

Dear Editor and reviewers,

We thank you for the insightful suggestions and comments, which greatly improved this paper. Following your suggestions and comments, we have revised the manuscript accordingly. Below please find our point-by-point responses. The comments are in black and our replies are in blue. We also highlighted changes in the manuscript in red.

Editor: I also found your discussion of how your seismological observations inform fault dynamical properties, including the potential role of fluid weak. A bit more reading on how to relate kinematic observations and infer dynamical properties would probably be help you. There is a large body of publications that you could take inspirations from in this topic.

Thank you for your suggestions. In the revision, we have further strengthened the Discussion section by adding text on how fault dynamic properties can be inferred from kinematic observations. Previous studies usually combined geodetic data and seismicity to infer fault behavior. For example, during the postseismic period, the combination of geodetically resolved afterslip and aftershock evolution has been interpreted as evidence for stable or conditionally stable slip, often consistent with rate-strengthening friction or brittle creep on portions of the fault surrounding coseismic rupture patches (e.g., Perfettini and Avouac, 2004). In our case, however, it is difficult to directly detect afterslip following the large Mendocino earthquakes using geodetic observations due to their locations offshore. We therefore rely primarily on seismicity, including migrating aftershocks and long-term background repeating earthquakes, to infer afterslip and identify creeping segments. We also expanded the discussion of the mechanisms that may underlie these creeping segments, which are mainly related to seawater infiltration. On the one hand, hydration of mantle peridotite can produce serpentinite, a material that commonly exhibits velocity-strengthening friction and therefore favors stable creep or aseismic slip (Kohli et al., 2021; Kuna et al., 2019). On the other hand, infiltrating fluids can elevate pore pressure and reduce effective normal stress, thereby further promoting aseismic slip (Guo et al., 2018). Recent numerical modeling studies and seismic observations additionally suggest that dilatancy strengthening in fluid-rich and porous oceanic transform fault segments may also be a key control on the occurrence of aseismic transients (Gong et al., 2026; Liu et al., 2020). [Lines 415-433 and 455-462]

“Aseismic slip transients have been frequently observed after large earthquakes and play an important role in triggering aftershocks. For instance, geodetic observations revealed that the afterslip of the 2005 Nias-Simeulue Mw 8.7 earthquake occurred in the coseismic slip zone’s up-dip and down-dip directions (Hsu et al., 2006), and the displacements of this afterslip within 11 months exhibited a linear relationship with the increase of the cumulative number of aftershocks over time, implying that a stable or conditionally stable slip occurred in the postseismic period, often consistent with rate-strengthening friction or brittle creep on portions of the fault surrounding coseismic rupture patches (Perfettini and Avouac, 2004). In our case, it is challenging to directly detect the afterslip of the large Mendocino earthquakes based on geodetic analysis given their locations offshore. However, a recent study indicated that there is a potential acceleration of afterslip in the weeks following the 2024 Mendocino mainshock based on the observations of repeating earthquakes (Mohanna et al., 2025). Furthermore, the migration pattern of aftershocks was also observed in the 2004 Mw 6.0 Parkfield (Peng and Zhao, 2009) and 2011 Mw 9.0 Tohoku (Perfettini et al., 2019) earthquake sequences, with the underlying mechanism of these migrating aftershocks mainly explained as afterslip based on numerical modelling and geodetic investigation (Murray, 2006; Perfettini et al., 2019, 2018). This suggests that the migrating aftershocks of the three large Mendocino earthquakes are likely driven by along-strike propagation of aseismic slip transients (Perfettini et al., 2018), which relieve co-seismic stress increases like afterslip (Ingleby and Wright, 2017) and/or stresses built up during the preceding inter-seismic period like triggered slow slip events (Araki et al., 2017).”

“OTFs commonly exhibit varying slip behavior (i.e., seismic and aseismic slips) along strike mainly due to seawater infiltration. On the one hand, the hydration of mantle peridotite can produce serpentinite, a material that commonly shows velocity-strengthening friction and therefore favors stable creep or aseismic slip (Kohli et al., 2021; Kuna et al., 2019). On the other hand, infiltrating fluids can raise pore pressure and lower effective normal stress, which can also facilitate aseismic slip (Guo et al., 2018). Recent numerical modeling investigations and seismic field observations further indicate that the key control on the occurrence of aseismic transients may be the dilatancy strengthening in fluid-rich and porous OTF segments (Gong et al., 2026; Y. Liu et al., 2020).”

Reviewer #1: Review of "Interaction between seismic and aseismic slips along the Mendocino oceanic transform fault offshore northern California" by Liu et al.

This study analyzes the spatial characteristics of three M6.5+ earthquakes in 2016/1994/2024 and their aftershocks on the Mendocino oceanic transform fault. The authors use ML-aided seismic analysis to derive an enhanced earthquake catalog for the 2024 event, combined with NC double-difference-relocated catalogs for the 1994/2016 events. The authors infer aftershock migration behavior that appears linear along the strike over logarithmic postseismic time, leading to some overlap between the coseismic/aftershock zones of adjacent events. They also estimate the early-aftershock productivity of these events and compare it with that of the East Pacific Rise and California, adding new data points to the scaling law.

I find the manuscript is concisely written and logically organized. While the procedures for earthquake catalog processing, aftershock productivity results, and general interpretation are reasonable, the parts of estimating aftershock migration and spatial relations are not very robust due to neglecting detection issues and oversimplifying event spatial extent (see specific comments below). The quality of the presentation is mixed - some figures are rough and difficult to read. Additional tests and improvements are necessary.

[Thank you for your review and constructive suggestions. We have revised the manuscript accordingly. Below please find our point-by-point responses.](#)

1. Aftershock spatial window

Line 233: The authors "further analyze the 1994 earthquake's one-month aftershock sequence, which includes 160 aftershocks with latitude and longitude ranging from 40.2° to 40.5° and -126.2° to -124.3°, respectively... For the 2016 Mendocino OTF earthquake sequence ... with latitude and longitude ranging from 40.2° to 41.0° and -127.0° to -125.8°"

=> The chosen spatial windows are restrictive for the 1994 and 2016 events. In particular, the apparent sharp eastern boundary of aftershocks in Figure 1d seems to coincide with the chosen boundary (-125.8°). The authors should show the complete spatial extent of all aftershocks within the considered postseismic window to assess their spatiotemporal migration patterns in an unbiased

way.

We are sorry that our previous description misled you. In fact, the western and eastern boundaries of the chosen spatial windows for both the 1994 and 2016 events were -127.1° and -124.3° , respectively. Figures 1c and 1d exhibit the actual aftershock distributions of the two events within one month, which are significantly shorter than the chosen spatial windows. We have made it clear in the revision. Besides, to avoid confusing readers regarding the sharp eastern boundary of the 2016 event's aftershocks, we also added a comparison of seismicity along the Mendocino OTF before and after the 2016 event in the revision, which indicates that the eastern segment has no clearly increased seismicity rate after the 2016 mainshock (Figure R1), and there is a ~25-km-long seismicity gap between the western and eastern segments. [Lines 240-243 and 246-253]

“Therefore, we instead extract the one-month aftershocks of the 1994 earthquake with latitude and longitude ranging from 40.2° to 40.5° and -127.1° to -124.3° , respectively, from the high-resolution Double-Difference Earthquake Catalog (DD catalog, version v202112.1) of Northern California (Waldhauser & Schaff, 2008).”

“Therefore, we conduct a 30-day template matching detection before and after the mainshock based on 3,226 magnitude ≥ 2 USGS cataloged earthquakes from 2008 to 2024 with latitude and longitude ranging from 40.2° to 41.0° and -127.1° to -124.3° , respectively. Results indicate that the western segment (longitude $< -125.8^{\circ}$) accommodated 116 aftershocks within one month after the mainshock, which are ~10 times more than background earthquakes within one month before the mainshock (Figure S1). Whereas the eastern segment (longitude $> -125.8^{\circ}$) exhibits no significantly increased seismicity rate after the mainshock (Figure S1).”

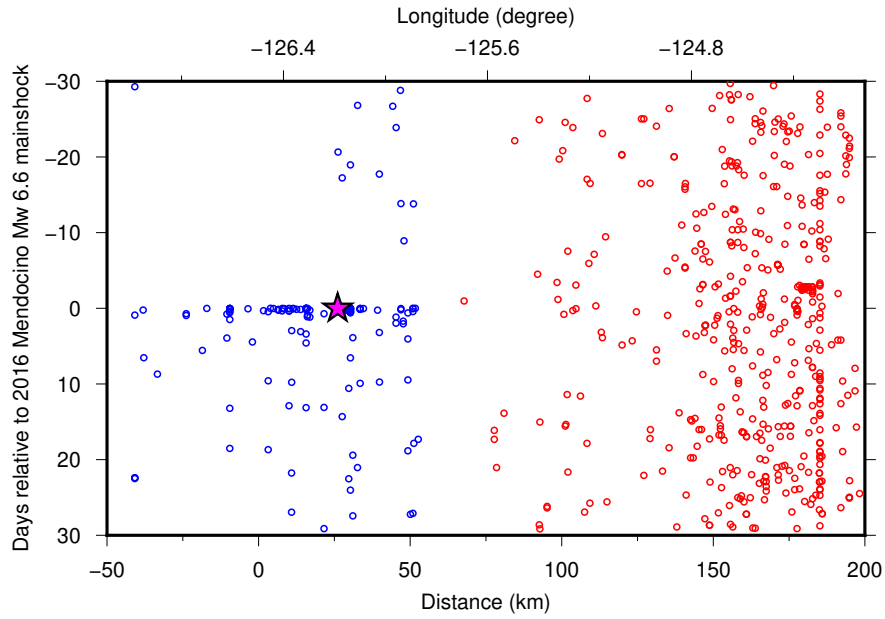


Figure R1 (also Figure S1 in Supplementary information). Comparison of seismicity along the Mendocino OTF before and after the 2016 event (magenta star). Blue and red circles represent earthquakes that occurred in the western and eastern segments, respectively.

