CC1

Dear Adar Glazer:

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

Major comments

1) Some of the conclusions of this manuscript are based on geochemical analyses for which statistical measures are not provided. For example, linear correlations are sometimes referred as “good” without mentioning the R-squared values. Adding R-squared values would assure the readers that correlations are actually good and improve the reliability of this manuscript. Also, in Figure 13, KDE bandwidth and histogram bin width are not reported.

Thank you for your comment. It is problematic to use R-squared values with the number of samples involved – although for the record, they are high (Th-Rb: R-squared values=0.89; P2O5-SiO2: R-squared values=0.98; the R-squared values in Harker diagrams > 0.95; Rb/V-1/V and La/Cr-1/Cr: R-squared values=0.79–0.96). We have edited the text to refer to “trends” rather than “correlations”. The word “good” is not used in the text; instead we describe trends as positive or negative. The histogram bin width value has been added to Figure 13. Figure 13 was created using 'Isoplot4.15,' and there is no setting for KDE bandwidth.

2) Based on the εHf(t)-age pattern of zircons, the authors suggest that “the Longshoushan Complex is most likely the crustal source of the granitoids in this

study". As most of the zircons fall outside the εHf(t)-age field of Longshoushan Complex rocks, more evidence should be provided to support this argument.

Thank you for your comment. We have rewritten this sentence to explain the reason: *"In crust-mantle mixing processes, crust-derived magmas typically have lower εHf(t) values. Therefore, lower εHf(t) values can roughly reflect the composition of the crustal source. As shown in Fig. 10, some spots with lower εHf(t) values from both rock bodies fall within the evolutionary trend line of the Early Precambrian basement strata, known as the Longshoushan Complex, into which the studied plutons are intruded."*

3) In several cases methods are described outside the 'Methods' section making the manuscript a bit complicated and tiring for reading.

We have moved this part of the content: 'In this paper, the $^{206}Pb/^{238}U$ age and $^{207}Pb/^{206}U$ ages are determined for younger zircons (<1000 Ma) and older grains (>1000 Ma)' to the Methods section.

4) Please avoid the use of acronyms. That would make the article more accessible to the readers.

Considering the Reviewer's suggestion, We have changed the abbreviations in the manuscript to their full names, such as NOB, SOB, NQVA.

Minor comments

5)Line 39: south > southern

Revised.

6) Line 40: Add a reference to your map when introducing the study area.

Thank you for your comment. We have added a reference to the map in the introduction section.

7) Line 54-55: change ca. to ~ or use one of them throughout the whole manuscript.

Thank you for your comment. We have standardized 'ca.' to '~'.

8) Line 105: “with a small amount of gabbro also present” > with subordinate Gabbroic rocks.

Revised.

9) Line 109: “The investigated plutons in this study” > In this study we investigated two plutons located…

Revised.

10) Line 112: Duplication of “biotite quartz schist”.

Revised.

11) Line 147: CJ-1 > GJ-1

Revised.

12) Line 153: “has the values of” – values of what? Please state.

We sorry for the ambiguity in this sentence; The revised content is as follows:

During our analyses, the value of Plešovice, 91500 and GJ-1 were 0.282472–0.282495, 0.282302–0.282314 and 0.282024–0.282032 respectively, consistent with their recommended values (Plešovice: 0.282482 ±23; 91500: 0.282308 ±106; GJ-1: 0.282010 ±89, Zhang et al., 2020).

13) Line 154: It would be much more convenient for the reader to omit all these zeros right of the decimal point, e.g. “Plešovice: 0.282482 ±23”.

Thank you for your comment. The revised content is as follows:

During our analyses, the value of Plešovice, 91500 and GJ-1 were 0.282472-0.282495, 0.282302-0.282314 and 0.282024-0.282032 respectively, consistent with their recommended values (Plešovice: 0.282482 ±23; 91500: 0.282308 ±106; GJ-1: 0.282010 ±89, Zhang et al., 2020).

14) Line 185: slight > slightly

Revised.

15) Line 191: and in many other cases: use zircons instead of “spots”.

Thank you for your comment. Using 'spot' is more accurate because some zircons are quite complex, with inherited cores and metamorphic rims. Therefore, a single zircon may have multiple spots, and each spot can only represent the zircon characteristics of its specific area, rather than the entire zircon.

