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Dear editors

We would like to thank you for the opportunity to revise and resubmit our manuscript egusphere-2022-1433, entitled " *Mineralogical and elemental geochemical characteristics of Taodonggou Group mudstone in Taibei Sag, Turpan-Hami Basin: Implication for its formation mechanism* " by Miao et al. We found the topic editors' comments to be helpful in revising the manuscript and have carefully considered and responded to each suggestion, corresponding changes to the resubmitted manuscript are highlighted in yellow.

We also included a response to topic editor in which we addressed comments the topic editor, we hope that these modifications can fulfill the requirements to make the manuscript acceptable for publication. Please let us know if you have any concerns about the manuscript and we would like to address them as soon as possible.

Thank you again for your consideration of the revised manuscript.

Sincerely,

Huan Miao

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Respond to topic editor

Thank you for reviewing my manuscript and giving me the opportunity to make revisions. I have now made detailed modifications to this manuscript. For your convenience in reviewing it again, I have highlighted the revised parts in yellow. The detailed comments and modifications are as follows:

Comment: Figure 1: depth instead of deoth (in the legend located right of the figure); Figure 1: what is “glutenine”? (is that a typo?)

Thank you for reviewing my manuscript. I have now corrected the typo in Figure 1. Additionally, "glutenine" was a spelling mistake, and it should be "medium-grained sandstone". The revised Figure 1 is as follows:

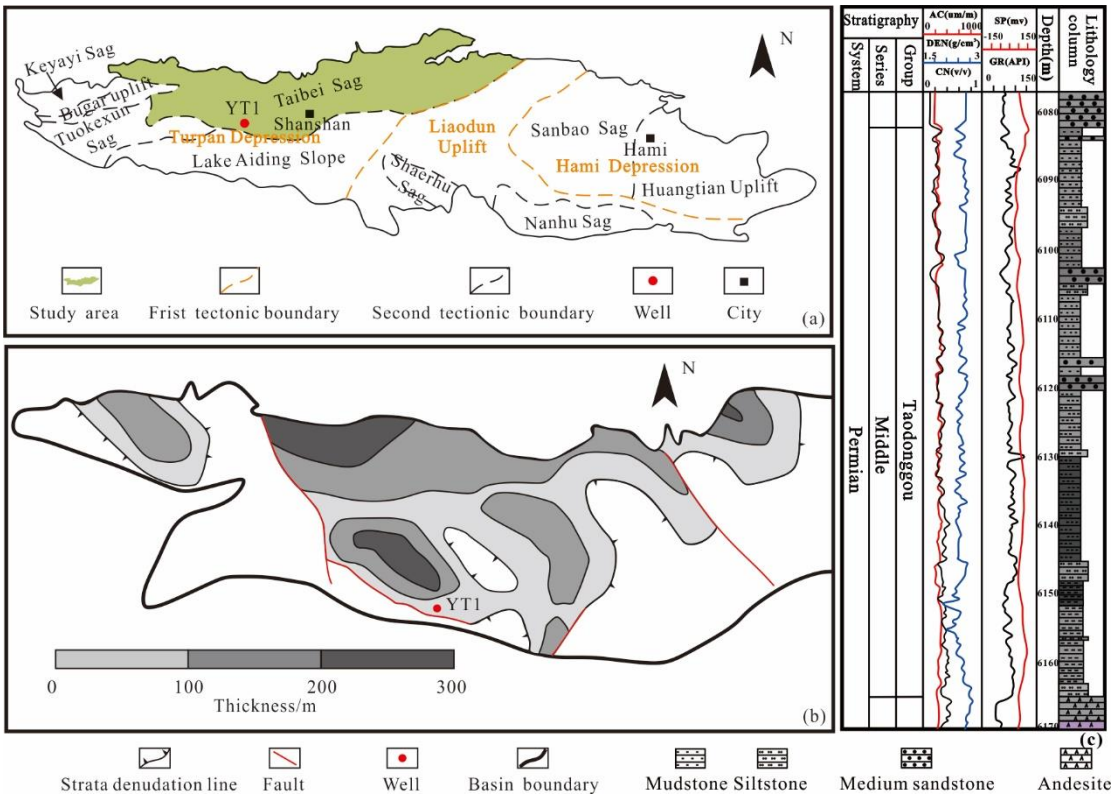

Figure1: Geological overview of the study area (modified after Miao et al., 2021; Miao et al., 2023): (a) Geological background of Turpan-Hami basin; (b) Thickness contour map of Taodonggou Group mudstone in Taibei sag; (c) YT1 stratum of Taodonggou Group

Comment: Lines 167-168 : the authors state that the Taodonggou samples do not show enrichments with respect to the global average shale and they state that only Hf shows a moderate (1.3 enrichment); however, in figure 4 several samples are in the range EF 1-2 and Hf attains values slightly above 2; could the authors please clarify this point?

