Dear Huan Li

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 and the revisions are indicated. However, I recommend you read the PDF attached (Supplement), as it will be more convenient for reading and contains images.

The major comments for modification are outlined below.

1) Line23: It is no need to display εHf(t) values to two decimal places.

Thank you for pointing this out. We have modified the values of εHf(t) to one decimal place.

2) Line59: The timing of the amalgamation of the Alxa block and North China Craton is in dispute, not unclear. The relationship between the Alxa block and North China have also been discussed by Yuan Wei and Yang zhenyu, 2015 and Li jinyi et al., 2012.

Considering the reviewer’s suggestion, we have revised the sentence and added the reference. The revised content is as follows:

The eastern margin may have undergone collision and amalgamation events with the North China Craton, although the timing of the amalgamation is in dispute (Li et al., 2012; Wang et al., 2015; Yuan et al., 2015; Dan et al., 2016).

3) There are several instances of improper citations, and many important references are missing. Such as line 58, papers by scholars such as Wang Tao and Wu Fuyuan can be referred to; Line 69-73, the authors neglected earlier researchers, who first to make these points, e.g. Shi Xingjun et al., 2014, and Zhang Lei et al., 2023, and these

work seems to provide some new ideas for the study of magmatism in the Longshoushan Mountains; Line 78-87, When it comes to the Precambrian magmatism of the Alxa block, the findings of some authors should be considered, e.g. Dan Wei ,2012, Wang zengzhen , 2019, Dong chunyan ,2007.

Considering the reviewer's suggestion, we have added these reference:

The tectono-thermal events in the Alxa Block mainly occurred during the Paleoproterozoic and Paleozoic to early Mesozoic. During the Paleoproterozoic, the Alxa Block experienced the ~2.5 Ga magmatic-metamorphic event, ~2.3 Ga and 2.05-2.0 Ga magmatic events, as well as the 1.95-1.80 Ga magmatic-metamorphic event (Zhang et al., 2013; Gong et al., 2016; Zeng et al., 2018; Qi et al., 2019; Wang et al., 2019).

As an important component of the continental crust, granitoid is of great significance in studying crustal properties, tectonic framework and tectonic evolution (e.g. Pearce et al., 1984; Wang et al., 2017; Wu et al., 2017; Zeng et al., 2022).

Hence, recent studies have indicated that the Qagan Qulu Ophiolite Belt was most likely a Late Paleozoic suture related to the closure of a back-arc basin, representing the tectonic boundary between the Alxa Block and the Central Asian Orogenic Belt (Shi et al., 2014; Zhang et al., 2015; Hui et al., 2021; Zhang et al., 2023).

The ~2.3 Ga and 2.05-2.0 Ga magmatic events are primarily found in the Bayanwulashan, Diebusuge and Longshoushan areas, and they are generally believed to be related to an extensional tectonic setting (Dong et al., 2007; Dan et al.，2012; Zeng et al., 2018). The 1.95-1.80 Ga metamorphic events are widely documented in the metamorphic basement throughout the Alxa Block (Zhang et al., 2013; Gong et al., 2016; Zeng et al., 2018).

4) Line 110: The size and shape of the pluton have not been described.

Considering the Reviewer's suggestion, we added a sentence to describe the exposed area of the rock body.

These two plutons occupy an area of approximately 12 km^2.