16) Line 201: “which converts to εHf(t)” > with εHf(t) of

Revised.

17) Line 202: what do you mean by “using the weighted mean age”? Each zircon has its crystallization and Tdm age. please clarify.

Theoretically, the weighted mean age of the co-magmatic zircons can more accurately define the crystallization age of the co-magmatic zircons. So, we use the weighted mean age of the co-magmatic zircons to calculate the εHf(t) and Tdm age for each co-magmatic zircons.

18) Line 207: “In this paper, the $^{206}Pb/^{238}U$ age and $^{207}Pb/^{206}U$ ages are determined for younger zircons (<1000 Ma) and older grains (>1000 Ma).” – should be moved to methods.

We have moved this content to the methods section.

19) Line 208-211 (and in other cases): referring to spots #1/2/3… is very confusing and not necessary. please consider it again. You can potentially just say “Among them, three zircons are weakly luminescent…”

Revised

20) Line 216: Twelve zircon spots > Twelve zircons

Revised

21) Line 218: “The $^{176}Hf/^{177}Hf$ ratio of #6 (825 Ma) is 0.281812, which converts to

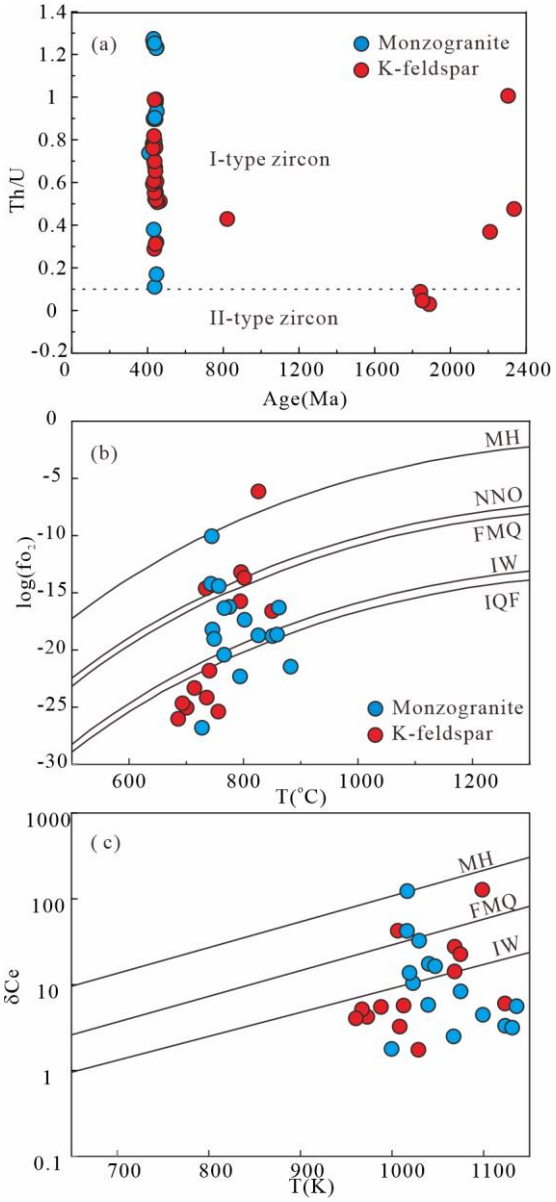
εHf(t) value of -16.07, and TDM_2 of 2722." > One older zircon (825 Ma) has a $^{176}Hf/^{177}Hf$ ratio of…

Revised

22) Line 234: would be useful to add a Th/U vs. Age diagram when discussing the implications of Th/U values. Also, you state that the ages of zircons from the second group represent the timing of metamorphism. What are their ages? Do their ages correspond to any metamorphism event known in the region?

Thank you for pointing this out. We have added a Th/U vs. Age diagram. We also included the metamorphic ages in the article and discussed their significance. The content is as follows:

The spots from the II-type zircons have ages of 1847 –1894 Ma, which is consistent with the age of the metamorphic events in the Longshoushan area during the Paleoproterozoic (Gong et al., 2016; Zeng et al., 2018)



23)Line 280: "Thus, the monzogranite and K-feldspar granite are not A-type granites" and are more compatible with being I or S-type granites.

