

Auxiliary material for paper 2008GL036080.

Strong tremor near Parkfield, CA, excited by the 2002 Denali Fault earthquake
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Introduction:

This auxiliary material contains six figures and their figure captions.

Figure Caption:

2008gl036080-fs01.eps (Figure S1). A comparison of amplitude spectra of ambient tremor, triggered tremor, noise, Denali coda, and earthquakes. The triggered tremor spectrum is computed from vertical seismograms between 900 s and 1000 s recorded at station PKD, the Denali coda spectrum is from signals between 750s and 850 s, and the background noise is from signals between -300 and -200 s before the origin time of the Denali Fault earthquake. The ambient tremor spectrum is a linear average of those from 8 tremor episodes near Cholame [*Nadeau and Dolenc, 2005*] and recorded by station PKD (with 80 samples/s). The earthquake spectrum is a linear average of those from 3 earthquakes occurred in 2004 within 10 km of the triggered tremor location near Cholame. The magnitudes of these events are between 2.0 and 2.5.

2008gl036080-fs02.eps (Figure S2). (a) A record section of the envelope functions showing the moveout of the strong tremor in the northern region. Each envelope is obtained from 2-8 Hz band-pass-filtering of the vertical seismograms after smoothing with a half width of 50 points (2.5 s). The dashed line shows the synthetic S-wave travel time at the depth of 15 km. The thick line shows the stacked tremor envelope functions after correcting for the moveout. (b) A record section for the tremor in the southern region. Other symbols are the same as in (a).

2008gl036080-fs03.eps (Figure S3). A record section of the 2-8 Hz band-pass-filtered vertical seismograms showing moveout of the tremor in different regions. The seismograms are plotted using the same scale. The vertical bar on the bottom right marks the length of 3 mm/s. Other symbols and notations are the same as in Figure 3.

2008gl036080-fs04.eps (Figure S4). The maps of misfit function at depth of 25 km using all tremor envelopes observed during 864 and 1200 s (a), and 1214 and 1354 s (b) after the origin time of the Denali earthquake. Misfit is defined as

$$M(x) = \frac{2}{N(N-1)} \sum_{i=1}^N \sum_{j=i+1}^N \frac{1 - C_{ij}(t_j(x) - t_i(x))}{1 - C_{ij}^{\max}}$$

where x is a trial source location, N is the number of stations, and C_{ij} is the cross-correlogram between the envelopes of the i th and j th stations evaluated at a lag time corresponding to the predicted S-wave time difference [Wech and Creager, 2007]. The dark lines denote surface traces of the San Andreas fault system. The two solid circles mark the epicentral locations of the two strong tremor sources around Parkfield using envelopes from stations listed in Figure S02. The dark gray circle marks the epicentral locations of a possible weak tremor source further north. The light gray circle mark the epicentral location of the tremor reported by Gombert *et al.* [2008] near San Juan Bautista. The station names are also marked on the figure. The epicentral locations of the two strong tremor sources (dark circles) are very close but are not at the exact local minimum, because the epicenter is computed using the envelopes from the nearest 7-8 stations, while the map is obtained by using all envelopes. The reason is that more than one source region is active at a time (Figure 3). So stations closest to the first source should not be used to constrain the other source and visa versa.

2008gl036080-fs05.eps (Figure S5). Moveout of the Love waves with distance from the epicenter of the Denali earthquake. The dashed lines denote the best-fitting phase velocity of 4.1 km/s. Red and blue lines denote the seismograms recorded at station PKD shifted to the northern and southern tremor source locations.

2008gl036080-fs06.eps (Figure S6). Tremor envelope functions observed in two source regions compared with the surface wave displacements after shifting them back to the tremor source regions. We use a nominal phase velocity of 3.5 km/s for the Rayleigh waves [Miyazawa and Brodsky, 2008]. The vertical lines mark the upward vertical surface displacement, which is used as an indicative of positive dilatational strains at depth [Miyazawa and Brodsky, 2008; Miyazawa and Mori, 2006].

