Dear Reviewer:

Thank you for your comments concerning our manuscript entitled "Whole-rock and zircon evidence for evolution of the Late Jurassic high Sr/Y Zhoujiapuzi granite, Liaodong Peninsula, North China Craton" (ID SE-2021-129). Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. We have studied comments and suggestions carefully and have made correction. We hope meet with approval. Below the comments of the reviewer are response point by point and the revisions are indicated.

To Reviewer #1:

1) Response to comment: The major criticism to the manuscript is about the tectonic implications, which is confusing and seems to have weak connection with the conclusion of this manuscript. The tectonic setting of the Late Jurassic granites given by the authors is unclear. In line 402-403, it is suggested that the Late Jurassic magmatism in Liaodong is related to the thinning of the NCC mantle lithosphere, which means an extensional setting since the thinning of lithosphere often occurs in thus setting. Whereas, in line 421, the authors give a compressional environment for those Late Jurassic granites, which is opposite to the previous statement. Besides, the authors proposed a mature continental arc setting for the Late Jurassic rocks, which I guess might be one of the implications of this work for the tectonic evolution of the NCC. However, the arguments for this implication are not well given and more discussion is needed.

We are very sorry for this error. In fact, the content of line 402-403 is what we should have deleted in the final version of MS. But we missed it. Therefore, we have deleted this content.

We gratefully appreciate your valuable suggestion. We have added more text and new references on this point. The revised content is as follows:

"In the middle-late Jurassic, I-type granites are dominant in the Liaodong Peninsula, such as the Zhoujiapuzi granite (this study), Heigou pluton, Gaoliduntai pluton (Wu et

al., 2005a), Waling granite (Yang et al., 2015a) and Wulong granite (Yang et al., 2018). There are not A-type granites, and mantle derived magmatism is extremely rare. These granites were formed by partial melting of crustal materials without obvious contribution of mantle derived magma (Wu et al., 2005a; Yang et al., 2015b, 2018; Xue et al., 2020). In addition, WNW-ESE compression during 157-143 Ma was widespread in the Liaodong Peninsula (Yang et al., 2004; Zhang et al., 2020). It not only mylonitized the granite plutons in middle-lower crust levels, but also intensely deformed the thick sedimentary cover in the upper crust (Qiu et al., 2018; Ren et al., 2020). Hence, Late Jurassic magmatism in the Liaodong peninsula is most likely to be related to subduction of the Paleo-Pacific plate in a mature continental arc, with crust previously thickened by compressional tectonics, related to both the oceanic subduction and the earlier Mesozoic collisions at the north and south margins of the NCC. This setting would produce the conditions required for extensive crustal melting of pre-existing basement. There is a potential resemblance to the modern arc of the Central Andes (Allmendinger et al., 1997), where crustal thickening and plateau growth has developed over the Cenozoic (Scott et al., 2018), and melting of older basement has taken place during subduction of the Nazca plate (Miller and Harris, 1989). This model is also consistent with the idea that much of eastern China was a high orogenic plateau during the Mesozoic, before widespread Early Cretaceous extension and core complex development (Meng, 2003; Chu et al., 2020).”

2) Response to comment: The 206Pb/238U ages for the ESZ and LSZ are undistinguished within the analytical error. The authors are not suggested to use these age data to discuss the different crystallization stages for the zoned zircons. In line 222-226, the dispersion of age data for zircon grains from the same sample are used to indicate the cooling rate of magma. What is the rationale? How to build the connection between the U-Pb isotopic variation to the cooling rate of magma? Please give more discussion about this linkage.

We agree with this comment. It is really true that we can not use the age data to discuss the different crystallization stages for the zoned zircons. We adopted a more conservative method to process the zircon data, and put the data of light CL core and dark CL rim together to calculate the weighted average age. The ages of 160.7 ± 1.1 Ma (MSWD=1.3) and 159.6 ± 1.1 Ma (MSDW=1.2) were obtained for the two samples. The MSDW are both within the expected range for 95 % confidence interval. In addition, the dispersion of age data can not be used to indicate the cooling rate of magma. Therefore, we deleted that part (line 222-226) and deleted Fig.11d.

3) Response to comment: Except for the Liaohe Group, a lot of Precambrian granitic intrusions and mafic dikes/sills were also exposed in the Liaodong Peninsula, which are suggested to be included in the section of geological setting.

