Detailed seismic imaging of the Mw7.1 Ridgecrest earthquake rupture zone from data recorded by dense linear arrays

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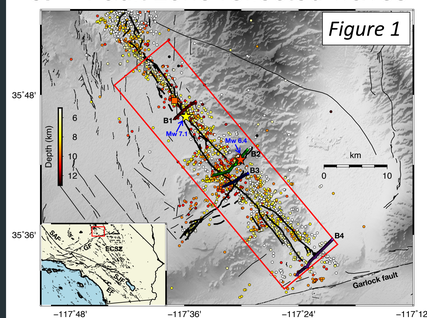
INTRODUCTION

We image fault zone internal structures by analyzing data recorded by four arrays (Figs. 1 & 2) that cross the surface rupture of the 2019 Mw7.1 Ridgecrest event.

Our analyses include:

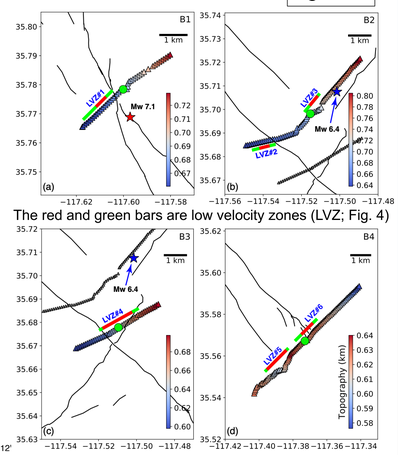
1. Teleseismic & local *P* wave delay time analysis
2. Fault zone trapped waves
3. Fault zone reflected waves

Figure 1



Catalog of Hauksson et al. (2012; extended to 2019) is used

Figure 2

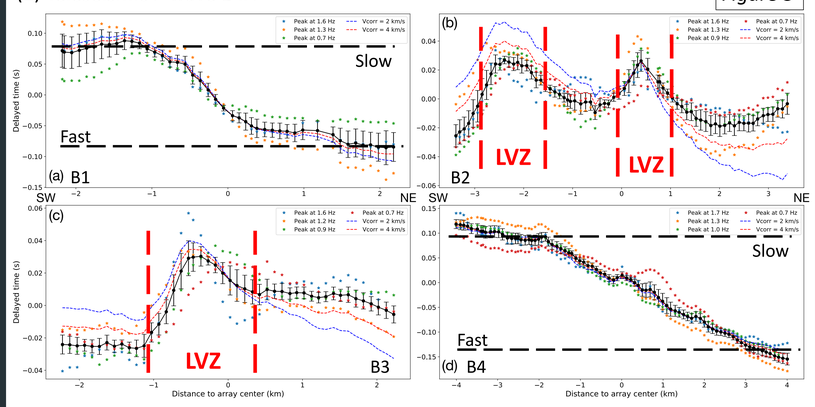


The red and green bars are low velocity zones (LVZ; Fig. 4)

P wave delay time analysis (DTA)