Revised

24) Line 284: Those correlations seem to be very weak. Please provide R-squared values.

Thank you for your valuable comment. The R-squared values range from 0.89 to 0.98. We have added these R-squared values in the MS to demonstrate a significant

correlation.

25) Line 293: Also here, I wouldn't say that these are "clear linear correlations" as they are not so clear. Please provide R-squared values.

We have added a description of the R-squared values in MS, all of which are greater than 0.95.

26) Line 311: "The εHf(t) values of the monzogranite" / "while those of the K-feldspar granite" – εHf(t) values are of zircons, not whole rock.

Revised

27) Line 312: "a large range of variation" > a large range of εHf(t)

Revised

28) Line 318: Please provide R-squared values.

We have added a description of the R-squared values in the MS.

29) Line 320: Add a few words on the Xijing clinopyroxene diorite and Jiling granite and how they relate to the studied plutons. That would make the manuscript more accessible to the international community.

Thank you for pointing this out. They are both located in the Longshoushan area, and we have clarified this relationship in the MS.

30) Line 328: mantle-derived and crust-derived > mantle and crust-derived

Revised

31) Line 338: "…Longshoushan Complex, into which the studied plutons are intruded.

Revised

33) Line 340: Actually, most of the zircons from your samples fall outside the

εHf(t)-age field of the Longshoushan Complex, so arguing based on εHf(t)-age data that "the Longshoushan Complex is most likely the crustal source of the granitoids in this study" is inaccurate.

Thank you for your comment. We have rewritten this sentence to explain the reason: *"In crust-mantle mixing processes, crust-derived magmas typically have lower εHf(t) values. Therefore, lower εHf(t) values can roughly reflect the composition of the crustal source. As shown in Fig. 10, some spots with lower εHf(t) values from both rock bodies fall within the evolutionary trend line of the Early Precambrian basement strata, known as the Longshoushan Complex, into which the studied plutons are intruded."*

34) Line 356: During the Paleozoic to Mesozoic > During the Paleozoic-Mesozoic.

Revised

35) Line 359: "which includes areas ~2000 km to both the east and west of the Alxa Block" > which extends ~2000 km east and west of…

Revised

36) Line 377: is > are

Revised

37) Line 381: some scholars > various authors

Revised

38) Line 387-389: awkward phrasing. That observation has far-reaching implications for the geology and tectonic evolution of your study area. Please rephrase so it is clearer for the reader.

Thank you for your comment. The revised content is as follows:

Figure 12 indicates that magmatism in the Alxa Block started later than 500 Ma which is later than in other parts of the Central China Orogenic Belt to the south. In

addition, the Longshoushan area lacks the twin peaks in Early Paleozoic ages for magmatism found in other areas such as the North Qilian Orogenic Belt and Central Qilian Block (Allen et al., 2023).

39) Section 6.4.2: that section should be modified so it becomes smoother and clearer. Methods should be moved to the 'Methods' section or just be cited and the results of your crustal thickness analysis should become more prominent.

This is the data processing workflow, not the testing method. Additionally, this section processes not only the data obtained from this study but also a majority of previous data. Therefore, we did not move this section to the Methods.

40) Line 425: which statistics?

Thank you for your comment. Figure 2 provides a statistical of the rock ages. The revised content is as follows:

A notable feature of the Longshoushan is the large volume of Late Ordovician-Silurian magmatic rocks (Fig. 2). Based on the statistics and analysis of U-Pb ages and geochemical data of these rocks.

41) Line 426: can be divided > can be defined.