Thank you for your comment. In the section of geological setting, we supplement the overview of Precambrian magmatism. The details are as follows:

"The study area experienced strong magmatic activity in the Paleoproterozoic, which can be divided into two stages of 2.2–2.1 Ga and ~ 1.85 Ga. The 2.18–2.14 Ga Liaoji granites (also called gneissic granites), which lie within an area measuring 300 km × 70 km, are dominated by A- and I-type granites (Li and Zhao, 2007; Yang et al., 2016; Wang et al., 2020a). Metamorphosed volcanic rocks (leptynite, leptite and granulite) in the Liaohe Group also formed at 2.2–2.1 Ga (Li et al., 2015). The ~1.85 Ga granites mainly consist of I- and S-type porphyry granites and alkaline syenites (Yang et al., 2007; Yang et al., 2015b). In addition, there were small amounts of mafic magmatic activity at ~2.17 Ga, ~2.1 Ga and ~1.8 Ga (Meng et al., 2014; Yuan et al., 2015). There are a variety of viewpoints on the Paleoproterozoic tectono-magmatic evolution in the Liaodong Peninsula, such as an intracontinental rift opening-closing model (Li et al., 2005) and an arc-continent collision model (Faure et al., 2004)."

4) Response to comment: Please give the standard reference materials used in the dating and Hf isotope analyzing and their analytical results, which is important for readers to evaluate the data quality.

Considering the Reviewer's suggestion, we have supplemented the standard reference materials used in the dating and Hf isotope analysis and their analytical results in section "4. Analytical methods" and Supplementary data.

5) Response to comment: Line 170: please add the range of U concentration for high-U zircons as well as the cited reference.

Thank you for pointing this out. We checked the relevant literature, and there is no quantitative standard for the U content of high U zircon (e.g. Mezger et al., 1997; Zhao et al., 2014; Park et al., 2016). Considering that the median value of zircon U content in granite is 350 ppm (Wang et al., 2011), the description of "the LSZ have high U content" should be reasonable. Hence, considering the preciseness of the MS, the sentence "*the LSZ are characterized by high U content*" was replaced by "*the LSZ have high U content, which is significantly higher than the median value of zircon U content in granitic magma (350 ppm, Wang et al., 2011)*"

References

Mezger, K., Krogstad, E. J., 1997. Interpretation of discordant U-Pb zircon ages: An evaluation. J Metamorph Geol 15, 127-140.

Zhao, K., Jiang, S., Ling, H., Palmer, M. R., 2014. Reliability of LA-ICP-MS U-Pb dating of zircons with high U concentrations: A case study from the U-bearing Douzhashan Granite in South China. Chem Geol 389, 110-121.

Park, C., Song, Y., Chung, D., Kang, I., Khulganakhuu, C., Yi, K., 2016. Recrystallization and hydrothermal growth of high U–Th zircon in the Weondong deposit, Korea: Record of post-magmatic alteration. Lithos 260, 268-285.

Xiang, W., Griffin, W. L., Jie, C., Pinyun, H., Xiang, L. I., 2011. U and Th contents and Th/U ratios of zircon in felsic and mafic magmatic rocks: Improved zircon‐melt distribution coefficients. Acta Geologica Sinica‐English Edition 85, 164-174.

Wang X, Griffin WL, Chen J, Huang PY, Li X., 2011. U and Th contents and Th/U ratios of zircon in felsic and mafic magmatic rocks: improved zircon-melt distribution coefficients. Acta Geologica Sinica-English Edition 85, 164–74.

6) Response to comment: the citation should be 'Yang et al., 2015a' and the intrusion should be 'Wulong granite'. Sanguliu granites were formed in early Cretaceous.

We are very sorry for this mistake. We have rechecked the references of this MS.

7) Response to comment: The depiction for some figures is too simple, like Fig 13, 14, which is a bit odd.

