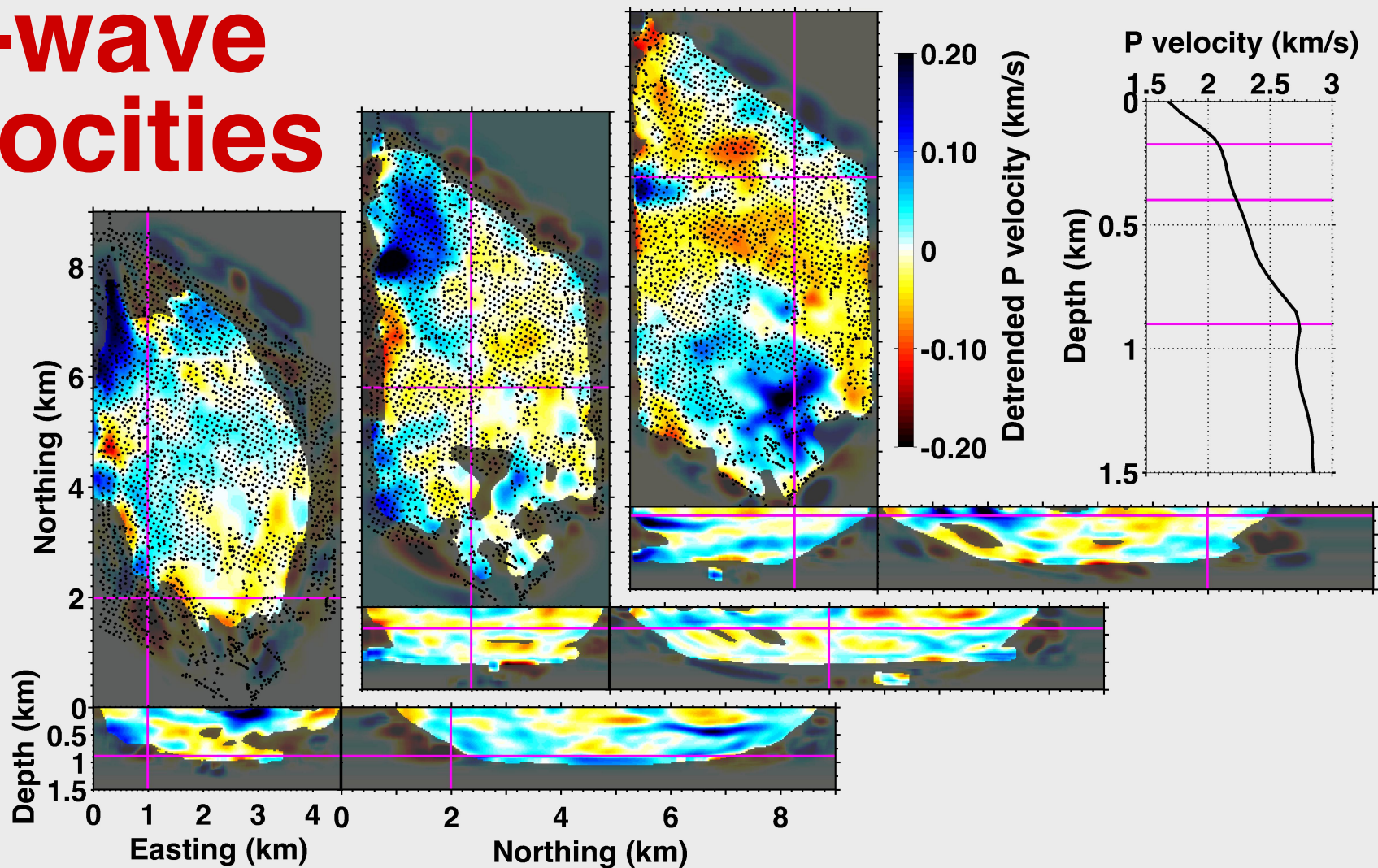
P-wave velocities



P-wave velocities



P-wave velocities



Body-wave interferometry

pre-correlation processing

resampling

cross correlation

body-wave extraction

CCF (& noise suppression)

tomography, imaging, ...

If I have 3 components...,

pre-correlation processing
resampling, P/S separation

cross correlation
Multi-component correlation

body-wave extraction (P, SV & SH waves)
CCF (& noise suppression)

tomography, imaging, ...
P & S velocities, anisotropy, attenuation

2D: Nakata et al., 2014, under review