Revised

42) Line 441: tectonic background > tectonic setting

Revised

43) Line 457: calc-alkaline granitic magmatism

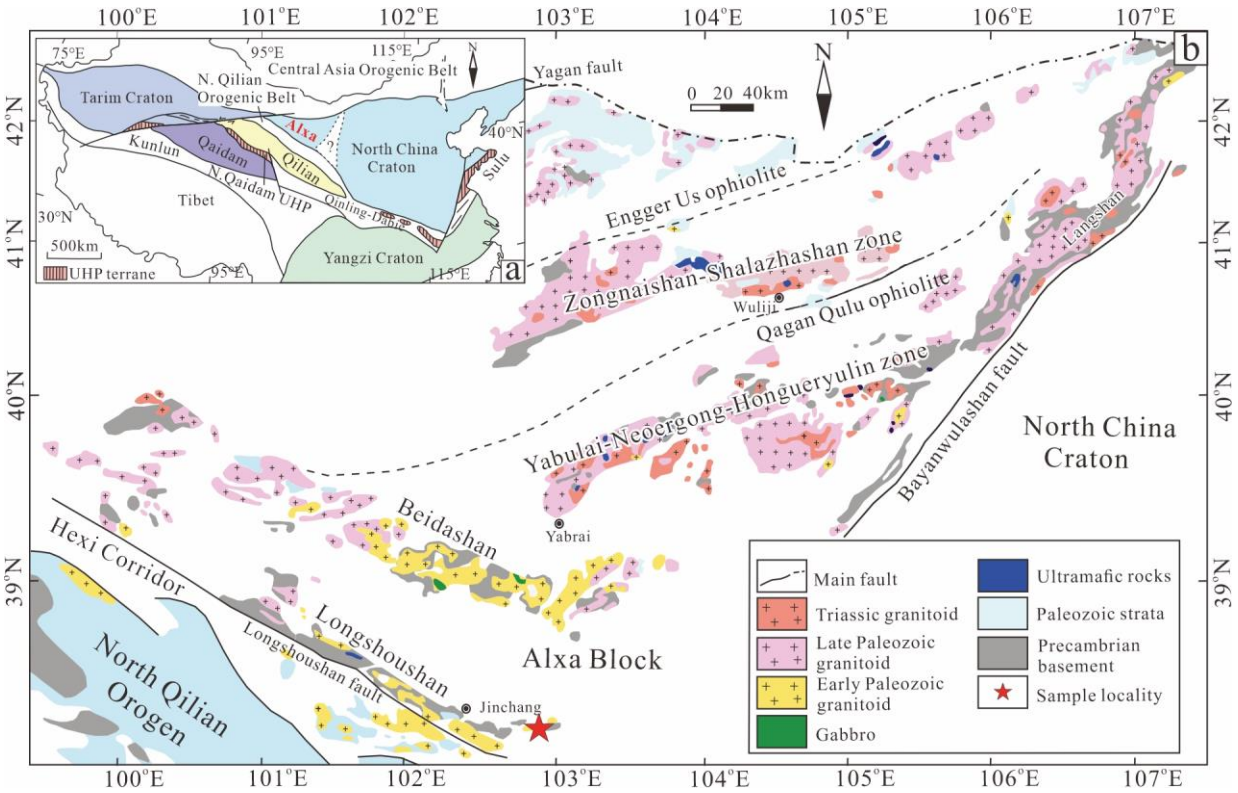
Revised

Figures

44) Figure 1: would be useful to add an inset of the world map for orientation. Please highlight your study area.

For the world, the Alxa Block is too small, so we did not include a world map; instead, we chose a map of China.

In Figure 1a, we represent the Alxa Block in bold red font. In Figure 1b, we added a star to indicate the study area.



45) Figure 2: add in the figure caption some reference to the geochronology you present. Are these zircon U-Pb ages? Whole rock Rb-Sr? Please describe. Highlight your study area in Figure 2a. 'Mafic rocks' appear twice in the legend.

Thank you for your comment. We have revised the title of Figure 2 to indicate that the data come from zircon U-Pb dating. In Figure 2a, we added a bold blue box to represent the study area. One legend of Mafic rocks has been deleted.