2. Aftershock migration and catalog completeness

Previous studies estimated the aftershock productivity using the entire catalog (Boettcher and Jordan, 2004; McGuire et al., 2005), so the results in Figures 2 and 3 are reasonable. However, to estimate the aftershock migration pattern and speed, the authors should address the common issue of missing earlier aftershocks due to the mainshock coda waves. Given this issue and the general sparseness of aftershocks (Figure 1c & 1d), the migration patterns for 1994/2016 are uncertain. Since the 2024 event catalog includes many more events, the authors should follow Peng & Zhao (2009) to estimate the completeness magnitudes across different postseismic windows and demonstrate that the results are not affected by time-dependent catalog completeness. This can support the inferred migration pattern for the 2024 event. The limitations for the 1994/2016 cases should be discussed.

Thank you for your suggestions. Following Peng & Zhao (2009), we checked the dependence of the 2024 event's aftershock migration pattern on M_c across different postseismic windows. Results indicate that the linear aftershock migration front is still clear after removing events with $M_L < M_c$ within corresponding windows (Figure R2). We added this examination in the revision. [Lines 346-349]

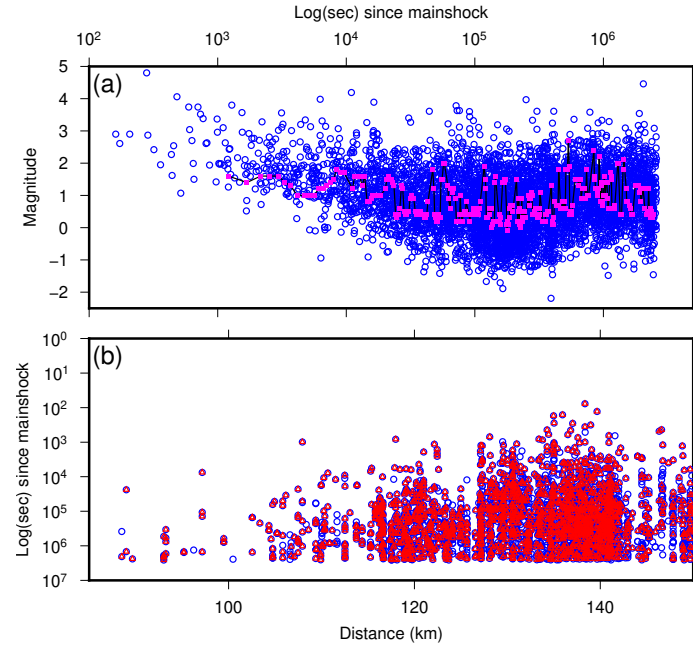


Figure R2 (also Figure S5 in Supplementary information). (a) Time-dependent M_c for the 2024 aftershock sequence (blue circles). The magnitude of completeness (M_c) was estimated using the GFT method within sliding windows of 100 events (magenta squares), with a step size of 20 events. (b) 2024 event's aftershock migration pattern after accounting for M_c variation across different postseismic windows. Blue circles and red triangles represent the aftershocks before and after removing events with $M_L < M_c$ within corresponding windows, respectively.

“Furthermore, we also evaluate the robustness of the aftershock migration pattern by accounting for M_c variation across different postseismic time windows following Peng and Zhao (2009). Results indicate that the westward migrating aftershocks remain clear after removing events with $M_L < M_c$ within corresponding windows (Figure S5).”

On the other hand, we agree that the migration patterns of the 1994 and 2016 aftershock sequences are less certain due to sparse aftershocks. We thus conservatively state them as potential migration fronts in the revision. However, the aftershock migration pattern is just one of the multiple lines of evidence that support the existence of along-strike propagating afterslip. The unusually long aftershock zones of the two sequences still support that afterslip likely served as a driver of some aftershocks.

Figure 1: "The green dashed line marks the aftershocks' westward propagation front, which is fitted by the 10th activated aftershocks (cyan line) within a 5 km-long sliding window (Kato and Obara, 2014), whereas the two black lines indicate the 20th and 30th activated aftershocks."

=> What does 10/20/30th aftershocks mean? I don't understand why the ordinal numbers of aftershocks are considered here.

To minimize the effect of missed aftershocks on the aftershock migration pattern of the 2024 event, we defined the activation of aftershocks at the time when the cumulative number of aftershocks within a sliding 5 km-long window along the Mendocino OTF exceeds a certain number of $N = 10$, following previous studies (Kato & Obara, 2014; Yao et al., 2017). We further examined the thresholds of $N = 20$ and 30, and found that the resulting aftershock migration patterns have no big change compared to $N = 10$, suggesting that the inferred aftershock migration front is robust. We have made it clear in the revision. [Lines 338-346]

"To minimize the effect of missed aftershocks on the aftershock migration pattern of the 2024 event, we defined the activation of aftershocks at the time when the cumulative number of aftershocks within a sliding 5 km-long window along the Mendocino OTF exceeds a certain number $N = 10$, following previous studies (Kato and Obara, 2014; Yao et al., 2017). The linear fitting of these 10th-activated aftershocks within different windows indicates that the aftershock migration speed is approximately ~ 11 km per order-of-magnitude increase in time (Figure 1b). We also examined the activation of aftershocks with $N = 20$ and 30, both of which exhibit migration patterns highly similar to that observed with $N = 10$ (Figure 1b)."

Figure 2a: Can you also add error bars to your events like those in McGuire et al. 2005?

Thank you for your suggestions. The error bars for the EPR T-phase catalog in McGuire et al. (2005) represent uncertainty in the catalog completeness threshold (M_c), which arises from the Acoustic Source Level (ASL)-based magnitude calibration. However, our catalogs do not have the same source of uncertainty because we directly estimate local magnitudes (M_L) from seismic waveforms. Nevertheless, the estimated M_c may vary depending on the method used. We therefore added error bars for the three Mendocino events in Figure 2a based on the MAXC- and GFT-derived M_c values.

Figure 2b: The main text should describe how the coseismic rupture lengths are estimated and the numerical values for the mean and uncertainties.

Thank you for your suggestions. Except for the coseismic rupture length of the 2016 Mendocino event, which was estimated from a recently proposed scaling relationship between M_w and rupture length of OTF earthquakes, the coseismic rupture lengths of the other earthquakes were manually measured from slip distributions inverted by previous studies using observed seismic, GNSS, InSAR and fiber-optic array data. In the revision, we added a table to summarize the methods and data sources used to invert the coseismic slip of these large earthquakes in Supplementary information.

The aftershock-zone-length-to-coseismic-rupture-zone-length ratios of two M_w 7.0 Mendocino OTF represent the average values determined by different publications (Atterholt et al., 2025; McGuire, 2002; Pollitz et al., 2025; Ulrich et al., 2025), with error bars indicating the upper and lower limits. The aftershock-zone-length-to-coseismic-rupture-zone-length ratio of Southern California represents the average value of four $M_w > 7.0$ earthquakes in Southern California, with horizontal and vertical error bars indicating the upper and lower limits of magnitude and aftershock-zone-length-to-coseismic-rupture-zone-length ratio, respectively. We have made it clear in the revision. [Lines 290-298]

“The aftershock-zone-length-to-coseismic-rupture-zone-length ratios of two M_w 7.0 Mendocino OTF represent the average values determined by different publications (Atterholt et al., 2025; McGuire, 2002; Pollitz et al., 2025; Ulrich et al., 2025), with error bars indicating the upper and lower limits. The aftershock-zone-length-to-coseismic-rupture-zone-length ratio of Southern California represents the average value of four $M_w > 7.0$ earthquakes in Southern California, with horizontal and vertical error bars indicating the upper and lower limits of magnitude and aftershock-zone-length-to-coseismic-rupture-zone-length ratio, respectively. Methods and data sources used to invert the coseismic ruptures of these large earthquakes are summarized in Table SI.”

3. Aftershock productivity and characteristics

Line 246: "\alpha is the triggering exponent of the ETAS model" => I cannot find information on what values are chosen/tested for alpha, or why.

Thank you for your careful review. The triggering exponent (α_2) of the ETAS model was determined as 0.8, which was derived from the analysis of global OTFs by McGuire et al., (2005). Furthermore, our results exhibit that the aftershock productivities of the three Mendocino events are consistent with this scaling law. We have made it clear in the revision. [Lines 271-277]

"Besides, α_2 is determined as 0.8, which was derived from the analysis of global OTFs in a previous study (McGuire et al., 2005). Note that the aftershocks outside the coseismic rupture zones of the three Mendocino events are included in the quantification of the aftershock productivity, implying that the inter-event stress triggering ability may be overestimated. Nevertheless, the resulting aftershock productivities of the three Mendocino OTF earthquakes in our study are still consistent with the corresponding scaling law derived from the analysis of global OTFs (McGuire et al., 2005) (Figure 2a)."