Thank you for your comment. We have modified the captions of Fig. 13, Fig. 14, as well as Fig. 3 and Fig. 11. The details are as follows:

"Figure 3. Geochemical classification diagrams for the Zhoujiapuzi granite. (a) TAS diagram (after Frost et al., 2001); (b)A/CNK-A/NK diagram (after Maniar and Piccoli, 1989);

Figure 11. Covariation diagrams for zircon from the Zhoujiapuzi granite. (a) U vs. Zr/Hf; (b) TZr-Ti vs. Zr/Hf; (c) Ce/Ce vs. Zr/Hf.;*

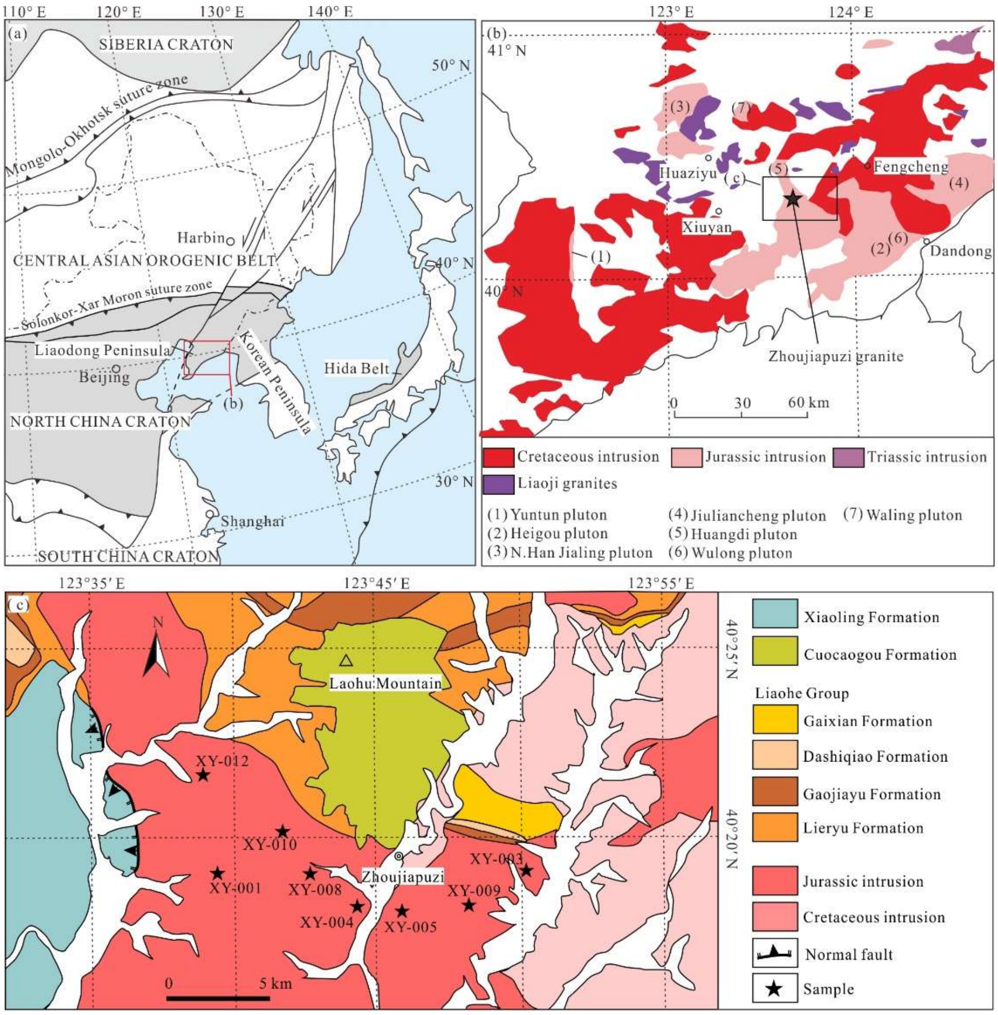
Figure 13. Adakite discrimination diagrams for the Zhoujiapuzi granite (after Defant and Drummond, 1990);

Figure 14. Source characteristics (a-d and f-h) and crystal fractionation (e and i) discrimination diagrams for the Zhoujiapuzi granite. Plots of (a) Nd/Sm vs. Ti/Eu; (b) SiO2 vs. MgO; (c) SiO2 vs. Mg#; (d) SiO2 vs. TiO2; (e) La vs. La/Yb; (f) molar Al2O3/(MgO+FeOT) vs. molar CaO/(MgO+FeOT); (g) (Na2O+K2O)/(FeOT+MgO+TiO2) vs. Na2O+K2O+FeOT+MgO+TiO2; (h) K2O/Na2O vs. Al2O3 diagrams(a after Yu et al., 2012; b-d after Wang et al., 2006; e after Gao et al., 2007; f after Altherr et al., 2000; g after Patiño Douce, 1999; h after Kamei et al., 2009)"

8) Response to comment: Figure 1: Please check the word spelling in a), e.g., 'SOUTH