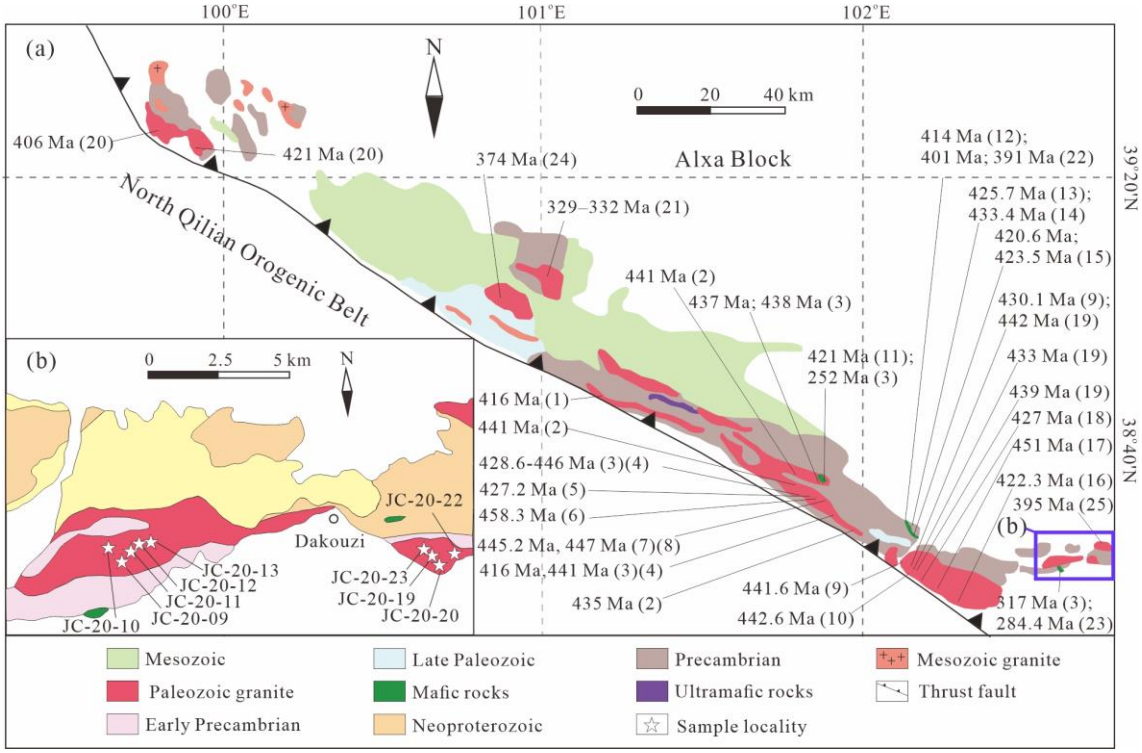
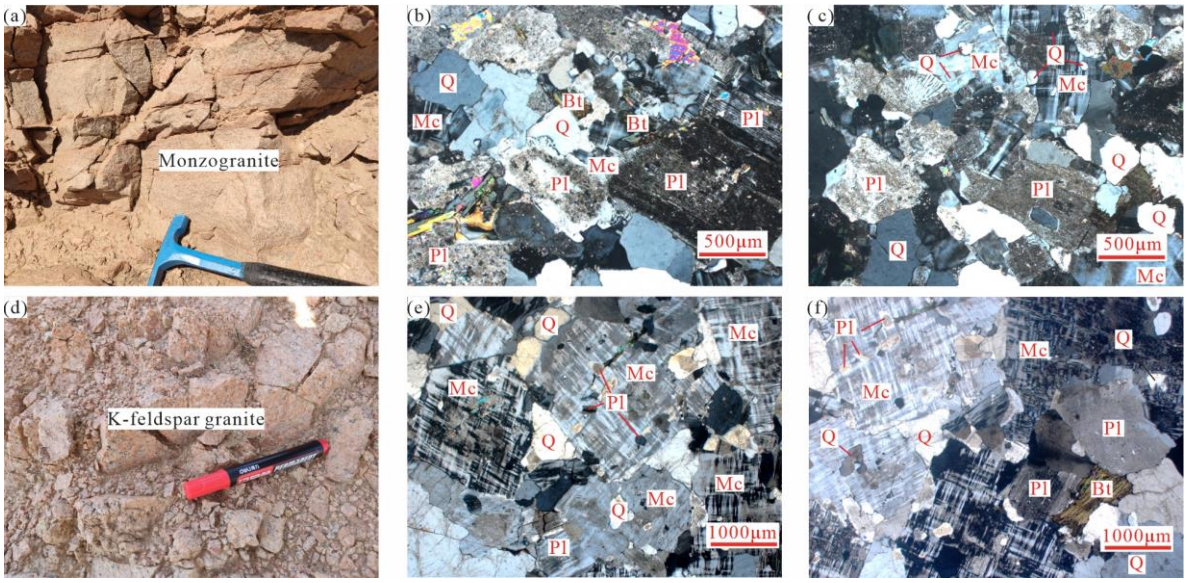


Figure 2 (a) Simplified geological map of the southwestern Alxa Block (Wang et al., 2020); (b) Simplified geological map of the east of the Longshoushan area. Data are in Supplementary materials Table S1 (All age data were obtained using the zircon U-Pb method).