Line 253: "We extract aftershocks of the three Mendocino OTF mainshocks following three criteria: 1) events with larger than ; 2) events that occurred within two weeks after the mainshocks; and 3) events that are located within 30 km of the mainshocks, which is comparable to the largest rupture radius of these mainshocks."

=> Can you clarify if the aftershocks are within 30 km of the hypocenter or the mainshock slip zone boundary? If the former, the window would be too small since the aftershock zones can span up to 150 km (Figure 1b-d).

Thank you for your careful review. We re-estimated the aftershock productivities within the whole aftershock zones of the three Mendocino mainshocks, which include both the inter-event stress-triggered and afterslip-triggered aftershocks. Nevertheless, the aftershock productivities of the three events are still consistent with the scaling law derived from the analysis of global OTFs (McGuire et al., 2005) (Figure 2). We have made this clear in the revision. [Lines 263-277]

“To directly compare the aftershock productivities of the Mendocino OTF earthquakes with the observations in McGuire et al., (2005), we extract aftershocks of the three Mendocino OTF mainshocks following three criteria.....3) events that are located within the whole aftershock zones of the three Mendocino OTF mainshocks.....Nevertheless, the resulting aftershock productivities of the three Mendocino OTF earthquakes in our study are still consistent with the corresponding scaling law derived from the analysis of global OTFs (McGuire et al., 2005) (Figure 2a). To directly compare the aftershock productivities of the Mendocino OTF earthquakes with the observations in McGuire et al., (2005), we extract aftershocks of the three Mendocino OTF mainshocks following three criteria: 1) events with M_L larger than M_c ; 2) events that occurred within two weeks after the mainshocks; and 3) events that are located within the whole aftershock zones of the three Mendocino OTF mainshocks (Figure S2). We use the Maximum curvature method (MAXC) (Wiemer & Katsumata, 1999) and the Goodness-of-fit method (GFT) (Wiemer, 2000) to estimate M_c for the three sequences (Figure 3). We then adopt the most conservative M_c of 1.4 (2024), 1.9 (2016), and 2.4 (1994) in the aftershock productivity quantification. Besides, α_2 is determined as 0.8, which was derived from the analysis of global OTFs in a previous study (McGuire et al., 2005). Note that the aftershocks outside the coseismic rupture zones of the three Mendocino events are included in the quantification of the aftershock productivity, implying that the inter-event stress triggering ability may be overestimated. Nevertheless, the resulting aftershock productivities of the three Mendocino OTF earthquakes in our study are still consistent with the corresponding scaling law derived from the analysis of global OTFs (McGuire et al., 2005) (Figure 2a).”

Line 297: "Nevertheless, our newly developed catalog reveals a clear westward expansion of the aftershock zone at ~11 km per order-of-magnitude increase in time (Figure 1b), which is well-constrained by the events' progressively larger S-P differential times as recorded by station WLKR (Figure 4)."

=> I do not see how randomly selected aftershocks (which appear to be equally spaced) will support aftershock migration patterns, unless some special procedure is applied to event selection. If the aftershock zone expands over time, then any randomly selected events would be randomly located as well. If I understand correctly, Figure 4 essentially shows that farther events have longer S-P differential times, not evidence for aftershock migration.

We are sorry for our inaccurate description. The purpose of Figure 4 is mainly to confirm the precision of aftershock locations, which can support the determination of aftershock zone length. We have corrected it in the revision. [Lines 336-338]

“The progressively increasing S–P differential times as along-strike epicenter distances increase further confirm the robustness of the earthquake locations that outline the aftershock zone (Figure 4).”

Figure 5.

(1) This figure has poor quality. Many features (e.g., pink circles and the gray star) are difficult to read. Please improve the clarity.

To further improve the readability of Figure 5, we moved the comparison between background seismicity, repeating earthquakes and the coseismic slip of the 2016 event to a newly added panel in the revision (Figure R3). Besides, we changed the colors of the background seismicity and the 2016 event to orange and green (Figure R3), respectively.

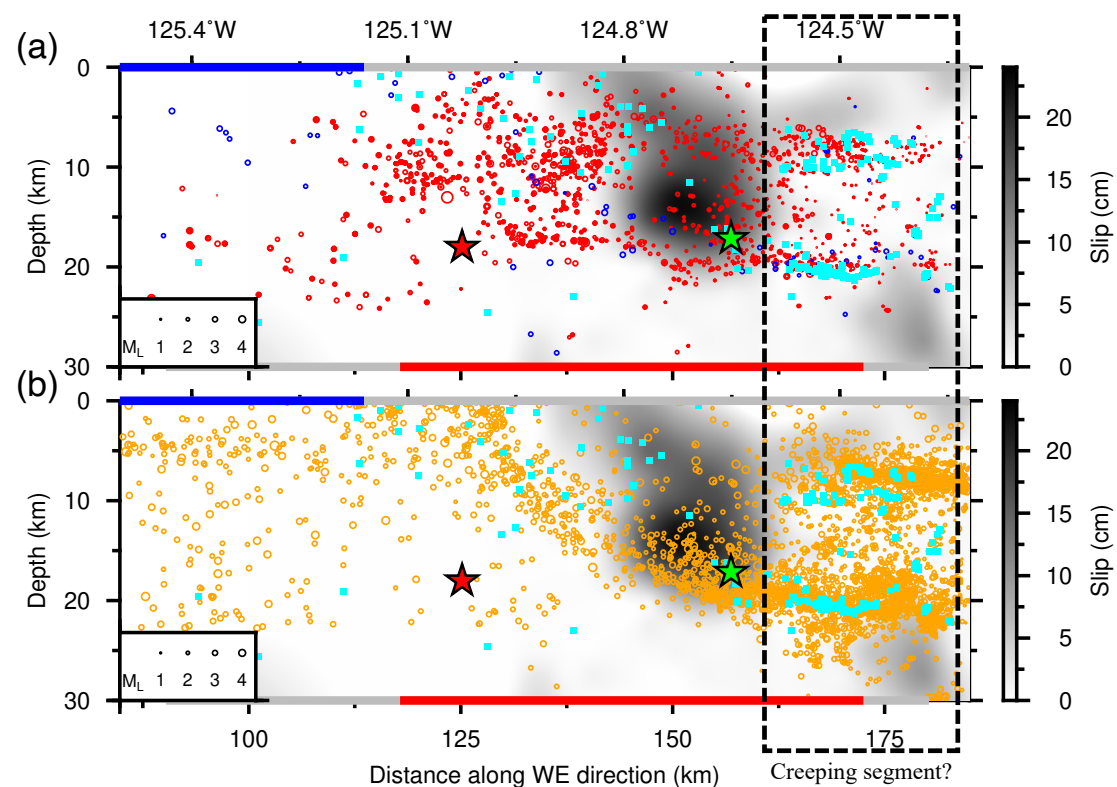


Figure R3 (also Figure 5 in the main text). Projection of Mendocino OTF seismicity along the west-east direction. (a) Aftershocks of the 1994 mainshock (blue circles) listed in the DD catalog

(Waldhauser & Schaff, 2008) are shown. Blue bold line marks part of the estimated co-seismic rupture zone of the 1994 mainshock (McGuire, 2002), while gray bold line next to the blue bold line marks the aftershock zone's extent (Figure 1c). Red circles represent the aftershocks of the 2024 mainshock listed in our GPU-M&L catalog. Red bold line marks the estimated co-seismic rupture zone length of the 2024 mainshock (Atterholt et al., 2025), while gray bold lines next to the red bold line indicate the aftershock zone's extent (Figure 1b). Gray shades indicate the co-seismic slip distribution (Yeck et al., 2023) of the 2021 Mw6.1 Mendocino OTF earthquake with green star marking its hypocenter. (b) Similar to (a), but for historical earthquakes (orange circles) listed in the DD catalog from 1984 to 2021. Black dashed rectangle marks a possible creeping segment inferred from repeating earthquakes (cyan squares) (Materna et al., 2018).

(2) Slip distribution for the smaller 2021 Mw6.1 is shown, which lies within the coseismic slip extent for 2024. More detailed information on the larger 1994/2024 events is missing, but it seems important for the spatial comparison and overall interpretation. Is that not available?

The co-seismic rupture zone of the 2024 event was determined by different groups, including Pollitz et al. (2025), Ulrich et al. (2025) and USGS (<https://earthquake.usgs.gov/earthquakes/eventpage/nc75095651/finite-fault>). But these available models exhibit significant differences, especially for the slip distribution in depth (Figure R4). Among these available models, the co-seismic rupture zone proposed by Pollitz et al. (2025) mainly occurred in regions relatively devoid of the migrating aftershocks of the 1994 event, background seismicity and repeating earthquakes (Figure R5), which is similar to the observation of the 2016 event's co-seismic rupture zone. Therefore, we only cited the model proposed by Pollitz et al. (2025) to support our inference of heterogeneous slip mode at depth and avoid further discussing other models in the revision, since it is challenging to judge the reliability of these available slip models.