Thank you for reviewing my manuscript. I have now made revisions to the descriptions in the manuscript, displaying the distribution range and average value of Hf content. Additionally, to facilitate the reading of Figure 4, we have added Table 4 (Enrichment Factors of the Taodonggou Group mudstone after AS transformation). The revised text and the newly added table

are as follows:

Figure 4 and Table 4 presents the enrichment factors of Taodonggou Group mudstone in the study area. It can be seen from Figure 4 and Table 4 that only Hf (0.5-2.11, mean = 1.29) is enriched in the Taodonggou Group mudstone compared with AS, and other elements are no enriched.

Table 4 Enrichment Factors of the Taodonggou Group mudstone after AS transformation

Samples	X_{EF}																	
	Be	Sc	V	Cr	Co	Ni	Cu	Zn	Ga	Rb	Sr	Mo	Ba	B	Th	U	Zr	Hf
YT1-1	0.43	0.11	0.92	0.42	0.68	0.51	1.04	1.80	1.28	0.53	3.66	0.63	1.14	0.68	1.05	0.78	0.71	1.28
YT1-2	0.39	0.12	0.53	0.25	0.70	0.44	0.78	0.89	1.13	0.49	1.34	0.25	1.35	0.82	0.54	0.52	0.66	1.44
YT1-3	0.75	0.19	0.76	0.48	1.07	0.74	1.36	1.33	1.68	0.72	2.03	0.43	1.49	1.20	0.83	0.67	1.06	2.11
YT1-4	0.30	0.10	0.42	0.28	0.64	0.43	0.70	0.92	0.91	0.33	1.36	0.41	0.86	0.66	0.49	0.52	0.55	1.15
YT1-5	0.52	0.13	0.85	0.47	0.66	0.50	1.19	0.77	1.37	0.45	1.07	0.41	0.29	0.73	0.73	0.47	0.70	1.45
YT1-6	0.41	0.12	0.68	0.47	0.66	0.48	0.92	0.94	1.14	0.24	1.45	0.51	0.94	0.59	1.03	0.83	0.69	1.44
YT1-7	0.55	0.14	0.74	0.43	0.69	0.53	0.85	0.75	0.77	0.23	0.91	0.40	0.54	0.62	0.83	0.82	0.74	1.54
YT1-8	0.54	0.11	0.51	0.38	0.72	0.41	0.85	0.54	0.52	0.09	0.40	0.33	0.61	0.34	0.66	0.49	0.62	1.29
YT1-9	0.44	0.14	0.51	0.46	1.09	0.52	0.81	0.62	0.64	0.10	0.53	0.72	0.73	0.40	0.63	0.42	0.76	1.49
YT1-10	0.28	0.07	0.62	0.36	0.77	0.36	0.77	0.45	0.50	0.07	0.50	0.72	0.57	0.32	0.50	0.55	0.53	1.13
YT1-11	0.28	0.08	0.55	0.33	0.72	0.33	0.70	0.42	0.42	0.07	0.54	0.65	0.56	0.36	0.44	0.52	0.51	0.89
YT1-12	0.35	0.08	0.76	0.37	0.81	0.38	0.85	0.52	0.54	0.08	0.59	0.84	0.65	0.33	0.55	0.58	0.58	1.08
YT1-13	0.14	0.04	0.84	0.30	0.61	0.25	0.79	0.29	0.23	0.06	0.14	0.86	0.46	0.28	0.32	0.53	0.27	0.50
YT1-14	0.72	0.27	1.39	0.87	1.62	0.76	1.54	0.92	0.83	0.13	0.55	0.95	0.54	0.53	0.76	0.89	1.01	1.43
YT1-15	0.42	0.15	0.60	0.36	1.22	0.51	0.90	0.75	0.63	0.09	0.58	0.27	0.33	0.38	0.52	0.41	0.75	1.38
YT1-16	0.45	0.14	1.35	0.39	1.41	0.23	1.40	2.03	0.81	0.13	1.23	0.41	0.65	0.51	0.23	0.17	1.19	2.00
Average	0.41	0.12	0.73	0.40	0.87	0.44	0.93	0.79	0.75	0.20	0.91	0.56	0.68	0.50	0.59	0.55	0.68	1.29

Comment: Lines 172-177 please put elemental concentrations in this paragraph (and in the whole paper) in ppm units and check the number of digits valid for the normalization ratios; moreover, patterns are not discussed and the significance of the depleted YT1-13 sample is not presented