46) Figure 3: mineral abbreviations and scale bars should be highlighted.

Thank you for your comment. We added a white background to the abbreviations and scale bars.



47) Figure 11: what is the meaning of the red arrow, please describe.

We explained the meaning of the red arrows in the figure caption.

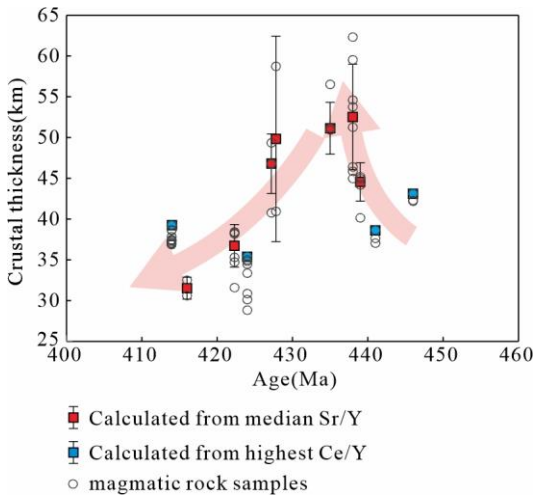
Figure 10 Zircon εHf(t)-age (Ma) diagram for samples in this study and published data for the region. The source of the published data can be found in Supplementary materials Table S1 (The red arrow represents the variation trend of εHf(t)).

48) Figure 13: please provide KDE bandwidth and histogram bin width.

Thank you for your comment. The histogram bin width value has been added to Figure 13. Figure 13 was created using 'Isoplot4.15,' and there is no setting for KDE bandwidth.

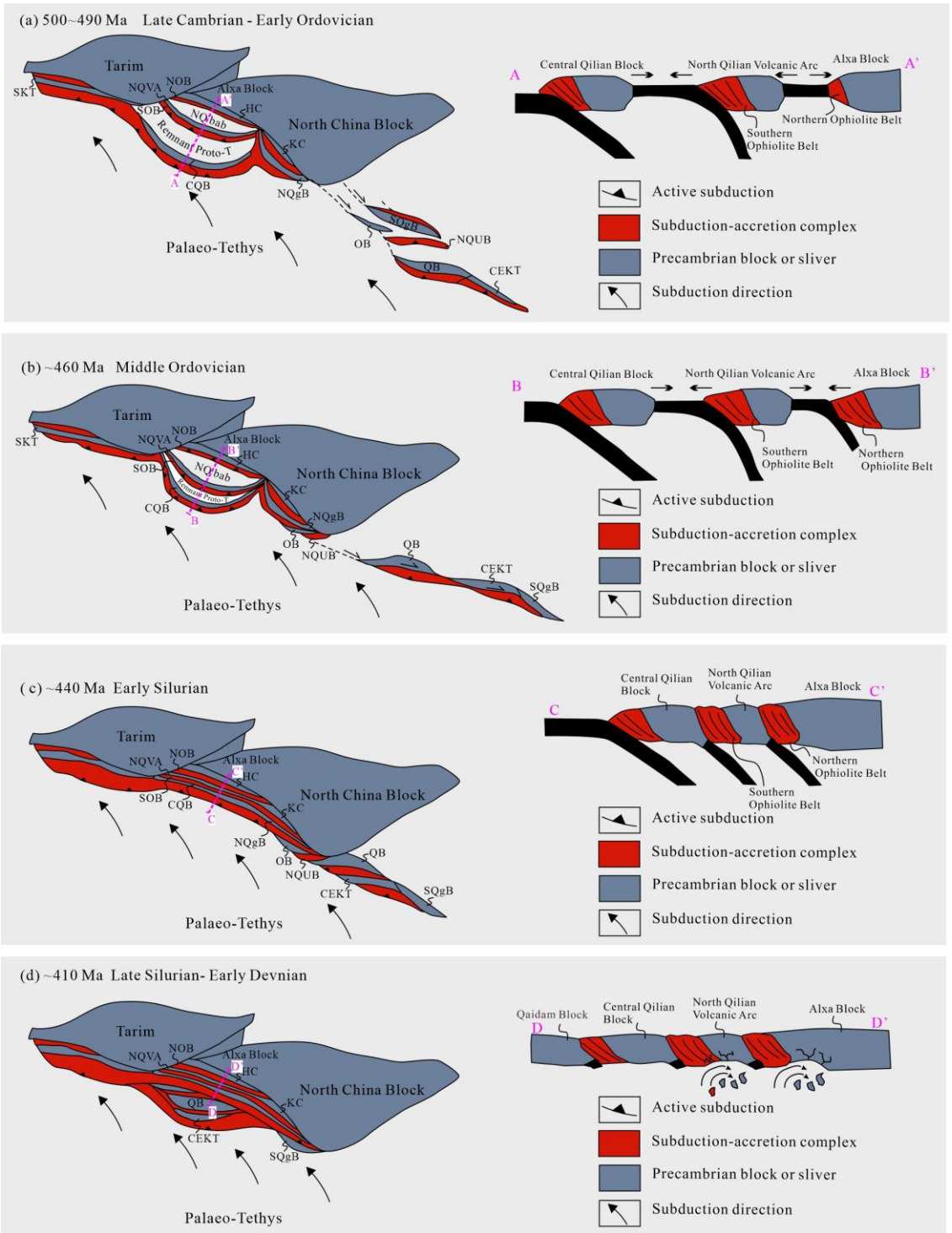
49) Figure 14: add ‘open circles’ in legend.