[Lines 482 and 485]

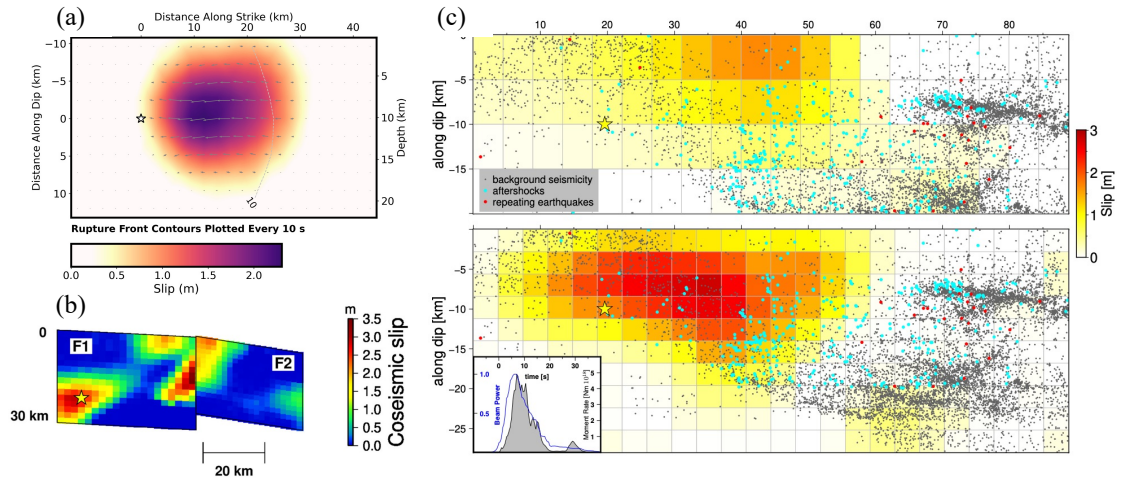


Figure R4. Coseismic slip of the 2024 Mendocino earthquake inverted by (a) USGS, (b) Pollitz et al. (2025) and (c) Ulrich et al. (2025). Upper panel in (c) represents the results inverted based on GNSS data only, whereas the lower panel represents the results inverted based on GNSS data, teleseismic body and surface waveforms, and regional waveforms.

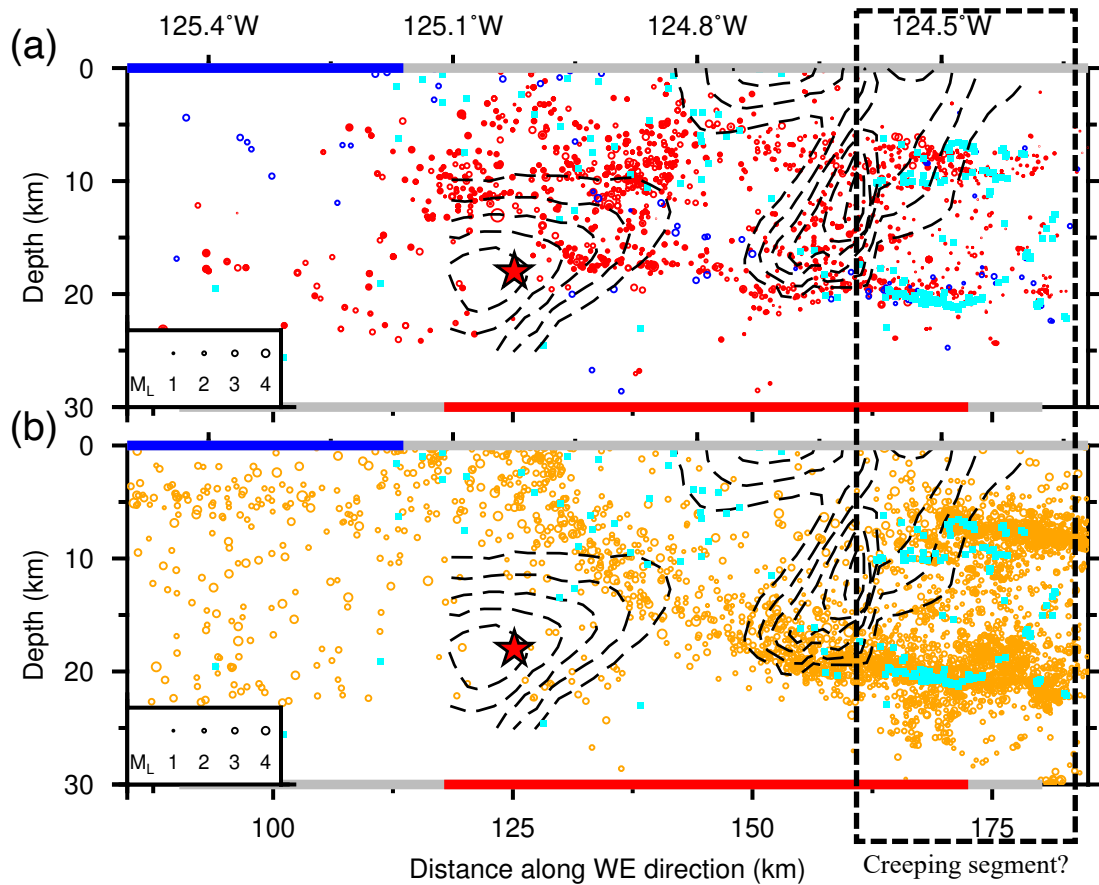


Figure R5 (also Figure S8 in Supplementary information). Similar to Figure 5, but for the comparison between the coseismic slip (black dashed lines; Pollitz et al., 2025) and aftershocks (red circles) of the 2024 event, background seismicity (orange circles) and repeating earthquakes (cyan circles).

squares).

4. Interpretation

Line 382: "which suggests that low-seismic-coupling segments along OTFs could have slip cycles that are synchronized with the earthquake cycles of neighboring high-seismic coupling segments while concurrently inhibiting the propagation of these seismic ruptures and limiting the eventual earthquake magnitude."

=> This interpretation is a bit complicated for me. I do not see how the presented results indicate synchronizations of the earthquake cycle, since the analysis doesn't involve long-term behavior for individual segments.

Our observations indicate that all three large Mendocino earthquakes triggered along-strike propagating afterslip. We thus speculate that the low-seismic-coupling segments along the Mendocino OTF could have slip cycles that are synchronized with the earthquake cycles of neighboring high-seismic-coupling segments. However, whether the low-seismic-coupling segments indeed have slip cycles that are synchronized with large seismic ruptures needs to be further verified with continuous longer-term analysis, which will be a follow-up work. We have clarified this point in the revision. [Lines 447-453]

"Based on this, a possible scenario seems to be that the aseismic slip segments along the Mendocino OTF could have slip cycles that are synchronized with the earthquake cycles of neighboring seismic slip segments while concurrently inhibiting the propagation of these seismic ruptures and limiting the eventual earthquake magnitude. However, this needs to be further verified using long-term characterization of repeating earthquake activities along the Mendocino OTF, which will be a follow-up work."

Line 397: "In our study, we find that the 2024 mainshock's inferred postseismic slow slip zone overlaps with the 1994 mainshock's co-seismic rupture zone, while the 1994 mainshock's inferred postseismic slow slip zone similarly overlaps with the 2024 mainshock's co-seismic rupture zone (Figures 1b, 1c, and 5)."

=> I think that the statement that a slow-slip zone overlaps with a coseismic rupture zone is

conditional on your definitions of these zones. Figure 5 shows that the 1994 event aftershocks almost completely span the 2024 coseismic/postseismic zone, which seems implausible given the paucity of 1994 aftershocks. If the estimate of these zones is based on where inferred non-zero slip reaches laterally, then there are issues of (1) lateral slip variations/tapering and (2) depth separations of seismic/aseismic slip. These uncertainties and spatial complexity should be addressed in the discussion.

In the revision, we added a β -value analysis (Aron & Hardbeck, 2009) to the Supplementary information to examine the aftershock zone of the 1994 event. This analysis quantifies changes in seismicity rate between a target and its preceding background time windows. Results show that the seismicity rate within the inferred, extremely long aftershock zone increased significantly immediately after the 1994 mainshock. Thus, when only the along-strike extents are considered-as is common in previous studies of OTFs (e.g., Braunmiller and Nábělek, 2008; Shi et al., 2022; Wolfson-Schwehr and Boettcher, 2019)-the afterslip zone of the 1994 event indeed overlaps with the coseismic zone of the 2024 event. This observation supports the previously proposed multiple slip mode of OTFs (i.e., aseismic and seismic slips can occur in the same region). However, our study further examines the depth extents of the seismic slip zones, represented by the coseismic rupture zones of the 2024 Mw 7.1 event and a Mw 6.4 event in 2016, and the aseismic slip zones, delineated by the migrating aftershocks of the 1994 event, repeating earthquakes and background seismicity. Our results reveal that the dominant seismic and aseismic slip zones are separated in depth. Therefore, the main point of our study is that the apparent multiple slip mode behavior of OTFs is probably due to previous studies using teleseismic data being unable to resolve heterogeneous slip distribution in depth. We have made it clear in the revision. [Lines 404-409 and 482-493]

“We further confirmed the long aftershock zones of the Mendocino earthquakes by using a β -value analysis (e.g., Aron and Hardebeck, 2009; Text S1), which quantifies the change in seismicity rate between the target and its preceding background time windows. Results indicate that the lengths of aftershock zones estimated from the statistical method are close to those directly outlined by migrating aftershocks (Figures S6 and S7).”