Thank you for reviewing my manuscript. I have now changed "μg/g" to “ppm” in the manuscript, and I have highlighted these modifications in yellow in the revised version. Additionally, we have added the distribution pattern of REEs and the reason for the depletion and other REEs in sample YT1-13. The REE distribution pattern of sample YT1-13 is consistent with other samples, showing a weakly right dipping REE distribution pattern. However, trace elements in sample YT1-13 are depleted compared to the average shale (highlighted in green in Table 4), indicating that the depletion is caused by groundwater leaching. Therefore, the revised text is as follows:

The REE content of Taodonggou Group mudstone in the study area is shown in Table 5. According to Table 5, the ∑REE content of Taodonggou Group mudstone ranged from 43.247 ppm to 257.997 ppm, with an average value of 159.206 ppm. The light rare earth element (LREE) content was the highest (mean value 133.45 ppm), followed by medium rare earth element (MREE) (mean value 17.438 ppm) and heavy rare earth element (HREE) (mean value 6.684 ppm) in that order. After chondrite standardization (Taylor and Mclennan, 1985), Taodonggou Group mudstone shows a right dipping REE distribution pattern

(Fig. 5), (La/Yb) N is 6.228–10.081, with an average value of 7.358.

In addition, in Figure 5, although the YT1-13 sample exhibits a weak right dipping REE distribution pattern similar to other samples, its rare earth elements are significantly depleted. Based on Figure 4 and Table 4, the trace elements in the YT1-13 sample are depleted compared to AS, indicating that the YT1-13 sample has been influenced by groundwater leaching.

Comment: In Figure 6 the chemical alteration index is shown, not the climate index, please modify; moreover, the climate index is presented in the text but not shown, instead the Ga/Rb ratio is presented; how do the C climate index and the Ga/Rb ratio correlate in the studied samples

Thank you for reviewing my manuscript. I have made the necessary revisions to Figure 6, and the climate index C has been added to Table 3. Additionally, I have included the correlations between CIA, C, and Ga/Rb, and updated the corresponding text as follows:

The CIA values of the Taodonggou Group mudstone in the study area were calculated based on Equation (2) and Equation (3), ranging from 68.71 to 96.97, with a mean value of 80.17. The climate index (C) is 0.22–2.42 (average = 1.01, Tab.3). The overall paleoclimate was warm, humid, and hot (Fig. 6a).

In addition, the cross plot of Ga/Rb and K2O/Al2O3 can also be used to analyze the paleoclimate characteristics during the formation of sedimentary rocks (Lerman and Baccini, 1987; Liu and Zhou, 2007). As shown in the cross plot of Ga/Rb and K2O/Al2O3 (Fig. 6b), almost all points are in the warm/wet area, which indicates that Taodonggou Group mudstone was deposited in a warm and humid paleoclimate.

By analyzing the correlations between CIA, C, and Ga/Rb (Figure 6c–e), it can be observed that there is the strongest correlation between CIA and C (Figure 6c, R2 = 0.7566). Additionally, the correlation coefficients between CIA and Ga/Rb, as well as C and Ga/Rb, are both greater than 0.4 (Figures 6d and 6e). This indicates that CIA, C, and Ga/Rb are reliable indicators of the paleoclimate during the sedimentation of the Taodonggou Group mudstone.

