Dear Jan Wijbrans:

Thank you for your comments concerning our manuscript "Petrogenesis of Early Paleozoic I-type granitoids in the Longshoushan and implications for the tectonic affinity and evolution of the southwestern Alxa Block" (EGUSPHERE-2024-1145). Those comments are all valuable and very helpful for revising and improving our paper. We have studied the comments and suggestions carefully and have made corrections. We hope our revisions meet with your approval. Below, the comments are addressed point by point.

1) The authors come up with a three stage tectonic model which is based on a proposed division in magmatism presented in section 6.1 and summarized in figure 7: with first, second and third stages respectively from 460-444 Ma, from 444-435 Ma, and from 435-410 Ma. This division is not further discussed in section 6.1. This discussion only comes in section 6.4.

Considering the Reviewer's suggestion, we have moved the content of the three-stage tectonic model and Figure 7 to section 6.4.3. In section 6.1, we only explain the zircon ages of the two granites involved in this study

2) The discussion in section 6.4 is based exclusively on the published data set. This part of the manuscript is not well integrated with the preceding study of the two granites and their merits for the tectonic interpretation. One would have expected that the outcomes of the geochemical study described in the first part of the manuscript would have been mentioned in section 6.4, where the second stage of the model, the period from 444-435 Ma is discussed in lines 455-478. Given the fact that the two granites that were studied in detail both had emplacement ages around 440 Ma, their geochemical make up as discussed in sections 6.1-6.3,to me seems relevant for the discussion in section 6.4. There is however in section 6.4 no mention of the preceding granite study. And I feel that this is a substantial shortcoming of this discussion section. A better integration of the outcomes of the geochemical study of the two granites in the discussion of the tectonics in section 6.4. is currently missing.

Thank you for your comment. In the discussion of the second stage in section 6.4.3, we have included the outcomes of the geochemical study of the two granites.

The details are as follows:

*The second stage (444–435 Ma): Compared to the first stage of magmatic activity, the intensity of the 444-435 Ma magmatic activity significantly increased, and the rocks have higher total alkali content (Fig. 4a and b). In this stage, although calc-alkaline granitic magmatism was still dominant, there are also some alkaline rocks. In addition, as previously mentioned, the ~440 Ma monzogranite and ~439 Ma K-feldspar granite were formed by crust and mantle-derived magma mixing. During this period, mantle-derived intermediate-basic rocks also existed in the Longshoushan (Figure 7). Therefore, there was mantle-derived magmatic activity in the Longshoushan from 444 to 435 Ma. The above magmatic rock assemblage is consistent with the post-collisional magmatic rock assemblage formed after a major ocean closed (Zhang et al., 2019; Wang et al., 2020). Noting that the meaning of post-collisional has multiple interpretations, the post-collisional stage refers to the stage after the initial collision between continental plates or between continental plates and island arcs in this study (Liegeois et al., 1998). In this study, the zircon εHf(t) values of the monzogranite and K-feldspar granite are primarily negative, with a minimum value reaching -16.27. As shown in Fig. 10, the Hf isotope characteristics indicate a significant decrease in zircon εHf(t) during the 444-435 Ma period compared to the previous stage (Fig. 10), reflecting the increasing contribution of ancient continental crust components in the magma source region. This phenomenon is also consistent with the variations in magmatic rocks during the transition from subduction to collision (Li et al., 2023). As shown in Fig. 13, significant crustal thickening occurred in the Longshoushan during the period of 444-437 Ma. This is consistent with that the monzogranite and K-feldspar granite in this study were formed through partial melting at the bottom of the thickened lower crust, with source pressures approximately between 0.8 and 1.5 GPa.*

3) To my mind the discussion section, and in particular the sections 6.1 and 6.4 could