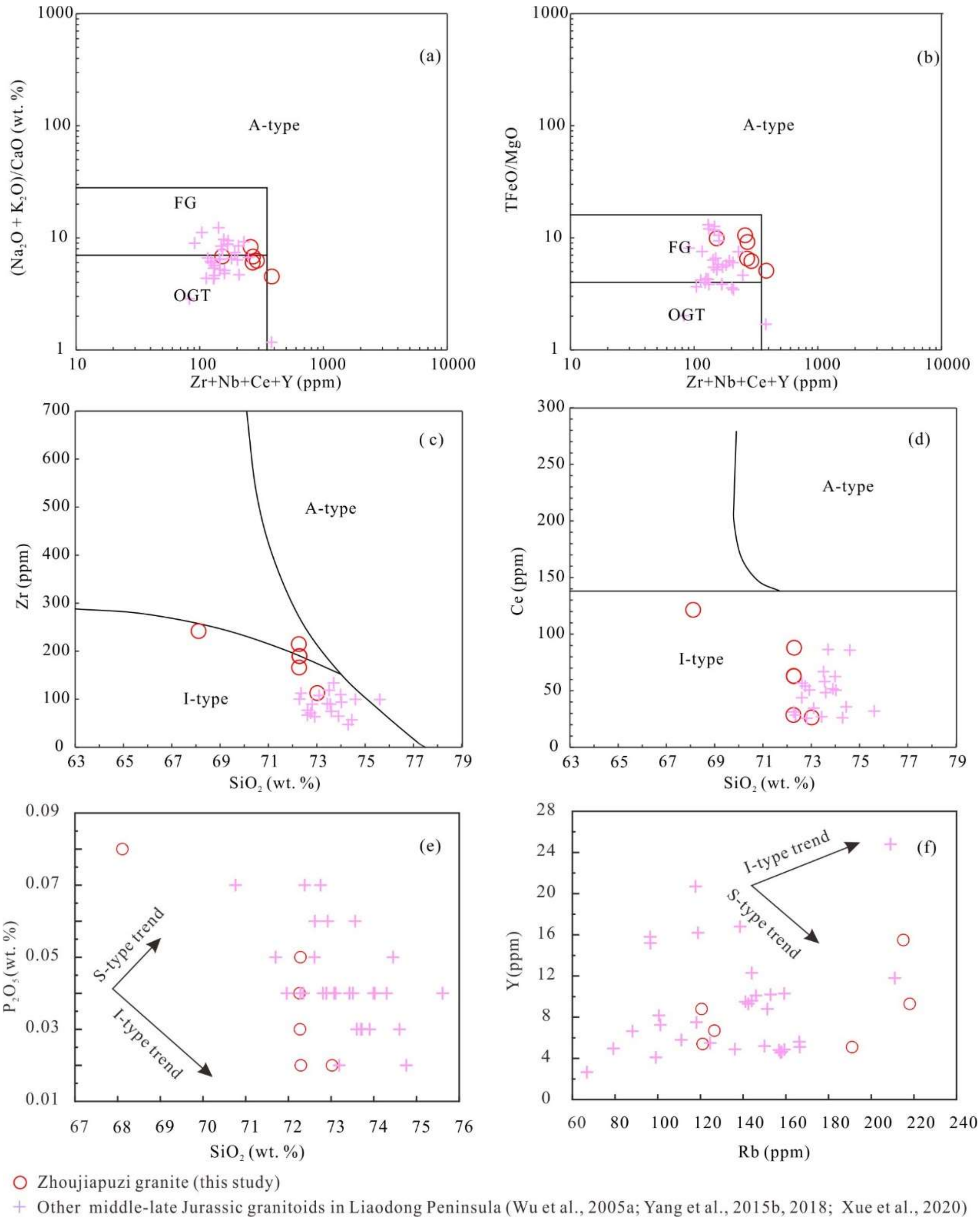
CHINA CRATON" and "CENTAL ASIAN OROGENIC BELT".

We have rechecked the spelling in fig. 1 of this MS. Sorth China Craton is corrected to South China Craton, and Central Asia Orogenic Belt is corrected to Asian rather than Asia (but not "Cental").



9) Response to comment: Figure 12: Please check the orientation of arrows in different diagrams and give what process the arrow refer to. Figure 14: Please give the meaning of the arrows in different diagrams.

Thank you for pointing this out. We have marked the meaning of the arrow in figures 12 and 14.