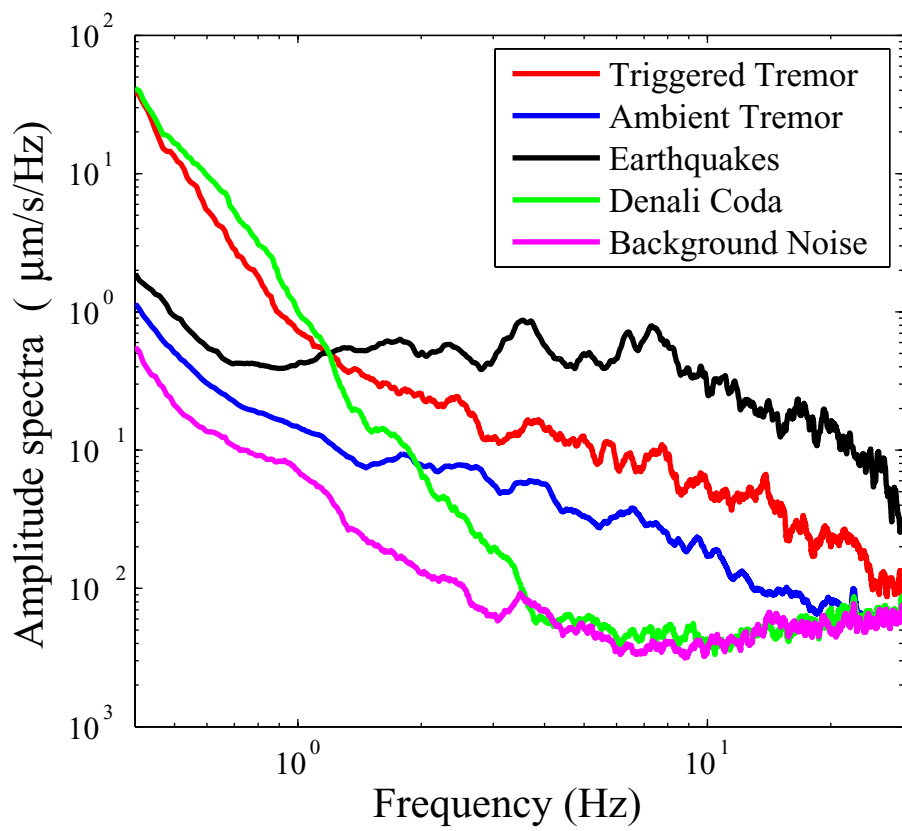


Figure S01

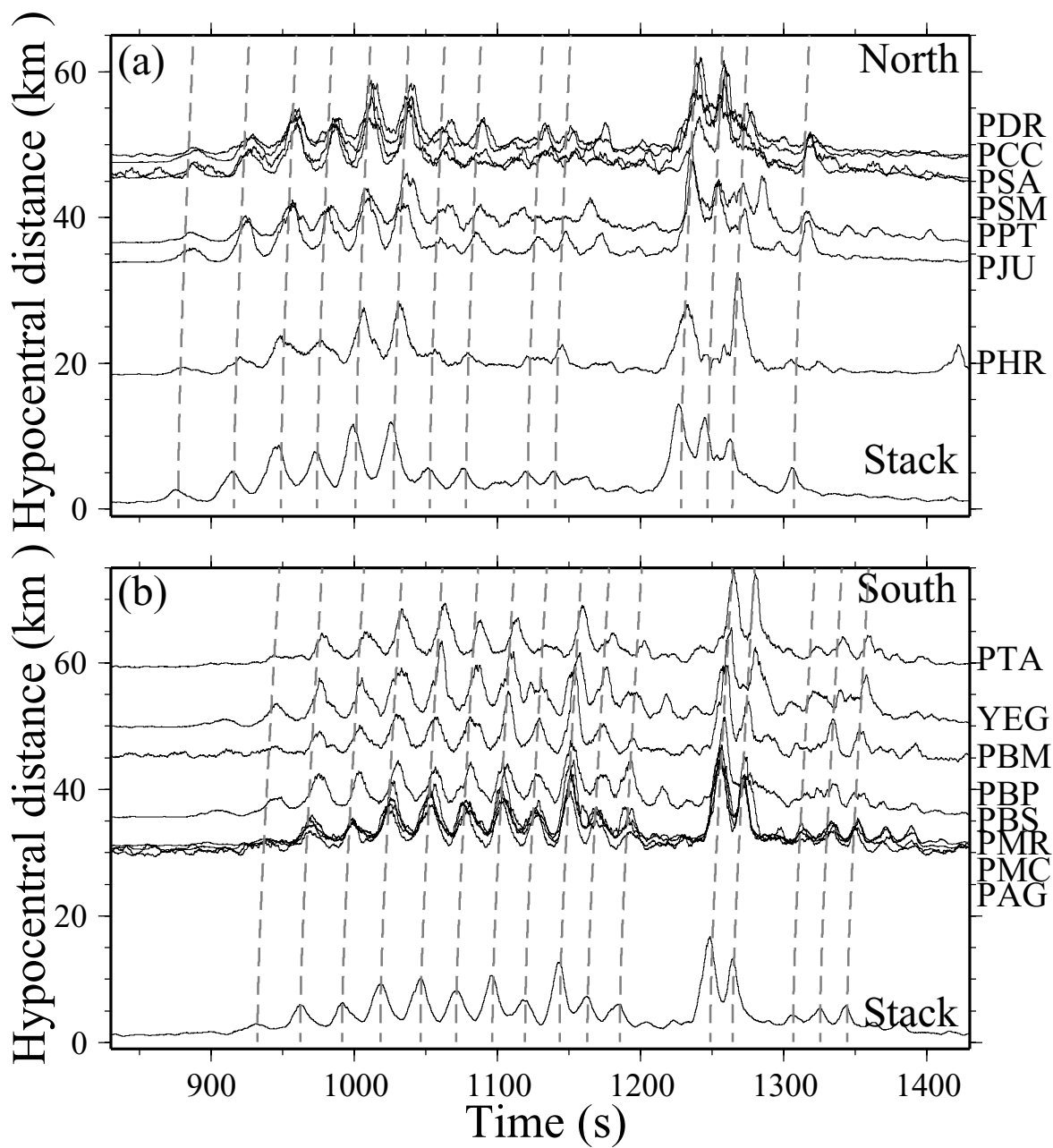