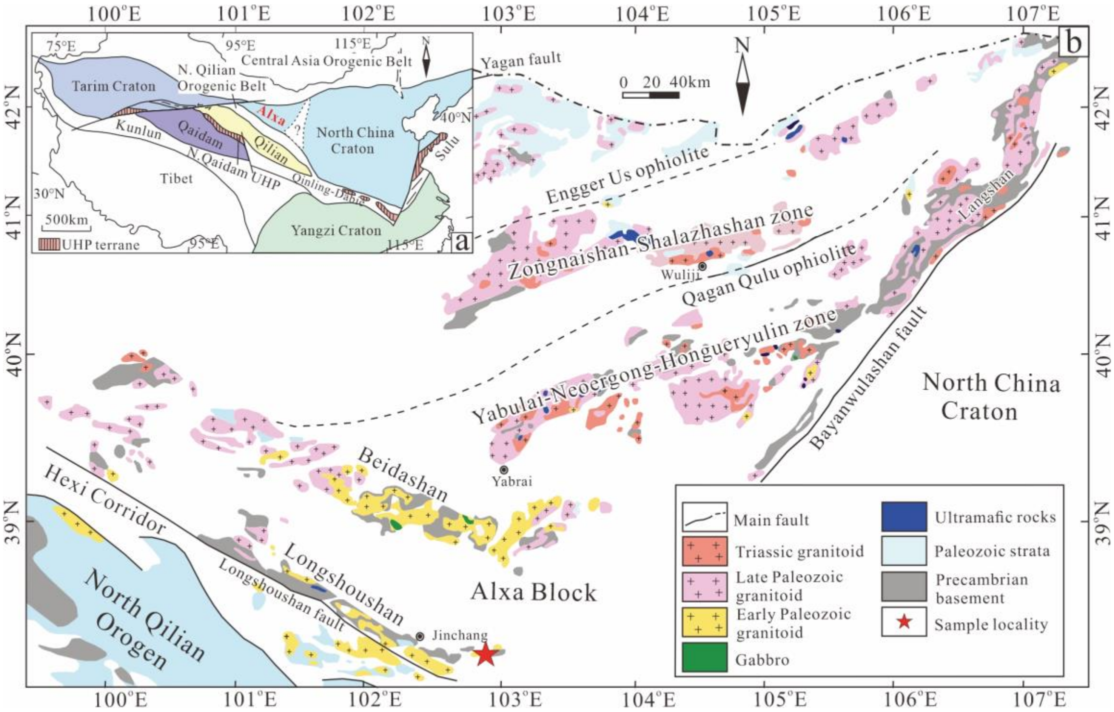
do with a substatial revision, including a motivation for the model division into three stages of tectonic and magmatic evolution to section 6.1, and integrating the outcomes of the discussion of section 6.1 to 6.3 better into section 6.4.

Thank you for your comment. We have moved the content of the three-stage tectonic model and Figure 7 to section 6.4.3, as some outcomes from sections 6.2, 6.3, 6.4.1, and 6.4.2 serve as evidence for establishing the tectonic-magmatic evolution model. We have incorporated the outcomes of the geochemical study of the two granites into section 6.4, as detailed in the previous response.