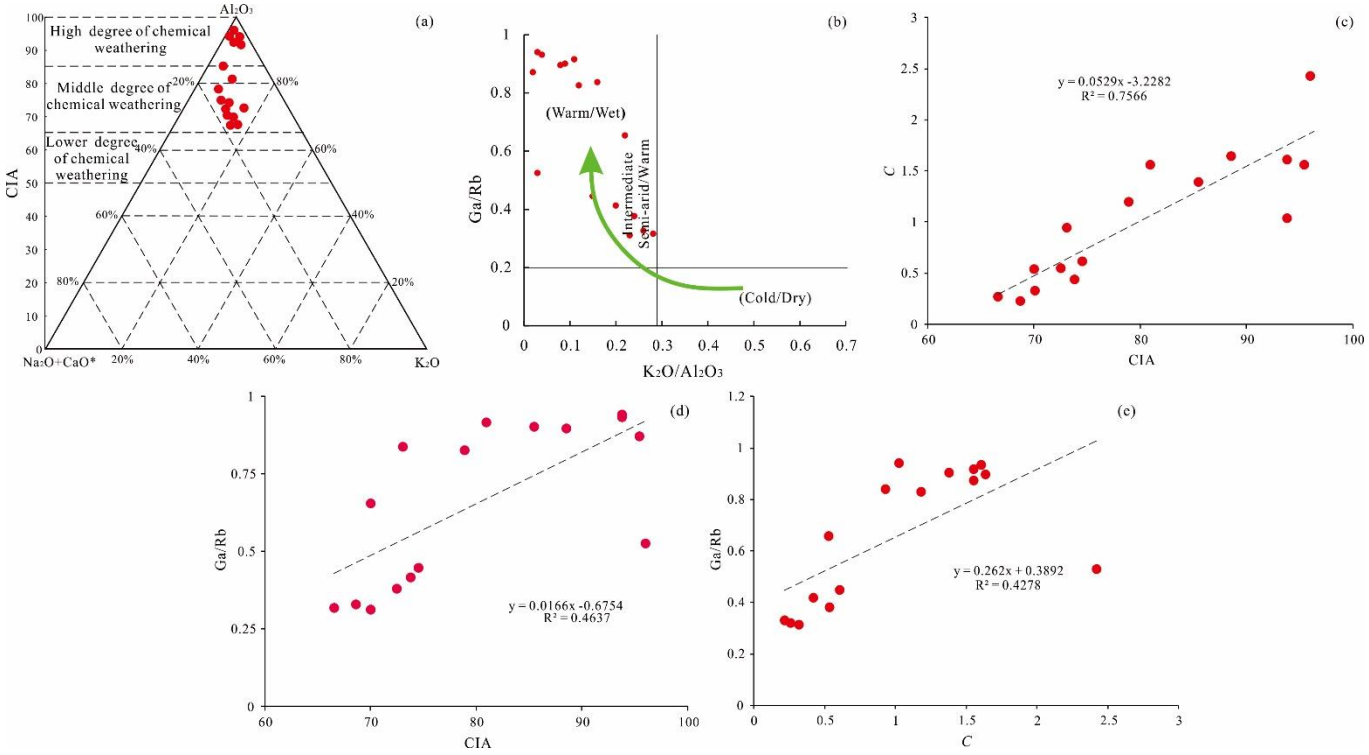

Figure 6: Paleoclimate of Taodonggou Group: (a) CIA Characteristics of Taodonggou Group mudstone (modified from Nesbitt and Young, 1984); (b) cross plot of K_2O/Al_2O_3 and Ga/Rb (modified from Roy and Roser, 2013); (c) cross plot of CIA and C; (d) cross plot of CIA and Ga/Rb; （e） cross plot of C and Ga/Rb

Comment: Fig. 10: “hydrothermal cherts” are written upside down, please modify for better reading

Thank you for reviewing my manuscript. I have made the necessary revisions to Figure 10. The updated Figure 10 is as follows:

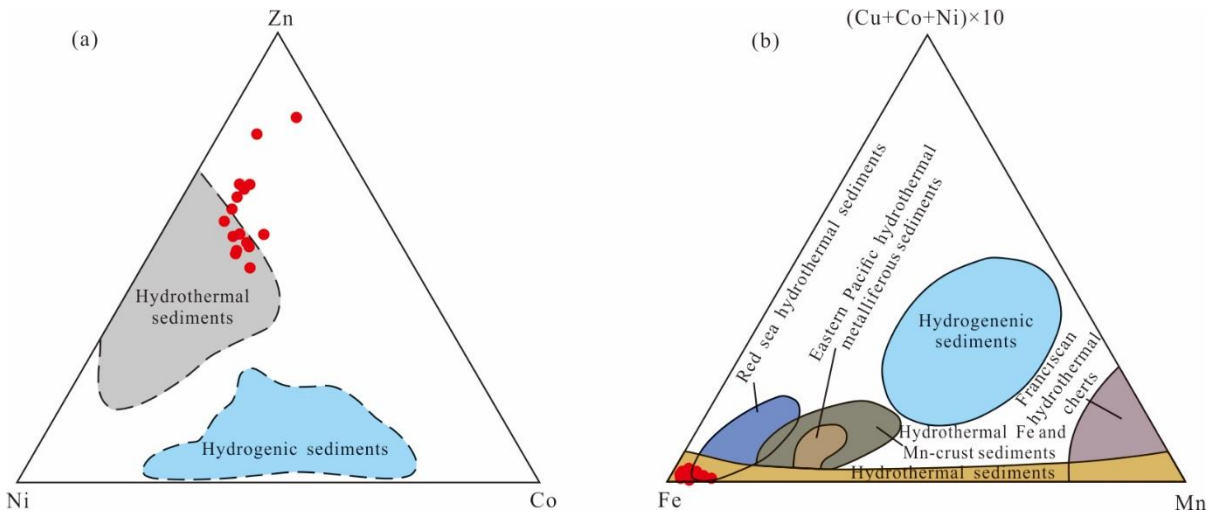

Figure 10: Zn-Ni-Co ternary diagram (a) and (Cu+Co+Ni) ×10-Fe-Mn ternary diagram (b) (modified after You et al., 2019)