Figure S02

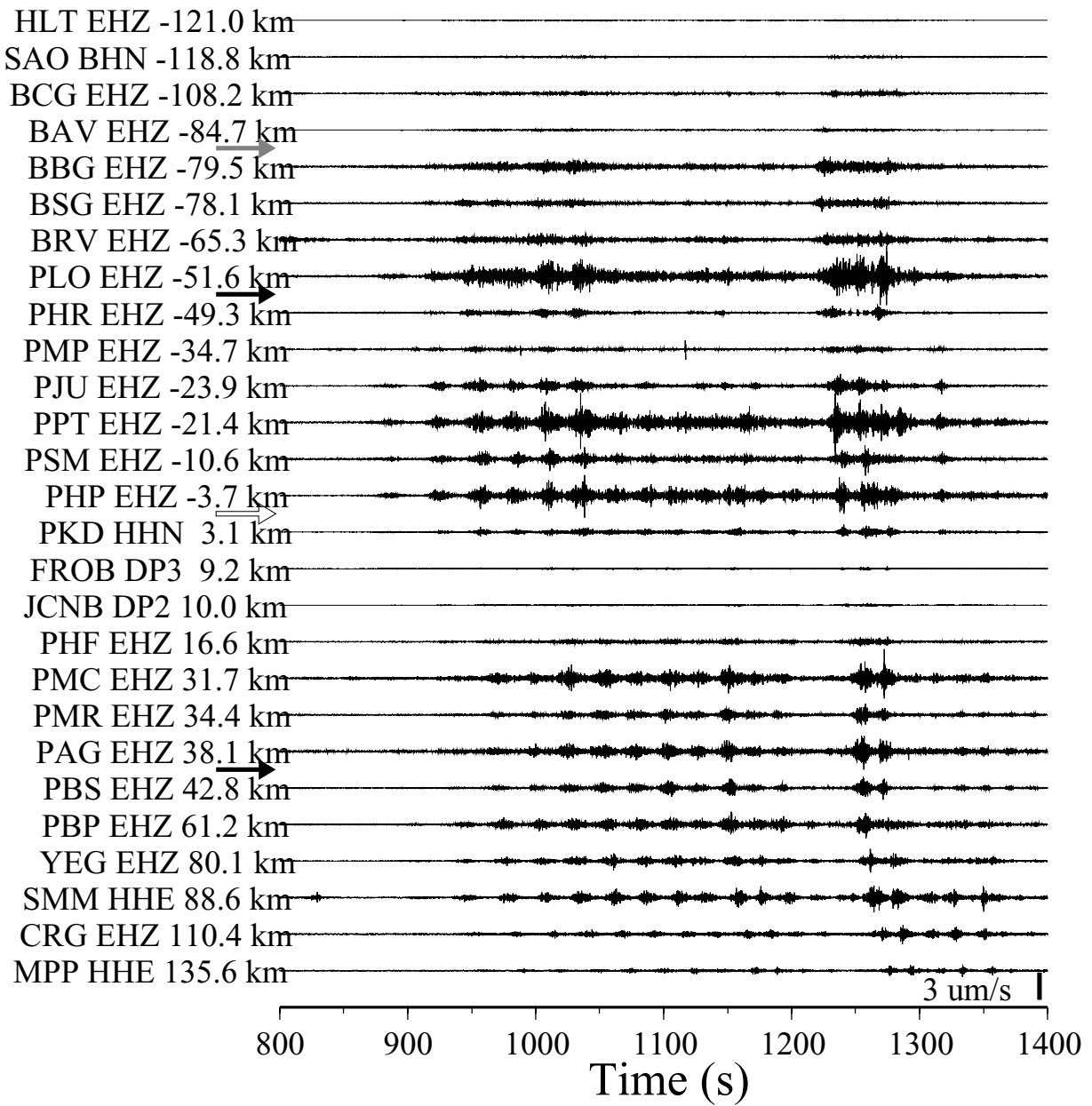


Figure S03