“For instance, while the 2024 Mw 7.0 earthquake and a Mw 6.1 earthquake in 2021 appeared to have ruptured the previously inferred low-seismic-coupling segment (Materna et al., 2018), which accommodated the 1994 mainshock's postseismic slow slip, when only looking at their along-strike extents, a closer inspection reveals that the two earthquake's co-seismic slip (Yeck et al., 2023; Pollitz et al., 2025) mainly occurred in regions relatively devoid of background seismicity (Waldhauser & Schaff, 2008) while surrounded by the 1994 earthquake's aftershocks (Figures 5 and S8). Therefore, while the multimode model (Boettcher and Jordan, 2004) had previously been proposed (Wolfson-Schwehr and Boettcher, 2019) to explain the presence of earthquakes including the occasional occurrence of $M_w > 6.0$ earthquakes on certain OTF segments with low or intermediate seismic coupling (Braunmiller and Nábělek, 2008), our observations suggest that such slip behavior could also be explained by heterogeneous embedding of seismic fault patches (i.e., asperities) within a predominantly aseismic slip zone (Figure 6)”

Highlight #4: "Mendocino OTF has heterogeneous slip behavior along both strike and dip directions." => There is no analysis or discussion about along-dip behavior. Most interpretations are based on the along-strike extent/migration, and no slip distributions of the three large events are shown/analyzed. Hence, I think this highlight is inaccurate.

We removed highlight 4 in the revision.

Minor issues:

Line 94: (Bürgmann, 2018) is missing in the reference list.

Thank you for your careful review. Bürgmann (2018) has been added in the reference list in the revision.

Line 224: symbol α here conflicts with α in the display equation (Line 246).

To avoid the conflicts, we used α_1 and α_2 in the two equations, respectively, in the revision.

Reviewer #2: This study detects and analyzes OTF earthquakes at Mendocino to understand the interaction between seismic and aseismic slip. The manuscript has done a great job in presenting the works of earthquake detection and catalog building, which I found to be particularly strong.

However, the other parts of the study are not well explained and their connections to the main questions of this study are not clear and coherent. I think significant improvements are needed before this manuscript can meet the standards of EPSL.

Thank you for your review and constructive suggestions. We have revised the manuscript accordingly. Below please find our point-by-point responses.

Magnitude calculation: The local magnitudes of relocated events are calculated based on the equation from Hudson (1986), but it's unclear if this equation, particularly the assumed attenuation relationship, applies to OTF earthquakes that have oceanic tectonic environments. It's also unclear how the magnitude uncertainty introduced through this calculation affects the following aftershock productivity analysis. I think magnitude calculations will surely affect the FMDs shown in Figure 3, but I couldn't find where FMDs are discussed in the manuscript and their contributions to the main research questions besides the estimation of M_c . This part about FMDs also needs further clarifications.

The equation from Hudson (1986) has been widely adopted for the calculation of earthquake magnitude in oceanic tectonic environments (e.g., Gong et al., 2022, 2023). However, we agree that the magnitude calculation may be affected by the potentially inaccurate attenuation relationship. We thus compared the magnitude difference of the common events with magnitude larger than M_c between our GPU-M&L catalog and another catalog developed by a USGS group (Pollitz et al., 2025). Results indicate that there is only a slight magnitude difference of ~ 0.25 between the two catalogs, which has a negligible effect on the analysis of aftershock productivity for the 2024 event (Figure R6). Besides, we also re-estimated the aftershock productivity of the 2024 event based on the official USGS catalog. The resulting value of aftershock productivity is lower than that of large continental earthquakes as well (Figure R6). We have made it clear in the revision. [Lines 321-329]

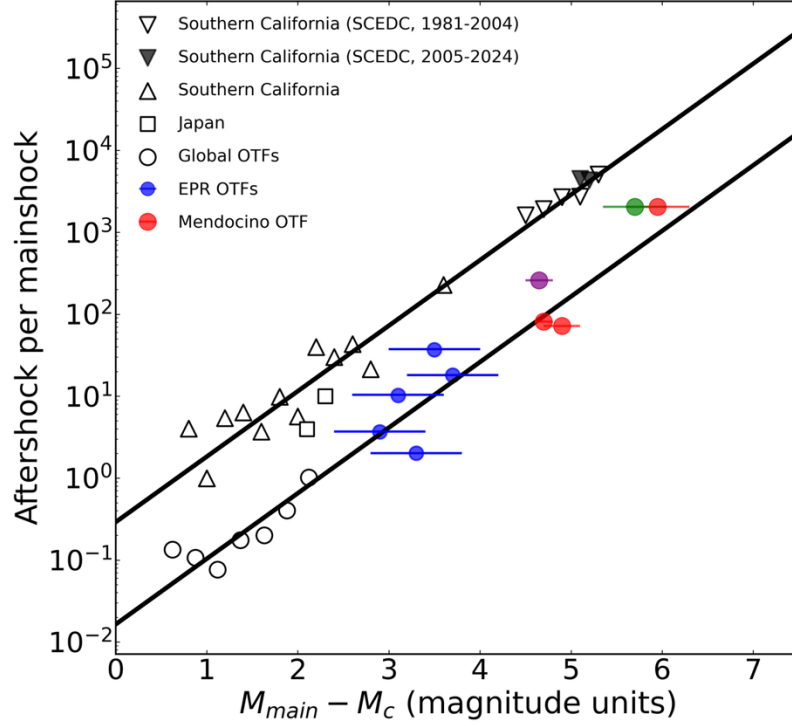


Figure R6 (also Figure S4 in Supplementary information). Similar to Figure 2a, but including the two re-estimations of the 2024 Mendocino Mw 7.0 sequence’s aftershock productivity based on the USGS catalog (purple circle) and our GPU-M&L catalog with a 0.25 magnitude correction (green circle), respectively. Error bars indicate the corresponding M_c uncertainties.

“Considering that the analysis of aftershock productivity may be affected by the potentially inaccurate attenuation relationship used during magnitude estimation, we compared the magnitude difference of the common events with magnitude larger than M_c between our GPU-M&L catalog and a newly published catalog (Pollitz et al., 2025). Results indicate that there is only a slight magnitude difference of ~ 0.25 between the two catalogs (Figure S3), which has a negligible effect on the analysis of aftershock productivity for the 2024 event (Figure S4). Besides, we also re-estimated the aftershock productivity of the 2024 event based on the routine USGS catalog. The resulting value of aftershock productivity remains lower than that of large continental earthquakes (Figure S4).”

Aftershock zone lengths:

Another part needs more thorough discussion in the main text is the estimation of aftershock zone lengths. How are they estimated for the Mendocino earthquakes? The larger aftershock-zone-to-

mainshock-rupture-length ratios for Mendocino OTF earthquakes seem to form a key evidence supporting aseismic slip transients, but I don't think they are convincingly presented in the manuscript.

The aftershock zone lengths of the three Mendocino earthquakes were directly measured based on the along-strike migrating aftershocks within one month after the mainshock. To evaluate the robustness of the aftershock zone length estimations, we adopted the statistical β -value method (e.g., Aron and Hardebeck, 2009) to further examine the aftershock zone lengths of the two Mw 7.0 Mendocino earthquakes with relatively reliable background seismicity rates. The resulting aftershock zone lengths of the two earthquakes are close to those outlined by migrating aftershocks, supporting our interpretation of along-strike propagating aseismic slip transients following mainshocks. In the revision, we clarified how the aftershock zone lengths were measured. Meanwhile, we added the examination of aftershock zone lengths of the two Mw 7.0 Mendocino earthquakes in Supplementary materials. [Lines 404-409]

“We further confirmed the long aftershock zones of the Mendocino earthquakes by using a β -value analysis (e.g., Aron and Hardebeck, 2009; Text S1), which quantifies the change in seismicity rate between the target and its preceding background time windows. Results indicate that the lengths of aftershock zones estimated from the statistical method are close to those directly outlined by migrating aftershocks (Figures S6 and S7).”

A few papers are cited in the caption of Figure 2b, but they are missing in the reference list. Do they use the same methods for estimating aftershock zones?

Thank you for your careful review. In the revision, we have corrected the reference list. For the continental earthquakes in Southern California, Turkey and Maduo, previous studies have compared their aftershock distributions with coseismic rupture zones (Figure R7). We therefore manually measured their aftershock zone lengths from corresponding publications (Neo et al., 2021; Yue et al., 2021, 2022; Guo et al., 2025). It should be noted that the aftershock zones of four Southern California earthquakes were determined by using a β -value analysis (Neo et al., 2021), which quantifies the change in seismicity rate between the target and its preceding background time windows. We did not perform a similar analysis for the other three continental earthquakes because

1) the resulting aftershock-zone-length-to-coseismic-rupture-zone-length ratios of the four Southern California earthquakes are close to the other three continental earthquakes (Figure 2b); and 2) the β -value-based aftershock zone lengths usually represent the lower limits of the aftershock zone length estimations, implying that the actual aftershock-zone-length-to-coseismic-rupture-zone-length of the other three continental earthquakes may be even lower than current values. This does not affect our conclusion that continental earthquakes have lower aftershock-zone-length-to-coseismic-rupture-zone-length ratios than OTF earthquakes.

