Solid Earth Discussions

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Comment on se-2021-92

Anonymous Referee #1

Referee comment on "Impact of basement thrust faults on low-angle normal faults and rift basin evolution: a case study in the Enping sag, Pearl River Basin" by Chao Deng et al., Solid Earth Discuss., https://doi.org/10.5194/se-2021-92-RC1, 2021

This is an interesting manuscript presenting detailed structural analysis on the seismic profiles from the northern margin of the South China Sea, and further discusses the relationship between early thrust and late detachment. Based on the cross-sections, they provide a very detailed description on the fault geometry and how they initiate. I think this is a good contribution to the journal Solid Earth, and thus recommend publication after minor revision.

Below are some major and minor comments:

- The only major problem in this manuscript is the lengthy description and discussion. Some parts are repeated and unneeded. For example, the section 6.1 has 150 lines to discuss the possible model for the low angle faults. These models are well-known in interpretating the angle of faults, but several sentences are sufficient for readers to understand the reason why the formation model is adopted. Too many words may have countereffects. I thus recommend shortening this section, leaving section 6.1 without any subsections, and briefing the key evidence for the inherited tectonic model. This kind of problem also applies in the structural description in section 5, and the rest parts of discussion. The current discussion is too long to get the key ideas.
- The abstract could be improved with some more implications. The discussion gives them on the evolution and interaction between the thrust faults and normal faults, they should be introduced at the end of it.
- In lines 40-45, as cited in this manuscript, the inherited tectonics has been studied, but, of course, questions remains unsolved in many aspects. Being short of investigation is not a good scientific question for motivation. Instead, I want to see a specific problem in this area, and how this problem can be solved to improve our understanding of the inherited structures, such as how many growth patterns has been

studied, how many reactivation modes exist, and etc.

- I am curious on the three stages of extension. Their time spans seem continuous. Is there any evidence on separating them? Fig. 2 provides a stratigraphic column of the study area showing that the earliest stage is compressional and lasted until Early Eocene. It contrasts with the background that there should be an extension stage before Cenozoic. Does this basement have some age constraint? What is the timing of the thrusting?
- Data acquisition is missing in the text. Some introduction can be briefly added in the text.
- I have some questions on the interpretation of seismic profiles. The fault BF2 is partly normal fault and reverse fault. It is clear to identify its upper part, but why is the lower part explained as a reverse fault? I cannot see any evidence of thrusting. Some of red faults in Fig. 5a may be normal fault, such as the first two faults from the right. The authors need more caution on the geometry of faults.

Figures:

- In fig. 1, the upper sedimentary cover is post-rifting formation, which, however, is cut by some normal faults. There should be a clear definition on the syn- and post rifting stages.
- I find some figures are overlapping, Fig. 5a and 6b, Fig. 5b and 9b, and Fig. 5c and 6a. The purpose of emphasizing one segment from a long profile is not clear. Can the short profiles be integrated with the main profiles?
- The last figure shows different generations of faults. I think some reactivated faults are better marked in red for clarity.