Mw7.8 Denali Fault earthquake Love wave moveout

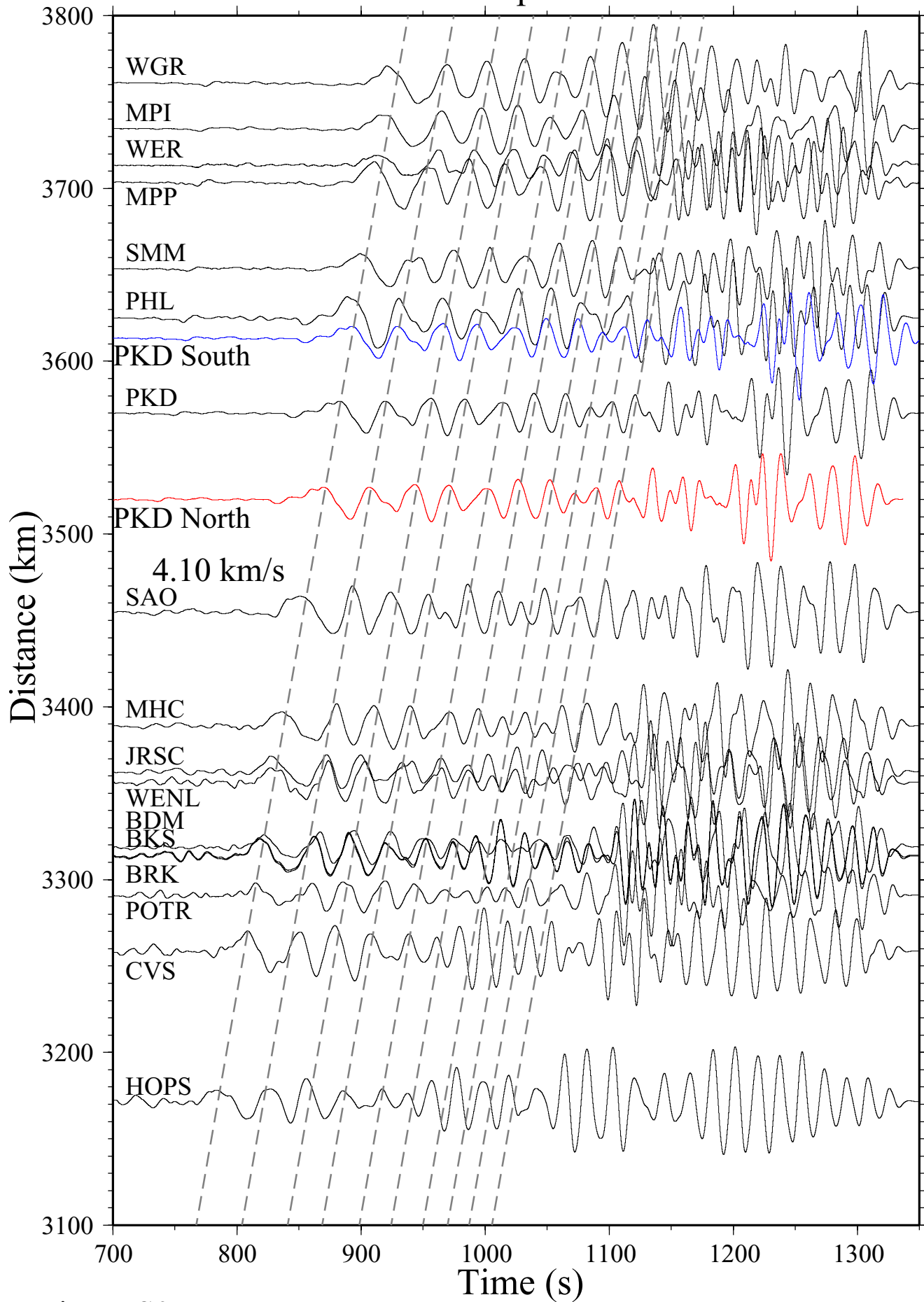