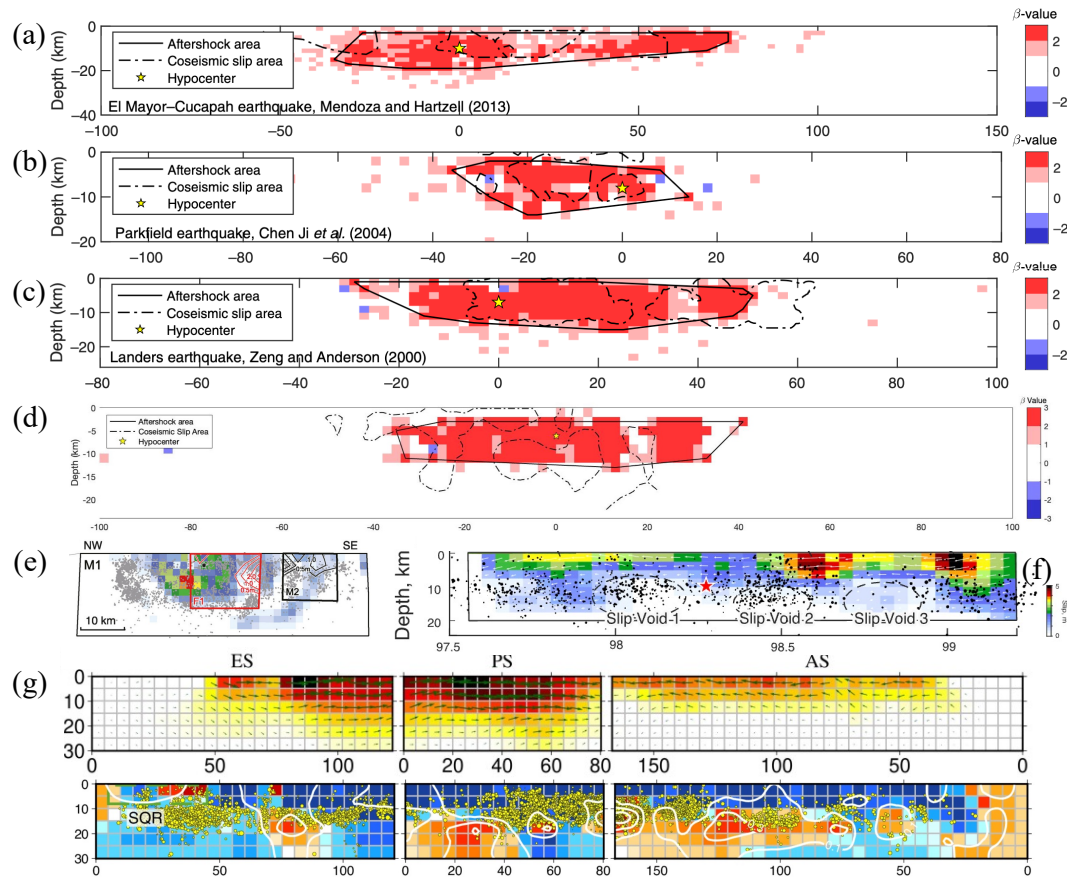


Figure R7. (a) Comparison between the coseismic zone (black dashed lines) and aftershock zone (black line) of the 2010 EI-Mayor-Cucapah Mw 7.3 earthquake (Neo et al., 2019). The aftershock zone was determined by using a β -value analysis. (b-d) Similar to (a), but for the 2004 Parkfield Mw 6.0, 1992 Landers Mw 7.2 and 1999 Hector Mine Mw 7.2 earthquakes (Neo et al., 2019), respectively. (e) Comparison between the coseismic zone (colored background) and aftershock zone (gray dots) of the 2019 Ridgecrest Mw 7.1 earthquake (Yue et al., 2021). (f) Similar to (e), but for the 2021 Maduo Mw 7.4 earthquake (Yue et al., 2022). (g) Upper and lower panels indicate the coseismic zone (colored background) and aftershock zone (yellow dots), respectively.

Why are only $M > 7$ earthquakes (e.g., not $M > 6$ earthquakes) in Southern California chosen for comparison here?

We are sorry that our previous description misled you. The three Mendocino OTF earthquakes represent typically large (i.e., $M_w \geq 6$) strike-slip mainshock-aftershock sequences. To provide a more reasonable comparison with the three events, we tried to select large continental strike-slip mainshock-aftershock sequences in the estimation of aftershock-zone-length-to-coseismic-rupture-zone-length ratios. For Southern California, only the four $M > 7$ earthquakes meet the aforementioned requirements. We have made it clear in the revision. [Lines 400-403]

“The resulting aftershock zone to co-seismic rupture zone length ratios of ~ 1.6 – 3.4 are significantly larger than those of large (i.e., $M_w \geq 6$) continental strike-slip mainshock-aftershock sequences (~ 0.9 – 1.4) (Figure 2b), which were manually measured from the comparison between coseismic slip zones and aftershocks in previous studies (Table S1).”

Interpretation of results: The manuscript ties the observations to along-strike propagation of aseismic slip transients and uses a fault model with velocity-weakening and velocity-strengthening friction to explain the underlying physics. However, I find this part is not strongly supported by the observations. Given these are OTF earthquakes, how about the effects of fluid? The manuscript cited Liu et al. (PNAS, 2020) which clearly demonstrates the effects of enhanced fluid-filled porosity and dilatancy and how they can contribute to aseismic slip transients. I would suggest toning down the interpretations and including other alternative models in discussions as well.

Thank you for your suggestions. In the revision, we added new discussion about the effect of seawater infiltration on the slip mode of OTFs. On the one hand, the hydration of mantle peridotite with infiltrating seawater can produce serpentinite, which is a material that commonly shows velocity-strengthening friction and therefore favors stable creep or aseismic slip (Kohli et al., 2021; Kuna et al., 2019). On the other hand, infiltrating fluids can raise pore pressure and lower effective normal stress, which can also facilitate aseismic slip (Guo et al., 2018). Recent numerical modeling investigations and seismic field observations also indicate that the key control on the occurrence of aseismic transients may be the dilatancy strengthening in fluid-rich and porous OTF segments

(Gong et al., 2026; Y. Liu et al., 2020). To avoid confusing readers, we respectively replaced velocity-weakening and velocity-strengthening with high and low seismic coupling in the model proposed in Figure 6 in the revision. [Lines 455-462 and 500-504]

“OTFs commonly exhibit varying slip behavior (i.e., seismic and aseismic slips) along strike mainly due to seawater infiltration. On the one hand, the hydration of mantle peridotite can produce serpentinite, a material that commonly shows velocity-strengthening friction and therefore favors stable creep or aseismic slip (Kohli et al., 2021; Kuna et al., 2019). On the other hand, infiltrating fluids can raise pore pressure and lower effective normal stress, which can also facilitate aseismic slip (Guo et al., 2018). Recent numerical modeling investigations and seismic field observations further indicate that the key control on the occurrence of aseismic transients may be the dilatancy strengthening in fluid-rich and porous OTF segments (Gong et al., 2026; Y. Liu et al., 2020).”

“The easternmost segment of the Mendocino OTF exhibits predominantly aseismic slip (i.e., low seismic coupling) behavior (Materna et al., 2018) possibly due to the alteration of the fault zone to hydrous phases (e.g., serpentine) (Kuna et al., 2019; Yu et al., 2021) and/or enhanced fluid-filled porosity (Guo et al., 2018). The easternmost segment of the Mendocino OTF exhibits predominantly aseismic slip (i.e., low seismic coupling) behavior (Materna et al., 2018) possibly due to the alteration of the fault zone to hydrous phases (e.g., serpentine) (Kuna et al., 2019; Yu et al., 2021) and/or enhanced fluid-filled porosity (Guo et al., 2018).”

Other comments:

Line 169: It mentions 64 stations are used for detections, but I would imagine further stations don't contribute to the detection of small events as much as close stations. How do the further stations contribute to small event detection?

The aim of using these further stations was not to detect small earthquakes. Instead, they can provide important constraints on the locations of relatively larger earthquakes in the north-south direction, thereby indirectly enhancing the location accuracy of the small earthquakes in relative relocation.

We have made it clear in the revision. [Lines 171-173]

Besides, only 54 stations contributed to the development of the final high-precision earthquake catalog. We corrected this typo in the revision. [Line 170]

“Some stations are located relatively far from the Mendocino OTF in the perpendicular direction. While these distant stations are less sensitive to detecting small earthquakes, they provide important constraints on the locations of relatively larger earthquakes in the east-west direction, thereby indirectly improving the location uncertainty of smaller earthquakes during relative relocation.”

Line 181: This 1-D velocity model is used by NCSS and doesn't seem to apply to the oceanic environment.

This model has been widely adopted to detect and locate earthquakes in the Mendocino OTF in previous studies (e.g., Pollitz et al., 2025; Waldhauser and Schaff, 2008; Yoon and Shelly, 2024). We have made it clear in the revision. [Lines 187-190]

“Hypoinverse relocates 3,902 earthquakes based on a 1-D velocity model, which was used by Northern California Seismic System (USGS Menlo Park, 1966) for routine earthquake location and has also been applied to our study area in previous studies (Pollitz et al., 2025; Waldhauser and Schaff, 2008; Yoon and Shelly, 2024).”

Dear Editor and reviewers,

We thank you for the insightful suggestions and comments, which further improved this paper. Following your suggestions and comments, we have revised the manuscript accordingly. Below please find our point-by-point responses. The comments are in black and our replies are in blue. We also highlighted changes in the manuscript in red.

Reviewer #1: The revised manuscript has addressed many of my comments. The writing and discussion have improved, but there are several remaining issues.

Thank you for recognizing our revision. Below please find our point-to-point replies.

The quality of presentation remains mixed. Figure 5 is still low quality - the authors should pay due attention to how figures show up to readers in their Word document. The color schemes are better now. It would be better to have legends for various types/periods of seismicity/large event locations and annotations for mainshock hypocenters. The whole panels are oriented in the east-west directions from left to right, which appears opposite to what are shown in other figures and took me some time to make sense of the spatial relations. The authors can make a small extra effort to facilitate readers.