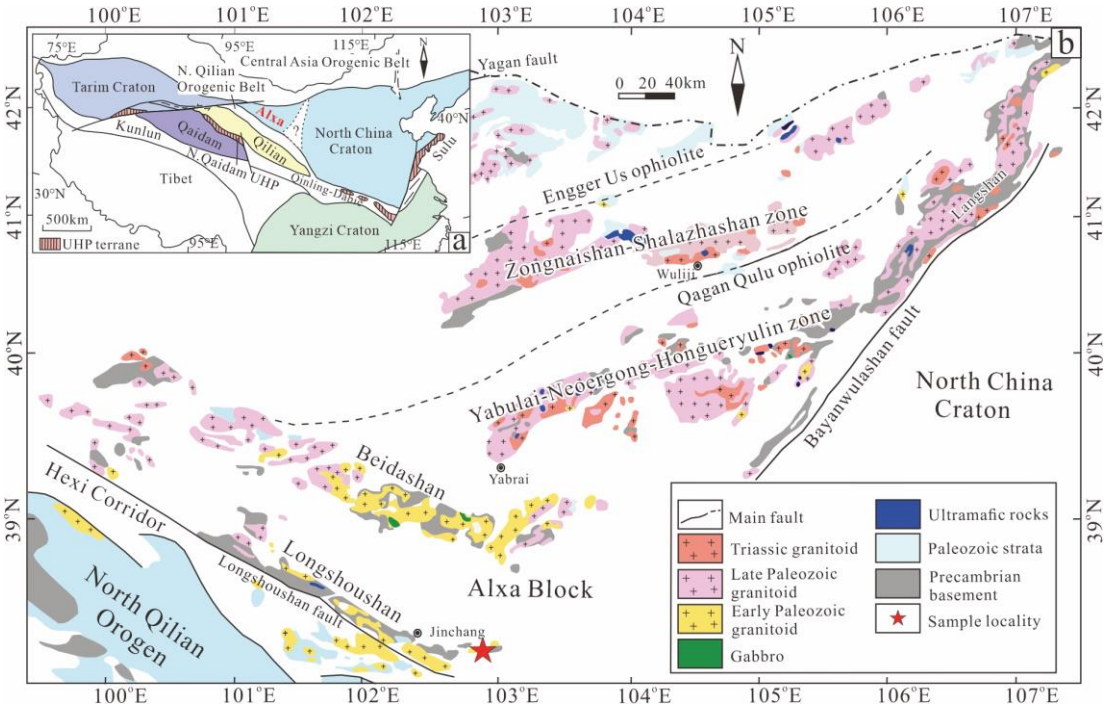
5) Line 343-345: The geochemical identification of high- fractionated granites relies primarily on trace elements, e.g. Cr, Ni, Co, Sr, Ba, Zr and ratio of Zr/Hf、Nb/Ta and Y/Ho.

Thank you for your valuable comment. We added content regarding the degree of differentiation through trace elements.

All the samples of the monzogranite and the K-feldspar granite are characterized by relatively high SiO_2, total alkali and differentiation index, low TFe_2O_3, MgO and CaO contents, low Nb/Ta (9.5–14.5) and Zr/Hf values (26.3–40.2), and enrichment of Rb, Th and U, indicating that these rocks are highly fractionated (Xiao et al., 2014; Wu et al., 2017). This is consistent with the samples of these two granites being in the fractionated felsic granites (FG) area in the FeO^T/MgO vs. Zr+Nb+Ce+Y diagram (Fig. 8c).

6) Figure1: The mafic rocks in northern Alxa region are mostly gabbroic not ultramafic (Fig. 1b), and the research area is not clear in Fig1b.

Thank you for your comment. We marked the location of the study area in Figure 1b with a red pentagram. The study area is primarily composed of gabbro, but there are also small amounts of ultramafic rocks, which is why there is a legend for ultramafic rocks.



7) Line 401-408: The authors removed a large amount of raw data based on Hu's methodology, can you explain the rationale?

The criteria for removing data in this paper are based on the paper by Hu and Mantle. The reasons include exceeding the range of original data that fits the formula, the presence of outliers, and samples that are strongly influenced by differentiation. We have added content in the MS explaining the reasons for data removal.

The first step is to eliminate the samples with SiO2>72% and MgO<0.5% or >6.0% in each subset, thereby removing those that exceed the range of original data fitting the formula

The third step is to eliminate the subset whose average Rb/Sr value is greater than 0.35, in order to filter out samples that have been strongly affected by fractionation.

In the second step, samples of alkaline and shoshonitic basalts derived from the enriched lithospheric mantle are excluded, as these rocks typically have abnormally high Ce/Y ratios (>4), rendering the results unusable.

8) Whether tectonics or related magmatism of extension have been reported in the region in the third stage? It is lack of evidence for post-collisional environment.

During this period, a large amount of A-type granite developed in the Longshoushan, along with mafic dikes formed in an intraplate extensional environment, indicating that the Longshoushan was in a post-collision extensional environment during the 435–410 Ma period. This viewpoint is discussed in Zeng et al., 2016 JAES, 2021 GM and 2021 Geochemistry. Our study reports evidence for crustal thinning, which is also an indication of extension.

Other comments and suggestions:

9) Line 55-56: "Therefore, there is still considerable debate regarding the tectonic background and tectonic evolution of the Longshoushan during the Early Paleozoic." This sentence can be deleted.

Revised

10) Line 134: "exhibited" change to "exhibit".

Revised

11) Line 381: "HREE distribution curves" change to "HREE distribution patterns".

Revised

12) Line 485: "were developed" change to "intruded".

Revised

13) Line 489: "that" change to "than"

Revised