Point-by-point Response

Reply to:
07 Nov 2024, Topic editor decision: Publish subject to minor revisions (review by editor), by Yang Chu

Comment: Please find the attached comments from reviewer 1, and reply and make changes to them. I cannot accept it if this procedure is incomplete. This is important!
Reply: Okay. We carefully studied the comments from reviewer 1, and revised the manuscript accordingly. Thank you.

Reply to the reviewer 1:

Comment: After the first round of revisions, the manuscript has shown improvements in both the text and figures. The authors have carefully addressed the reviewers' comments and revised the manuscript accordingly. However, I have identified some remaining issues that require minor revisions.
Reply: Thank you very much for the comments from reviewer 1.

Comment: 1. A gap persists between the structural data and the tectonic model. In the last paragraph of Section 3.1, it is mentioned that the Honglazi area experienced extension, left-lateral strike-slip, followed by extension. It remains unclear how these deformations are integrated into your three-stage model. I suggest adding a few sentences to clarify how these deformation phases are incorporated into the model.
Reply: Thank you very much for the suggestion. We have added some explanations in section 4.3, to incorporate the deformation phases from observation into the model.

Comment: 2. Lack of robust argumentation in the discussion section. For example, in Sections 4.1 to 4.3, the three-stage model is largely based on comparisons of geological events in the Jiaodong, Liaodong, and Jidong areas, rather than on your new structural data. Particularly, do you have any other direct evidence to support that the Jiao-Liao fault is connected to the Yalvjiang fault, such as geophysical data? Additionally, the discussion about the Tan-Lu fault is somewhat unclear, which seems to be a significant scientific issue that extends beyond the scope of your current data.
Reply: We have made serious revisions to the discussion section. About the relationship among the Jiao-Liao fault, NYSF, and Yalvjiang fault, we have supplemented explanation evidence from the aeromagnetic anomaly map. Due to the numerous issues with the Tan-Lu Fault, we only discussed its relationship with the Bohai Sea Basin. More data are needed for the future discussion on the Tan-Lu fault system.

Comment: 3. Excessive use of local geographical names, which may be difficult for international readers to understand. Terms such as Bohai Sea, Bohai Bay Basin, North China Plain, Lower Liaohe Plain, and various city names may pose challenges for foreign readers. Furthermore, "Bohai Sea" and

"Plain" seem to be geographical terms rather than geological ones.
Reply: Such is the case. We have tried to avoid using too many geographical terms. We have already used the Bohai Sea Basin to replace the region where the Bohai Sea is located. Although the North China Basin and the Lower Liaohe Basin can also be used to replace the North China Plain and Lower Liaohe Plain, respectively, as these two basins are not the focus of this study, we think it is better not to replace them. As for local city names, we have made significant deletions in this revision and believe that it is necessary to retain a certain amount of city names.

Comment: Some minor issues:
Figures 4, and 8: In these two figures, there are many inferred faults shown beneath the Bohai Sea and Cenozoic cover. Do you have some evidence, or are they sourced from some references?
Reply: We have reviewed the fault system in figures 4, 7, and 8 carefully. Among the faults, the Honglazi fault (HF) and East Bohai fault (EBF) are the faults inferred from our field observation in this manuscript. They developed along the coast and underwater of the Bohai Sea, with evidence from outcrop analysis. The Jiao-Liao fault (JLF) is inferred mainly from aeromagnetic anomaly map in figure 7. Other faults underwater in the Bohai Sea Basin are all from literatures such as Allen et al., 1997, Ren et al., 2013, and Wang et al., 2016. The relevant explanations have been added for the figures and in the main text.

Comment: Lines 63-64: Repetitive
Reply: Okay. We merged the sentences and eliminated the repetitive expression.

Comment: Lines 70-73: Regarding the linkage of the Tanlu fault and the Bohai Sea, it needs to be clear the significance of the Tanlu fault to understand the formation of the Bohai Sea.
Reply: Yes. Previous studies have rarely involved the relationship between the Tan-Lu fault and Bohai Sea Basin. They always inferred simply that the Tan-Lu fault as the eastern boundary of the Bohai Bay Basin. However, there is no conclusive evidence to determine whether the Tan-Lu fault exists in the Bohai Sea Basin and whether it constitutes the eastern boundary of the Bohai Sea Basin or Bohai Bay Basin.

Comment: Line 129: I don't think the Yanshan is an orogenic belt.
Reply: We think you are right. The Yanshan Mountains are not an orogenic belt, but a fold and thrust belt formed in late Mesozoic. Therefore, we replaced the Yanshan orogenic belt with the Yanshan fold-thrust belt.

Comment: Line 210: Explain how extensional fractures relate to left-lateral slip striking.
Reply: Okay. According to the relationship between the extensional fractures and fault motion (or shearing) direction, the acute angle between extensional fractures and shearing surface indicates the motion direction of the standing wall. Appling this criterion, we inferred that the early fractures in figure 6A indicate left-lateral slip striking.