**Technical comments**

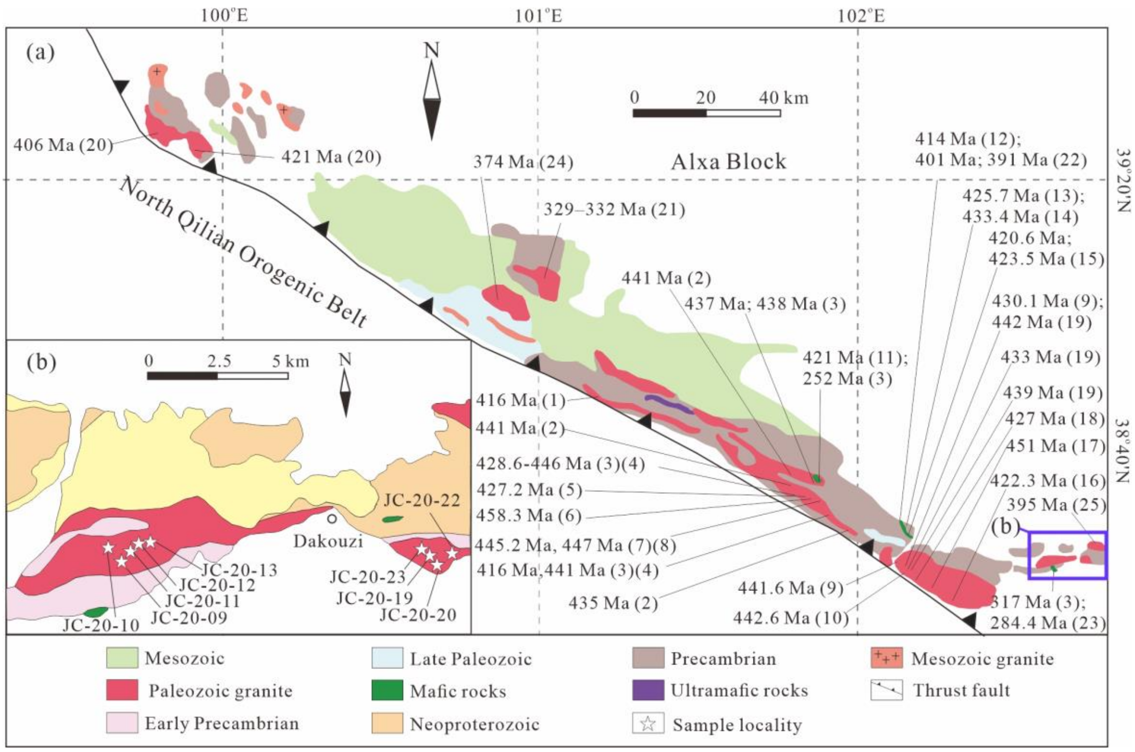
4) Figure 1. In the inset 'a' the border between the Alxa block and the North China craton is a Noth-south structure. This North South structure is not shown and cannot be inferred from the detailed map 'b', where it seems more appropriate to inferre a NE-SW trending contact between the two units.

We are very sorry for this mistake. There is considerable controversy regarding the eastern boundary of the Alxa Block, with differing viewpoints including the Helanshan western fault, the western fault of the Bayan Ulanshan, and the Ordos western edge fault on the eastern side of the Helanshan. There are discrepancies in the boundaries selected in Figure 1 a and b. We have redrawn the boundary in Figure 1a to match that in Figure b.




5) Figure 2: inset'b'is a blow-up of part of overview map 'a', but the location of 'b'on 'a'is not well indicated. Please make the link between the two maps more noticeable.

Thank you for your comment. In Figure a, we have highlighted the area corresponding to Figure b with a bold blue box.



3)Line 139-140: wavelength dispersive XRF. Isn’t XRF not always wavelength dispersive.

We have removed 'wavelength dispersive'.

4)Line 162-163. You claim that the samples are in the Calcalkaline series in figure 4b. It seems to me that your data points are ‘straddling’ the Calc-alkalic – alkali-calcic boundary.

We apologize for the inaccuracy in our description. The revised content is as follows: *All samples fall in the granite area in the TAS classification (Fig.4a), and the Alkali -calcic to Calc-alkaline series areas in the* $SiO_2$*-*$N_2O$*+*$K_2O$ *diagram (Fig.4b).*