Figure S05

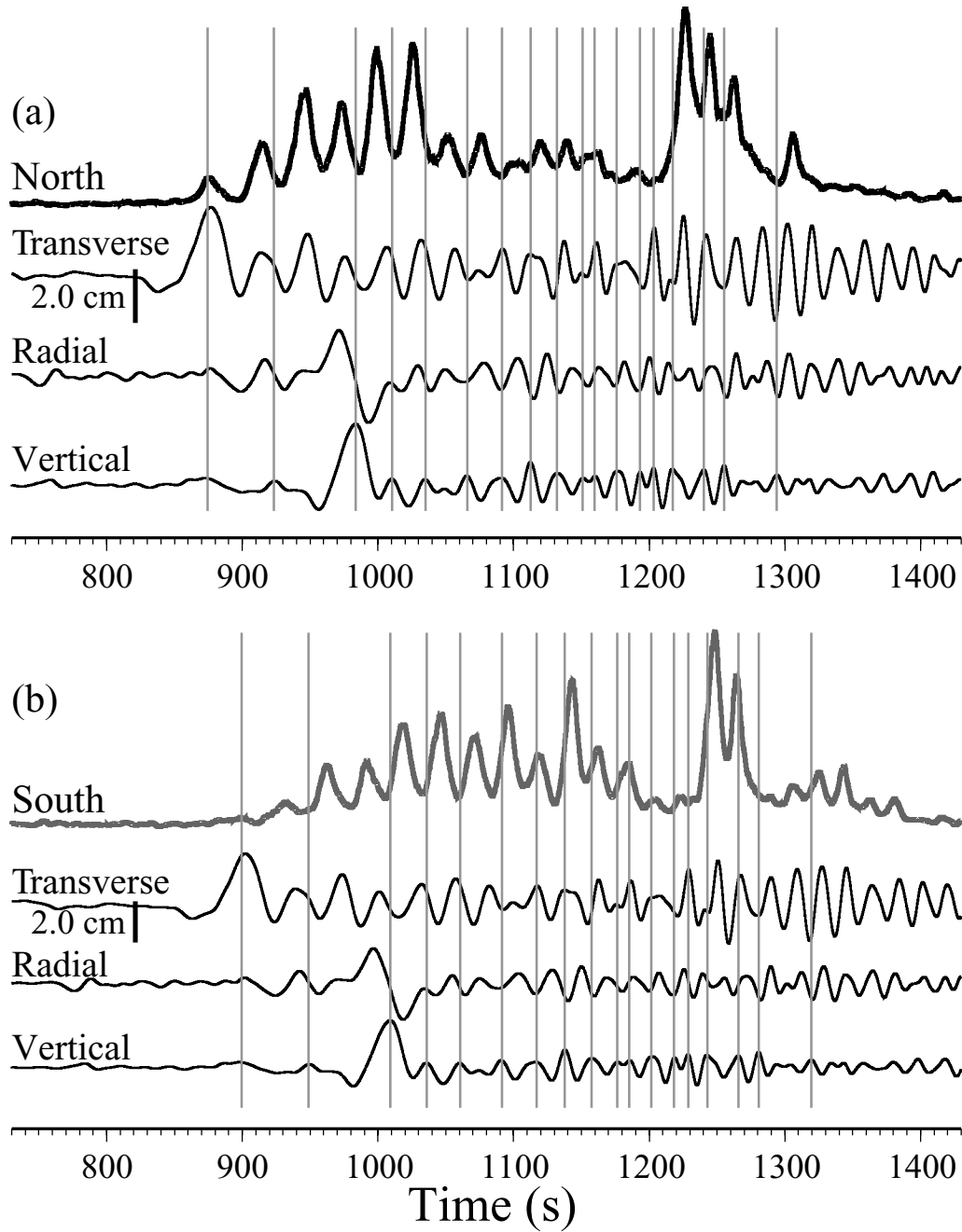


Figure S06