Thank you for your suggestions. We revised Figure 5 as suggested in the revision. In both panels, the left and right sides represent the west and east directions, respectively. In the previous version of the manuscript, we used letter notation (i.e., W and E) to indicate longitude. To avoid potential confusion, we have replaced the letter notation with plus and minus signs to denote longitude in the revised figure.

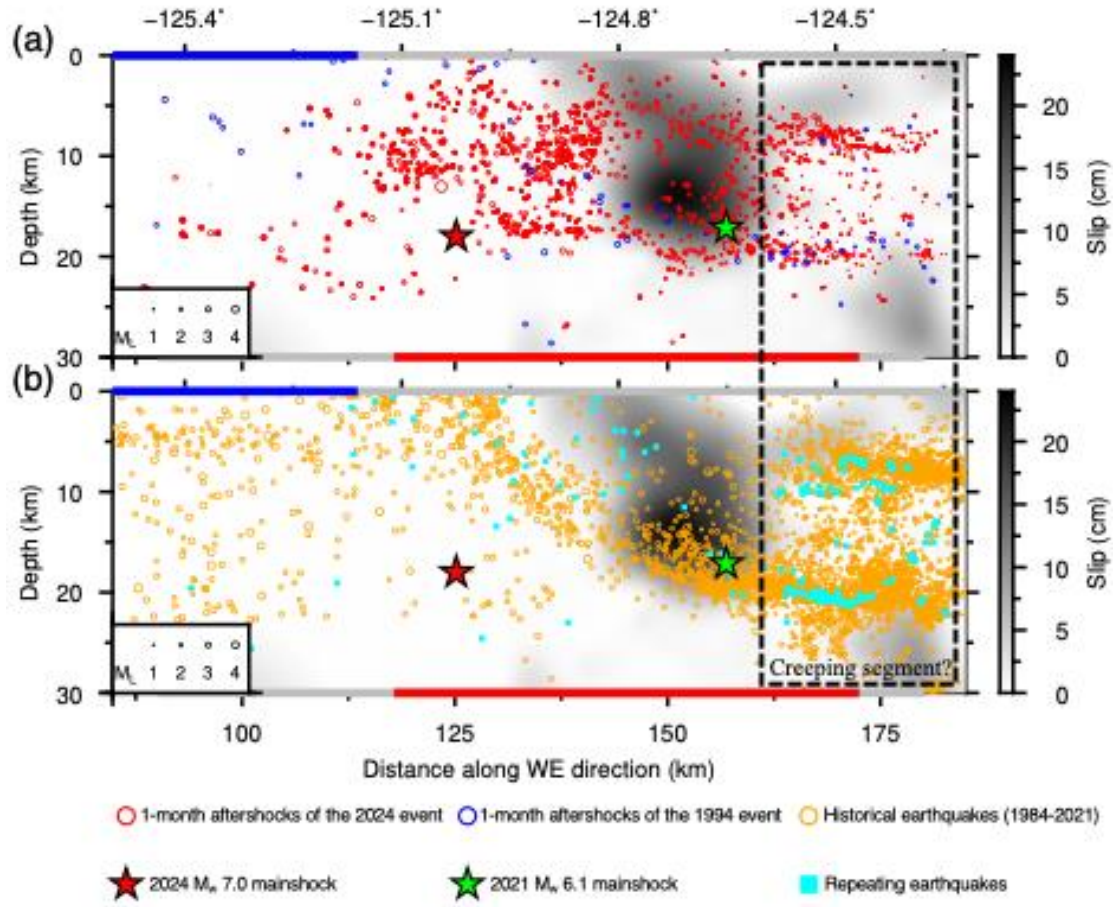


Figure 5. Projection of Mendocino OTF seismicity along the west-east direction. (a) Aftershocks of the 1994 and 2024 mainshocks are listed in the DD catalog (Waldhauser & Schaff, 2008) and our GPU-M&L catalog, respectively. Blue bold line marks part of the estimated co-seismic rupture zone of the 1994 mainshock (McGuire, 2002), while red bold line marks the estimated co-seismic rupture zone length of the 2024 mainshock (Atterholt et al., 2025). Red stars indicate the hypocenter of the 2024 mainshock determined by Hypoinverse. Gray bold lines next to the blue and red bold lines mark the corresponding aftershock zone's extents (Figures 1b and 1c). Gray shades indicate the co-seismic slip distribution (Yeck et al., 2023) of the 2021 M_w 6.1 Mendocino OTF earthquake. (b) Similar to (a), but for historical earthquakes listed in the DD catalog from 1984 to 2021. Black dashed rectangle marks a possible creeping segment inferred from repeating earthquakes (Materna et al., 2018).

The authors only show the finite-fault slip models of Pollitz et al. 2025, based on the rationale that

the inferred slip distribution is in areas devoid of background seismicity and appears more consistent with their interpretations. I think the authors should not only consider a model that fits their preference, without judging/arguing that the selected model is better resolved. The discrepancies between Pollitz's model and USGS and Ulrich (cite the preprint if allowed in EPSL) should be briefly mentioned/discussed, because both Ulrich's and Pollitz's models use combined geodetic and seismic data and their model differences meaningfully affect the interpretation of the relation between large event slip and microseismicity.

The slip models of the 2024 event proposed by Ulrich et al. (2025) and the USGS are both based on a mainshock depth of 10 km, which is the initial NEIC solution. In contrast, the slip model proposed by Pollitz et al. (2025) is based on a mainshock depth of 22 km, which provides the best fit among multiple slip inversions using a range of trial hypocenter locations. More importantly, this depth is consistent with our independently determined hypocenter depths of ~18 km from Hypoinverse and the depth of ~22 km located by NonLinLoc (Lomax, 2025). Because the assumed mainshock depth can substantially influence the resulting slip distribution, a more accurately determined hypocenter depth is expected to provide a more reliable slip model. In our study, we therefore compare only the slip model of Pollitz et al. (2025) with the relocated seismicity from our GPU-M&L and the DD catalogs. We have clarified this point in the revision. [Lines 459-469]

“It should be noted that Ulrich et al. (2025) also inverted the slip model for the 2024 event, but their model exhibits a substantially different depth distribution from that of Pollitz et al. (2025). In Ulrich et al. (2025), the mainshock hypocenter depth used in the slip model inversion was the initial solution (i.e., 10 km) reported by the National Earthquake Information Center. In contrast, Pollitz et al. (2025) determined an initial rupture depth of 22 km based on the best fit obtained from slip inversions using a range of trial hypocenter locations. This depth is also close to our independently determined hypocenter depth of ~18 km from Hypoinverse and the depth of ~22 km located by NonLinLoc (Lomax, 2025). Because the assumed hypocenter depth can substantially affect the resulting slip model, a more accurately determined mainshock depth is likely to yield a more reliable slip distribution. We therefore refrain from comparing the slip model of the 2024 event proposed in Ulrich et al. (2025) with the spatial distribution of seismicity along the Mendocino OTF in our study.”

After reading Figures 5, R4 and R5, I noticed that the 2024 mainshock hypocenter was obtained from the GPU-M&L catalog, but different finite-fault slip models (Ulrich, Pollitz, USGS) show different hypocenter depths (from about 10 to 20 km). Given the importance of slip distribution in interpreting slip mode patterns, please clarify how hypocenter depths are derived or adopted for the new GPU-M&L catalog and discuss their uncertainty/variability, especially for larger-magnitude earthquakes.

We adopted a sequential workflow combining absolute location (Hypoinverse), relative relocation (hypoDD) and template matching technique (GPU-M&L) to build the final catalog for the 2024 Mendocino sequence. The spatial pattern of the 2024 sequence revealed by our catalog coincides well with the background seismicity documented in the DD catalog. In relative relocation, we used a waveform-based cross-correlation technique to correct the P and S differential arrival times for all event pairs, which rules out some relatively large events due to the waveform dissimilarities between small and large events. However, these removed events, except for the mainshock, were recovered by subsequent template matching technique, which detect missed events based on a relatively lower threshold of waveform similarity. Therefore, in Figures 5, R4 and R5, the hypocenter of the 2024 mainshock, with a depth of ~ 18 km, was allocated as the absolute location determined by Hypoinverse. Note that our conclusions and interpretation do not depend on the mainshock depth, except for the comparison between the mainshock slip and the spatial pattern of seismicity. In the previous version of our manuscript, we reallocated the initial rupture point of the slip model proposed in Pollitz et al. (2025) to our mainshock hypocenter, which may be inappropriate even though there is only a ~ 4 km depth difference between our mainshock hypocenter and Pollitz et al. (2025). Therefore, we now directly compare the mainshock slip with a 22 km initial rupture depth and the seismicity in our GPU-M&L and the DD catalogs. Results indicate that the majority of mainshock slips are still in areas devoid of background seismicity (Figure S8), suggesting that our interpretation is robust. We have made this clear in the revision. [Lines 171-174 and 341-342]

“Note that while the correction of differential arrival times may rule out some relatively large earthquakes due to the dissimilarities between small and large events’ waveforms, the majority of these removed events are recovered by subsequent template matching technique.”

