Response to reviewers

Dear Reviewers,
Dear Topical Editor Mark Allen, Executive Editor Federico Rossetti, and Editor-in-Chief CharLotte Krawczyk,

We sincerely thank both reviewers for their fair and constructive reviews, which greatly improved our manuscript. We appreciate the feedback given on the manuscript and carefully incorporated all points risen. Please find below our answers for each comment in green coloured text.

Kind regards,
Yueyang Xia on behalf of all co-authors

Referee 2: Sara Martínez-Loriente

1. In my opinion, the presence of the subducting seamount, splay faults and back-thrusts is well resolved. My main concern is related to the lack of more evidence showing the lateral extension of these structures and thus confirming the link proposed by the authors between the presence of the seamount and the splay faults and back-thrusts, as well as their role during the seismic event. In addition, the authors claim to the physical properties related to the presence of this elements interpreted on the profile to justify their interpretation, but they are hard to see to me in this profile. Are these same structures seen elsewhere along the margin? Is its role in the sismogenesis process the same?

   This comment raises very similar concerns to the first reviewer. We take this remark very seriously and have adjusted the text accordingly. Please refer to Comment #2 of Reviewer 1 for details on how we adjusted the abstract and main text.

2. Finally, in my opinion the last part of the discussion section is quite speculative, where the authors propose a possible activation of the splay faults (L238-240; L247-254). I do not see any evidence (eg, in the seismic profile or in the seismic Vp structure) of the recent activity of the splay faults (deformation of the most recent sediments) as the authors state in L225.

   This concern was also voiced by Nathan Bangs (reviewer 1) – see his comments 3 and 4 and our response. We have deleted the paragraph on the possible activation scenario (Lines 233-242 in original manuscript) and have revised the text of Lines 247-254, where we now focus on the slip distribution and have deleted references and comments on a conceptual model involving the formation of splay faults due to seamount subduction or their activation during the co-seismic phase:
   Yang et al. (2012, 2013) modelled a dynamic rupture scenario with a seamount as a seismic barrier. The seamount imaged on our seismic profile may have halted seismic rupture at its leading edge, while rupture might have progressed closer to the trench to the west and east of the seamount (Fig. 5). Due to the lack of 3D seismic coverage of the rupture area, the exact structural control on the three-dimensional evolution of the rupture cannot be constrained. A similar mechanism of plate boundary rupture terminating against subducting lower plate relief is, however, discussed for the 2006 Java tsunami earthquake (Bilek & Engdahl, 2007) as well as numerous other plate boundary events (Wang & Bilek, 2011 and references therein).
   While we provide evidence for recent fault activity (Line 157: the main splay fault divides into several branches that crop out at the seafloor between kilometres 24-30 (Figs 2a, 2c,

3a). Line 215: Splay fault -b (Fig. 2a) causes a minor seafloor offset in the seismic section, while splay fault -c offsets the seafloor by ~500 m as seen both in the seismic section (Fig. 2a) and bathymetry map (Fig. 4b), indicating recent activity.), we agree with the reviewer that it remains unresolved if this fault activity is linked to megathrust earthquake rupture.

3. Minor comments

Figures:

I recommend doing some close-up of figure 2 to be able to observe some of the descriptions that are made in the text.

We have split panel a in Figure 2 into two segments in order to show close-ups of the seismic data and the described features.

I recommend incorporating the Vp contours to figure 2, without which it is impossible to observe some of the characteristics described by the authors.

We follow the suggestion by the reviewer and have incorporated vp contours in Figure 2.

I recommend making the back-thrust label more visible in figure 1b, as they are difficult to distinguish.

We have edited Figure 1b accordingly.

In addition to these edits, we have incorporated all annotations in the provided pdf version by reviewer 2:

- Additional reference Martinez-Loriente et al., 2019 added
- Back-thrusts enhanced in Figure 1
- Interpretation of single seamount instead of multiple small ones moved from results to discussion section
- Close-ups of seismic section added to Figure 2
- Vp contours added to Figure 2
- Comparison to region west of seismic line added to discussion section
- Section on activation of splay faults deleted
- Speculation on role of splay faults removed