Comment: Line 214: What’s the meaning of the “general”? Sub-horizontal? Gentle?

Reply: We are sorry. The “general” is the wrong expression of “gentle”. We use sub-horizontal to replace the general in this time.

Comment: Figures 5 and 6 can merged into one and removed 5c and 6c.
Reply: Okay. We have already adopted this modification suggestion in the previous revision, and merged the previous figures 5 and 6 into figure 5.

Comment: Line 231: Why is a strike-slip fault horizontal?
Reply: We have made modifications, to remove the “horizonal”. We are not saying that there is a horizontal strike-slip faulting, but rather, the horizontal striations on vertical surface indicate a movement pattern consistent with the strike-slip faulting. That is to say, the faulting plane of the strike-slip fault is almost vertical.

Comment: Line 280: Jiao-Liao-Ji tectonic belt.
Reply: Okay. We modified the Jiao-Liao-Jilin tectonic belt into the Jiao-Liao-Ji tectonic belt.

Comment: Line 286: in→into
Reply: Okay.

Comment: Line 313: Deleted “northern”
Reply: Okay.

Comment: Line 315: What's the meaning of “extension in NW”? NW-SE extensional tectonics?
Reply: The meaning of “extension in NW” is “extension in NW direction”, which is equal to the NW-SE extensional tectonics.

Comment: Line 326: Add the approximate age ranges for each stage to offer more context and detail.
Reply: Okay. We added the approximate age ranges for each stage.

Comment: Line 329: Most authors suggest NW-SE extension (perpendicular to the subduction zone) dominated during the Early Cretaceous, and please explain how NE-SW extension (parallel to the subduction zone) fits into the tectonic framework.
Reply: In the Yanshan fold-thrust belt located on northwest side of the Bohai Sea Basin (as shown as the Jidong Block in this manuscript) and the Jiaodong Peninsula on southeast side of the Bohai Sea Basin, there are indeed NW-SE extensional deformation mainly in the late Early Cretaceous. However, in the Bohai Sea Basin, especially in the Liaodong Bay area, the NW-SE extension mainly occurred in the Cenozoic (figure 4), controlling the development of the graben basin in this region. The NE-SW extension in late Early Cretaceous mainly occurred in the Luxi (western Shandong) region (figure 3). At the same time, the Yi-Shu Fault Zone, which is always considered as a part of the Tan-Lu Fault Zone, developed the NNE-trending rift system, indicating the WNW extension in late Early Cretaceous. This is to say, the extensional activity in late Early Cretaceous is not limited to the NW-SE direction, but also

the NE-SW and WNW directions. The Cenozoic regional structural framework in the Bohai Sea Basin is mainly controlled by NW-SE, NE-SW, and nearly N-S extensions.

Comment: Line 343: The discussion about the Tan-Lu fault is beyond your data.
Reply: We believe that it is necessary to discuss the evolution of Tan-Lu Fault, since this is directly related to the origin of the Bohai Sea Basin. Previous studies mostly believed that the formation and evolution of the Bohai Bay Basin and Bohai Sea Basin were controlled by the Tan-Lu Fault, and the Tan-Lu Fault constitutes the eastern boundary of the Bohai Bay Basin. The aeromagnetic anomaly map (figure 7) shows that the Tan-Lu Fault cannot be connected to the Liaodong Bay and Yilan-Yitong Fault (YYF) on the north side through the Bohai Sea Basin. Instead, the Tan-Lu Fault is modified by the extensional structures in the Bohai Sea Basin. Therefore, we need to discuss the Tan-Lu Fault and modify our understanding of it, when we are talking on the genesis of the Bohai Sea Basin. In our model, we believe that the HF and EBF belong to the same fault zone as the left lateral strike-slip Tan-Lu fault, during late Early Cretaceous to early Cenozoic. The HF and EBF are separated only in Cenozoic due to NW extension in the Liaodong Bay. According to previous studies, we believe that the dominated Cenozoic right lateral strike-slip faults developed in the Bohai Bay Basin and Bohai Sea Basin, are not parts of the left lateral strike-slip Tan-Lu fault system.

Comment: Line 414: What's the evidence of the extension parallel to the subduction zone?
Reply: The evidence for extension parallel to the subduction zone mainly comes from: 1) the NE extension during the late Cretaceous in the Luxi (western Shandong) region (figures 3, 4, and 7), which is nearly parallel to the NE trending subduction zone on the northwest side of the Philippine Sea Plate; and 2) the basement extension along the NE direction in the central Bohai Sea and northern Yellow Sea areas, in the aeromagnetic anomaly map (figure 7), which is also nearly parallel to the NE trending subduction zone on the northwest side of the Philippine Sea Plate. This part of description has been added to the section 3.4.