(a)
A-type
FG
OGT
(Na2O + K2O)/CaO (wt. %)
Zr+Nb+Ce+Y (ppm)
(b)
A-type
FG
OGT
TFeO/MgO
Zr+Nb+Ce+Y (ppm)
(c)
A-type
I-type
Zr (ppm)
SiO2 (wt. %)
(d)
A-type
I-type
Ce (ppm)
SiO2 (wt. %)
(e)
S-type trend
I-type trend
P2O5 (wt. %)
SiO2 (wt. %)
(f)
I-type trend
S-type trend
Y (ppm)
Rb (ppm)
Zhoujiapuzi granite (this study)
Other middle-late Jurassic granitoids in Liaodong Peninsula (Wu et al., 2005a; Yang et al., 2015b, 2018; Xue et al., 2020)

Fig. 12

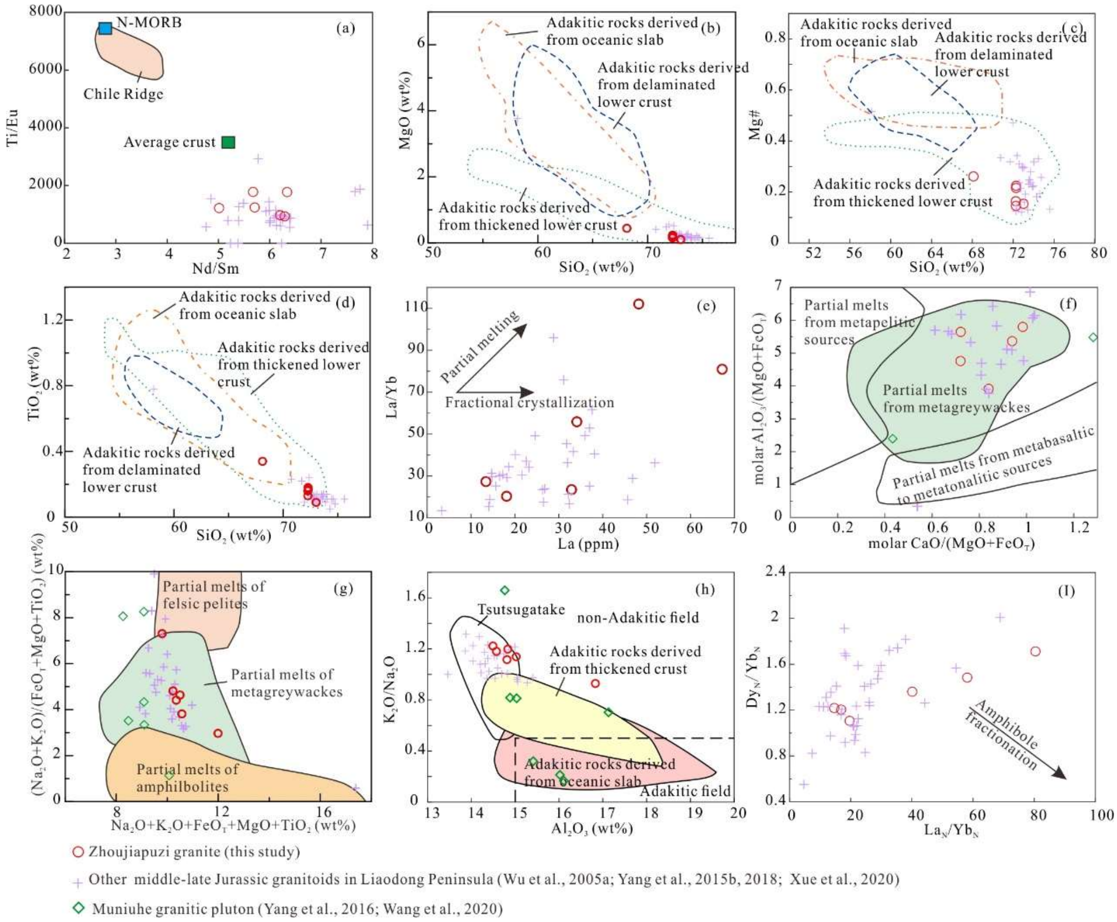


Fig. 14

We tried our best to improve the manuscript. We appreciate for Reviewer' s warm work earnestly, and hope that the correction will meet with approval.

Once again, thank you very much for your comments and suggestions.

Sincerely,

Renyu Zeng