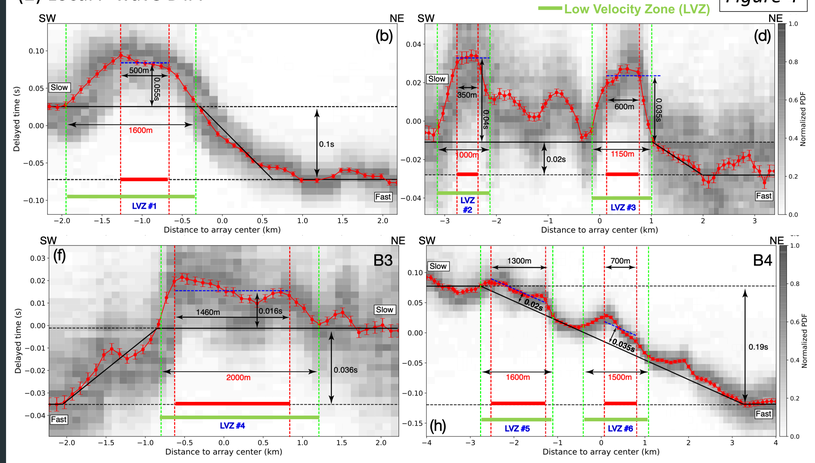
(1) Teleseismic *P* wave DTA

Figure 3



(2) Local *P* wave DTA

Figure 4

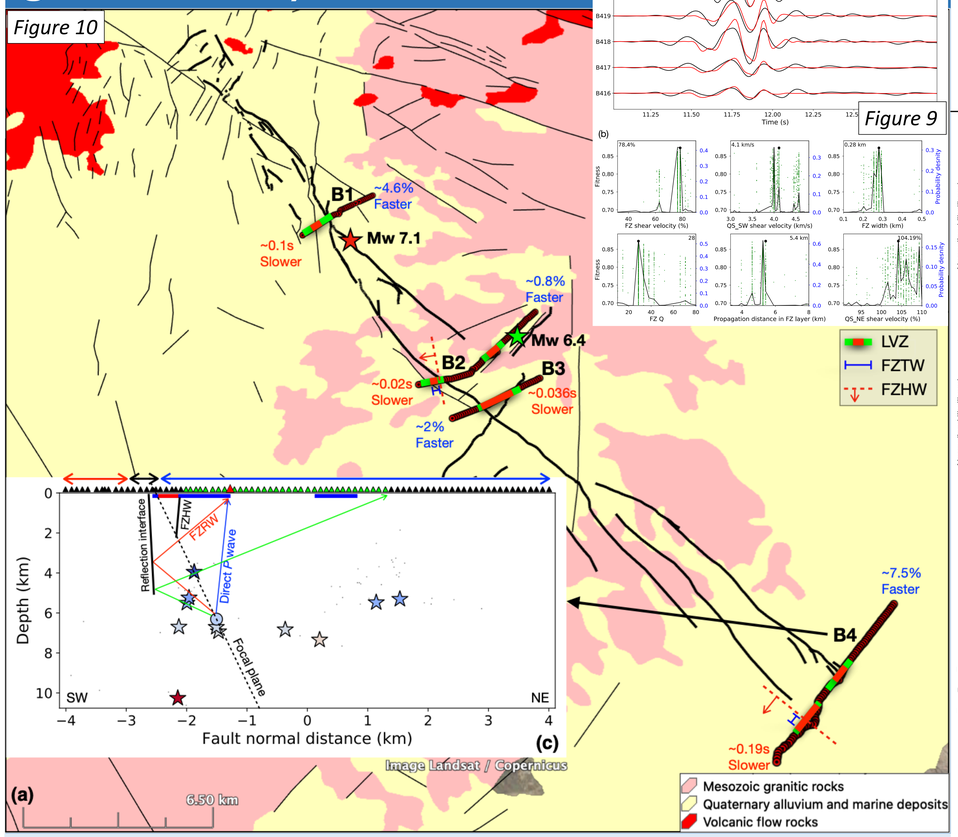


1. Several 1-2 km wide low-velocity zones with more intensely damaged inner cores (0.5-1.5 km wide) are identified beneath each array

2. ~600 identified FZTW candidate at array B4, the best fitting FZ parameters: *~300* m wide, Q of *~30*, Vs reduction of *~20*%, depth of *~3-5* km, *~4*% faster Vs in the NE.

3. Complex fault zone internal structures that vary along fault strike, in agreement the surface geology in the area (alternating playa and igneous rocks).

Figure 10



FZTW inversion (see Ben-Zion et al. 2003 for method details)

Figure 9

Fault zone trapped waves (FZTW)