The legend for open circles has been added, as follows:



50) Figure 15: would be more informative to give a different color to ophiolite belts. Add in legend the black arrows, and highlight the pink cross section paths on map view.

We have bolded the pink cross-section paths. In the legend, we explained the meaning of the black arrows. The ophiolite is included in the subduction-accretion complex, with the South Ophiolite Belt and Northern Ophiolite Belt being the names of these two tectonic units, as cited from Allen et al. (2023 ESR).


(a) 500~490 Ma Late Cambrian - Early Ordovician
Tarim
SKT
NQVA
NOB
Alxa Block
A
HC
SOB
NQbab
Remnant Proto-T
North China Block
KC
A
CQB
NQgB
SQgB
NQUB
OB
QB
CEKT
Palaeo-Tethys
A
Central Qilian Block
North Qilian Volcanic Arc
Alxa Block
A'
Northern Ophiolite Belt
Southern Ophiolite Belt
Active subduction
Subduction-accretion complex
Precambrian block or sliver
Subduction direction
(b) ~460 Ma Middle Ordovician
Tarim
SKT
NQVA
NOB
Alxa Block
B
HC
SOB
NQbab
Remnant Proto-T
North China Block
KC
CQB
B
NQgB
OB
NQUB
QB
CEKT
SQgB
Palaeo-Tethys
B
Central Qilian Block
North Qilian Volcanic Arc
Alxa Block
B'
Southern Ophiolite Belt
Northern Ophiolite Belt
Active subduction
Subduction-accretion complex
Precambrian block or sliver
Subduction direction
(c) ~440 Ma Early Silurian
Tarim
NQVA
NOB
Alxa Block
C
HC
SOB
CQB
North China Block
KC
C
NQgB
OB
QB
NQUB
CEKT
SQgB
Palaeo-Tethys
C
Central Qilian Block
North Qilian Volcanic Arc
Alxa Block
C'
Northern Ophiolite Belt
Southern Ophiolite Belt
Active subduction
Subduction-accretion complex
Precambrian block or sliver
Subduction direction
(d) ~410 Ma Late Silurian- Early Devnian
Tarim
NQVA
NOB
Alxa Block
D
HC
North China Block
QB
D
KC
CEKT
SQgB
Palaeo-Tethys
Qaidam Block
D
Central Qilian Block
North Qilian Volcanic Arc
Alxa Block
D'
Active subduction
Subduction-accretion complex
Precambrian block or sliver
Subduction direction