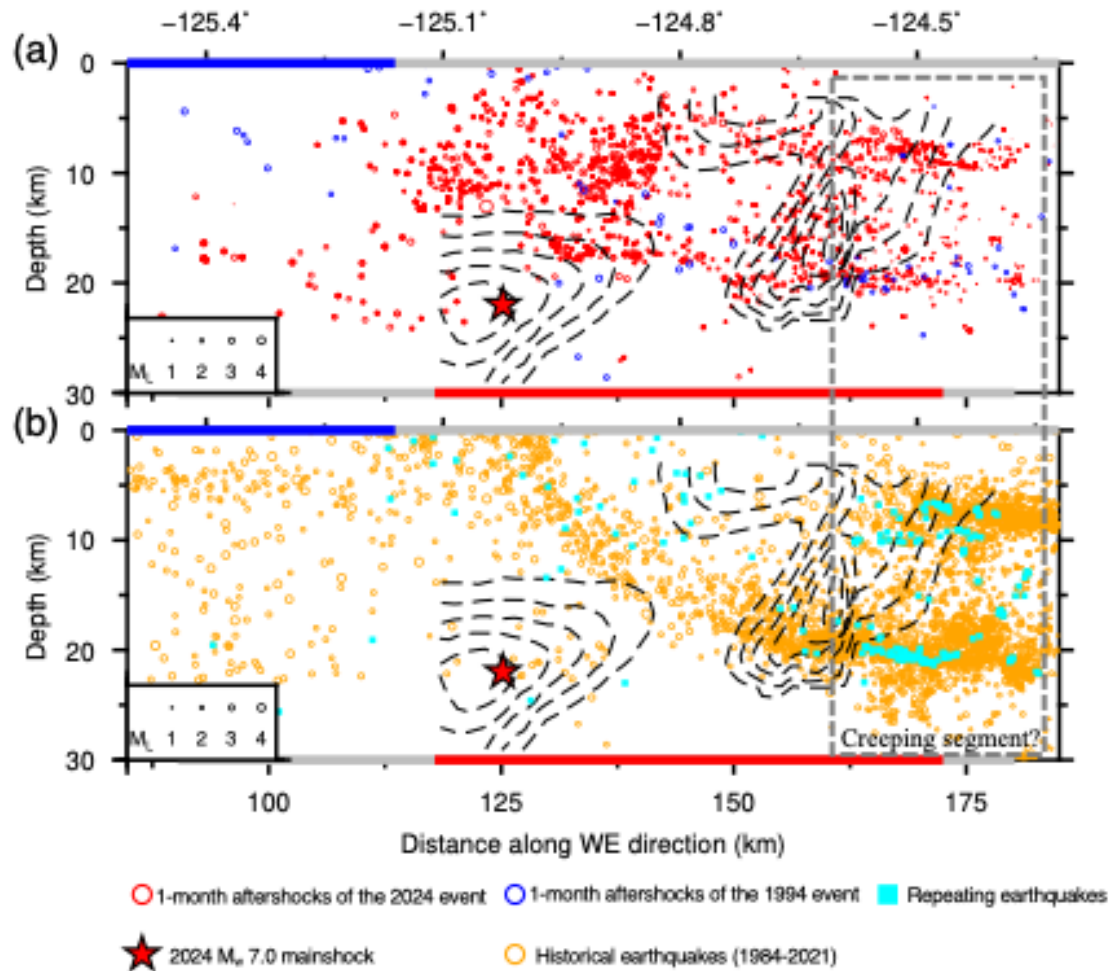


Figure S8. Similar to Figure 5, but for the comparison between the coseismic slip (black dashed lines; Pollitz et al., 2025) and the spatial pattern of seismicity along the Mendocino OTF. Red stars mark the mainshock hypocenter with a depth of 22 km used in the slip model inversion in Pollitz et al. (2025).

There are several places where the writing is informal and should be improved. For example, apostrophes are used too often, e.g., "1994 mainshock's coseismic rupture zone's along-strike extent" (Line ~470-474) and "1994 mainshock's postseismic slow slip" (Line 483). Also, "aftershock-zone-length-to-coseismic-rupture-zone-length ratios" => This word is too long. just say the length ratio between aftershock and coseismic rupture zones. The authors should make better effort to improving the text.

Thank you for your suggestions. In the revision, we have improved the text as suggested. [Lines 257-258, 261-262, 264-265, 27-268, 334-335 and 441-447]

“In our study, we find that the inferred postseismic slow slip zone of the 2024 mainshock overlaps with the co-seismic rupture zone of the 1994 mainshock along strike, while the inferred postseismic slow slip zone of the 1994 mainshock similarly overlaps with the co-seismic rupture zone of the 2024 mainshock along strike (Figures 1b, 1c and 5). The along-strike extent of the 2024 mainshock's co-seismic rupture zone also overlaps with a fault segment that was previously identified to host many repeating background seismicity (Figure 5) and inferred to accommodate up to 70% of its slip aseismically (Materna et al., 2018).”

Supplementary information should also have a separate reference list, given that Table S1 cited many papers.

Accepted.

I also checked the online repository of the 2016 and 2024 earthquake catalogs. It would be preferable that the authors add more detailed descriptions of the data format (e.g., time zone for earthquake origin times).

Accepted.

Reviewer #2: Your comments that will be conveyed to the Author: I appreciate the responses to my previous comments and find the manuscript has been greatly improved. I have a few follow-up questions about the measurements of aftershock zone ratios. Only a few large earthquakes in California (Landers, Hector Mine, El-Mayor-Cucapah, Ridgecrest, and Parkfield) are chosen to be compared with the Mendocino OTF earthquakes, but Neo et al. 2021 seems to include more large continental earthquakes and demonstrates a wider range of aftershock zone ratios. For example, large continental earthquakes like Loma Prieta and Northridge can have quite large aftershock ratios. Are they excluded because they are oblique-slip events?

Our study mainly focuses on the along-strike difference of aftershock-zone-length-to-coseismic-rupture-zone-length ratios between the Mendocino OTF and continental faults, rather than the aftershock-zone-area-to-coseismic-rupture-zone-area ratios. On the other hand, these large Mendocino OTF earthquakes represent typically pure strike-slip earthquakes with a nearly vertical fault plane. We thus also select large and pure strike-slip (i.e., dip angle $> 80^\circ$) continental

earthquakes to yield a more reasonable comparison with these large Mendocino OTF earthquakes. We have made it clear in the revision. [Lines 371-375]

“The resulting aftershock zone to co-seismic rupture zone length ratios of $\sim 1.6\text{--}3.4$ are significantly larger than those of large (i.e., $M_w \geq 6$) continental, pure strike-slip (i.e., dip angle $> 80^\circ$) mainshock-aftershock sequences ($\sim 0.9\text{--}1.6$) (Figure 2b), which were manually measured from the comparison between coseismic slip zones and aftershocks in previous studies (Table S1).”

Moreover, the ratios seem to depend on which slip inversion results and earthquake catalogs are used in the calculation. For El-Mayor-Cucapah, Landers, and Parkfield, Neo et al. 2021 showed different ranges of aftershock zone ratios. For Parkfield, using Ji et al. 2004 can lead to a much lower ratio compared to using Dreger et al. 2005. Could you explain why certain slip inversion results are chosen in this study?

Constraining coseismic slips at depth for large earthquakes is generally more challenging than determining their along-strike extent. Consequently, slip models from different literature often exhibit relatively consistent rupture extents along strike (i.e., rupture lengths), but substantial differences in depth distribution. For instance, both the El-Mayor-Cucapah and Landers earthquakes exhibit similar rupture lengths of ~ 120 and ~ 70 km, respectively, in different publications. Whereas the Parkfield earthquake's rupture lengths determined by Ji et al. (2004) and Dreger et al. (2005) are ~ 35 and ~ 27 km, respectively, which only cause a slight difference of 0.4 in aftershock-zone-length-to-coseismic-rupture-zone-length ratios. Similarly, earthquake locations are also generally better resolved horizontally than vertically. Because our main focus is the aftershock-zone-length-to-coseismic-rupture-zone-length ratios, the relatively small differences in rupture length among studies, as well as the relatively small horizontal error in earthquake locations, do not affect our conclusions and interpretation. In the revision, we added the rupture lengths of the El-Mayor-Cucapah, Landers, and Parkfield earthquakes from different publications in Table S1. Meanwhile, we recalculated the range of the aftershock-zone-length-to-coseismic-rupture-zone-length ratio for the Parkfield earthquake due to the different rupture lengths proposed by different publications. The resulting range of the aftershock zone to co-seismic rupture zone length ratio for large continental mainshocks changes from $\sim 0.9\text{--}1.4$ to $\sim 0.9\text{--}1.6$, still significantly lower than those of the Mendocino

OTF events (~1.6–3.4). [Line 373]

It also seems that there are differences between the results on Figure 2b and the results reported by Neo et al. 2021. The El-Mayor-Cucapah is reported to have aftershock zone ratios of 2.17 and 2.61 by Neo et al. when the Mendoza&Hartzell slip inversion results are used.

The main focus of our study is the aftershock-zone-length-to-coseismic-rupture-zone-length ratio. The rupture lengths of the El-Mayor-Cucapah earthquake determined by Wei et al. (2011) and Mendoza & Hartzell (2013) are both ~120 km, which in fact result in the same aftershock-zone-length-to-coseismic-rupture-zone-length ratio.

I think this part of aftershock zone ratios deserves a more thorough explanation and discussion to really support the comparison between the continental and OTF earthquakes .

Please see replies to your comments 1-3.