Figure 5

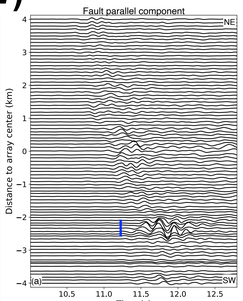


Figure 6

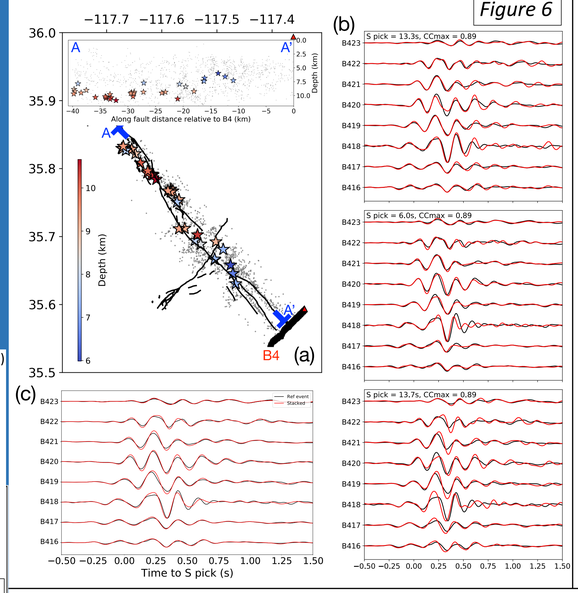
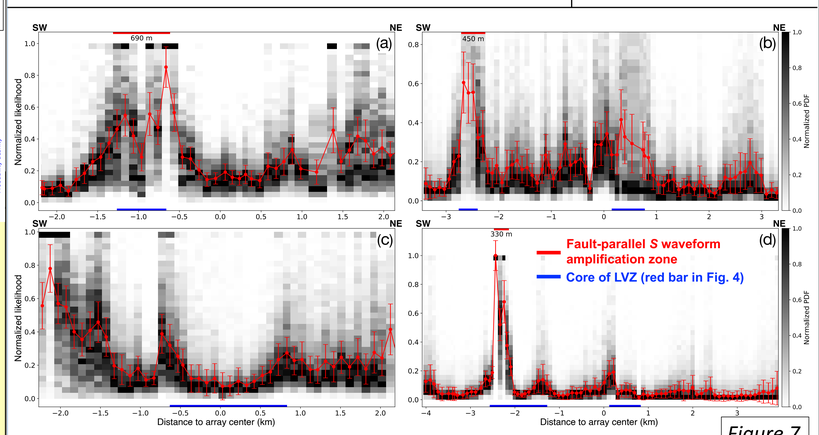
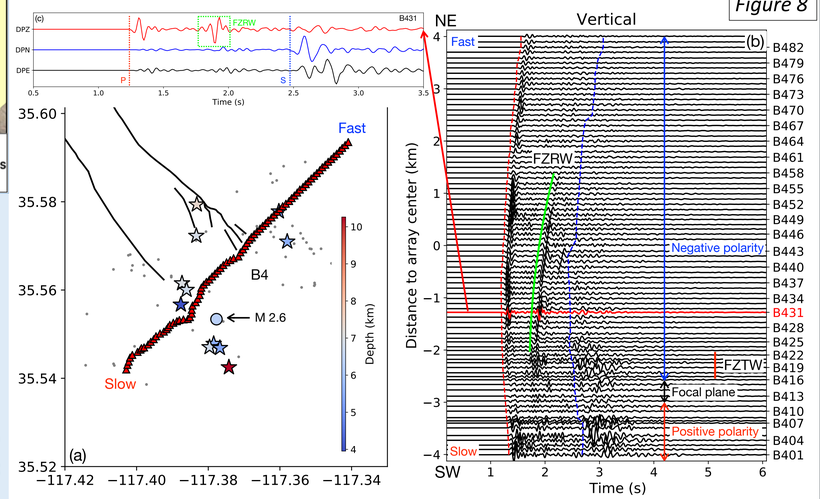


Figure 7



Fault zone reflected waves (FZRW)

Figure 8



References:

1. Ben-Zion, Y., Peng, Z., Okaya, D., Seeber, L., Armbruster, J. G., Ozer, N., et al. (2003). A shallow fault-zone structure illuminated by trapped waves in the Karadere-Duzce branch of the North Anatolian Fault, western Turkey. Geophysical Journal International. https://doi.org/10.1046/j.1365-246X.2003.01870.x
2. Hauksson, E., Yang, W., & Shearer, P. M. (2012). Waveform relocated earthquake catalog for Southern California (1981 to June 2011). Bulletin of the Seismological Society of America. https://doi.org/10.1785/0120120010

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