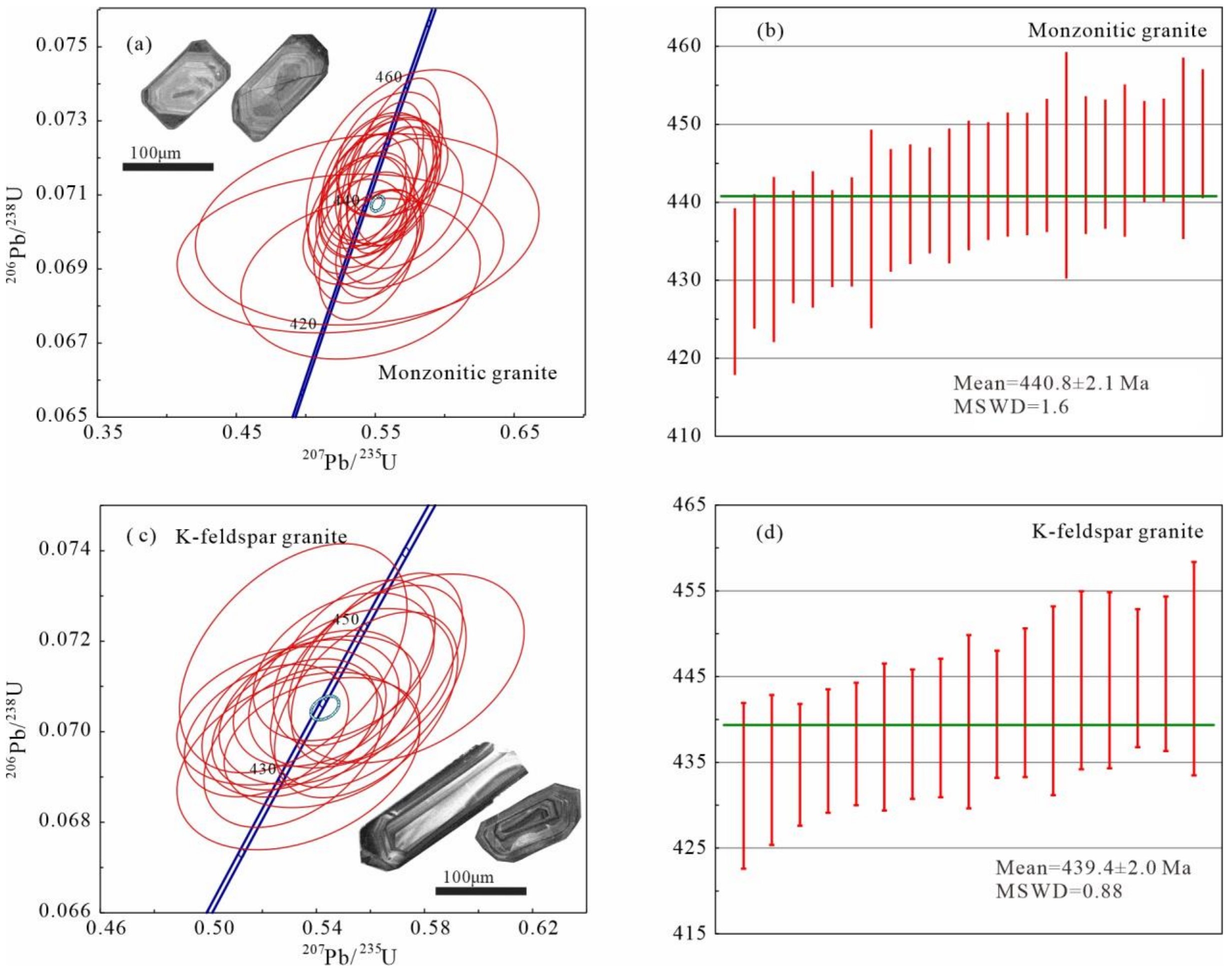
5)Line 179-187: what you don’t discuss in this section is the data in fig 5e:the series samples that have no LREE enrichment, which show flat patterns and in a couple of cases even a positive Eu*/Eu peak. Are these really granites? I’d expect such patterns more for diorites or gabbro’s.

Thank you for your comment. We apologize for limiting the samples to granite in the figure title. In fact, some data in this figure are from intermediate and mafic rocks, and as you mentioned, the flat patterns represents gabbro samples. Therefore, we have revised the figure title:

*Figure 5 Chondrite-normalized REE patterns and primitive mantle-normalized trace element patterns for Early Paleozoic magmatic rocks (chondrite and primitive mantle values are from Sun and McDonough, 1989). The source of the published data can be found in Supplementary materials Table S1.*

6) Fig 6 b and d, it may be a suggestion to plot the data with the ages going from low to high? Isn’t going to change the outcome of the discussion, but it would make evaluation of the data by eyeballing somewhat simpler.

Thank you for your comment. We have revised Figure 6.




7) Line 277: ‘Atype’ to read ‘A-type’

Revised.

8) Line 282: ‘SiO2P2O5 ‘ to read ' SiO2-P2O5’.

Revised.

9) Line 286 ‘Itype’ to read ‘I-type’

Revised.