Point-by-point responses (in blue) to the Editor and Reviewers' comments:

Manuscript No.: cp-2024-42

Title: Orbital-scale climate dynamics may impact Gzhelian peatland wildfire activity in the Ordos Basin

Editor:

1. Line 110: what is a "<20 top size" ? What are the units here?

Thanks for your suggestion. It was an error in our work, and the unit has been added.

2. Line 141-142: To increase the comprehensive of the database, it would be good to also use "Virgilian wildfire" to capture North American incidences.

Thanks for your suggestion. We have expanded the keyword search to ensure the accuracy of the data.

3. Line 162: should be "Scotese"

Thanks and done.

4. Line 167: Could a principal component analysis (PCA) to see how all of these variables co-relate shed additional insight?

Thanks for your suggestions. We attempted to perform principal component analysis (PCA), but the results were not ideal and did not provide new insights for our research.

5. Line 201: Table 1— fix such that column labels are not truncated

Thanks and done.

Table 1

The coal micro component contents of 20 samples of No. 9 coal seam from Yaogou Mine in Ordos Basin

Sample No.	Percentage of the total organic macerals (vol.%)			Percentage of the total inertinite macerals (vol.%)					TOM (vol.%)	Total minerals (vol.%)
	Vitrinite	Inertinite	Liptinite	Fusinite	Semifusinite	Macrinite	Micrinite	Inertodetrinite		
YG-1	79.6	14.6	5.8	1.1	9.3	0	0.2	4	53.9	46.1
YG-2	80.5	16	3.5	2.4	10.6	0.6	0.6	1.8	60.4	39.6
YG-3	68.3	27.4	4.3	0.9	14.1	1.5	2.6	8.3	81.2	18.8
YG-4	64.5	26.8	8.7	0.4	13.3	2.4	0.4	10.3	84.8	15.2
YG-5	84.7	11.9	3.4	0.4	7.4	1.5	0.2	2.4	84.9	15.1
YG-6	65.2	30.8	4	0	14.6	2.4	0.4	13.4	86.2	13.8
YG-7	72.2	23	4.8	3	10.7	3	0.8	5.5	87.1	12.9
YG-8	70.8	21.5	7.7	2.5	12.2	1.5	0.2	5.1	81.8	18.2
YG-9	78.4	19.1	2.5	0	9.8	2.5	0.4	6.4	80.1	19.9
YG-10	66.1	27.4	6.5	3.8	13.1	3.2	0.6	6.7	83.9	16.1
YG-11	75.2	23.5	1.3	0.6	12	3.4	0.2	7.3	79.6	20.4
YG-12	72.1	25.1	2.8	0.9	15.4	2.2	0.4	6.2	73.9	26.1
YG-13	65.8	30.2	4	0.8	17.2	4.1	1.8	6.3	86.2	13.8
YG-14	82	14.1	3.9	0	8.3	2.1	0	3.7	81.3	18.7
YG-15	80.2	18.4	1.4	0	11.2	0.8	0.6	5.8	77	23
YG-16	81.8	16.5	1.7	0	10.4	1.2	1.2	3.7	85.2	14.8
YG-17	78.1	18.4	3.5	2.7	9	1.7	0.5	4.5	59.5	40.5
YG-18	66.8	28.9	4.3	0.8	11.3	4.7	0	12.1	59.9	40.1
YG-19	73	24.9	2.1	1.1	8.9	2.9	0.4	11.6	71.5	28.5
YG-20	65	27.2	7.8	3.2	11	4.1	2	6.9	81.8	18.2

6. Line 214: typo; need extra space

Thanks and done.

7. Line 223: The “Virgilian” is the (approximate) time equivalent to the Gzhelian and was/is widely used in North America, so if you want this to be a more comprehensive database consider using that search term as well.

Thanks for your suggestion. We added this keyword to the search, but unfortunately, no additional data was found.

8. Line 285: noun needed (“organic and inorganic” what?)— maybe “matter”?

Thanks for your suggestion. This sentence has been rewritten.

9. Line 302-303: But, consider the volume of vegetation that is required to result in a given volume of peat (or - even more so - coal). Clearly there will be a greater concentration in the latter owing to this volume difference. Is that the point you are trying to make? I’ m finding the reasoning in this paragraph difficult to follow; I think I understand your point, but it is a bit muddled in my reading.

Thanks for your suggestion. This sentence has been rewritten.

10. Line 320-321: I’m not sure what this means— the “…dipping of tonsteins by acid solutions.” Are you referring to the leaching of tonsteins by organic acids released/related to the coals?

Sorry, it was a mistake of expression on our part. As you correctly pointed out, our intended meaning was that trace element enrichment in the enclosed coal seams is likely due to leaching by acidic solutions. The statement has been rewritten.

11. Line 321-322: again, PCA might help?

Thanks for your suggestions. We attempted PCA, but the results did not help us improve our analysis.

12. Line 326: unclear what is meant by “closing coals”

Thanks, it has been modified.

13. Fig 5 - it would be easier to analyze the possible correlations by conducting multicomponent statistical analyses. Also, on this plot, each dot represents a coal sample from a correlative coal seam? Ie, are the labels on the left - “YG” - are those all discrete coal layers? Could you add a

graphical stratigraphic log to help visualization of this?

Thanks for your suggestions. However, as Zhang et al. (2023) noted, there were frequent and intense volcanic activities in Coal Seam No. 9, and a certain amount of volcanic clastic material was present in the coal. The clastic material from volcanic activities affects the compound content in the peatland, leading to signal interference. As a result, the outcomes of our quantitative data analysis were not ideal, and we could only conduct qualitative discussions. Based on your suggestions, we have added the graphical stratigraphic log in Fig. 5.

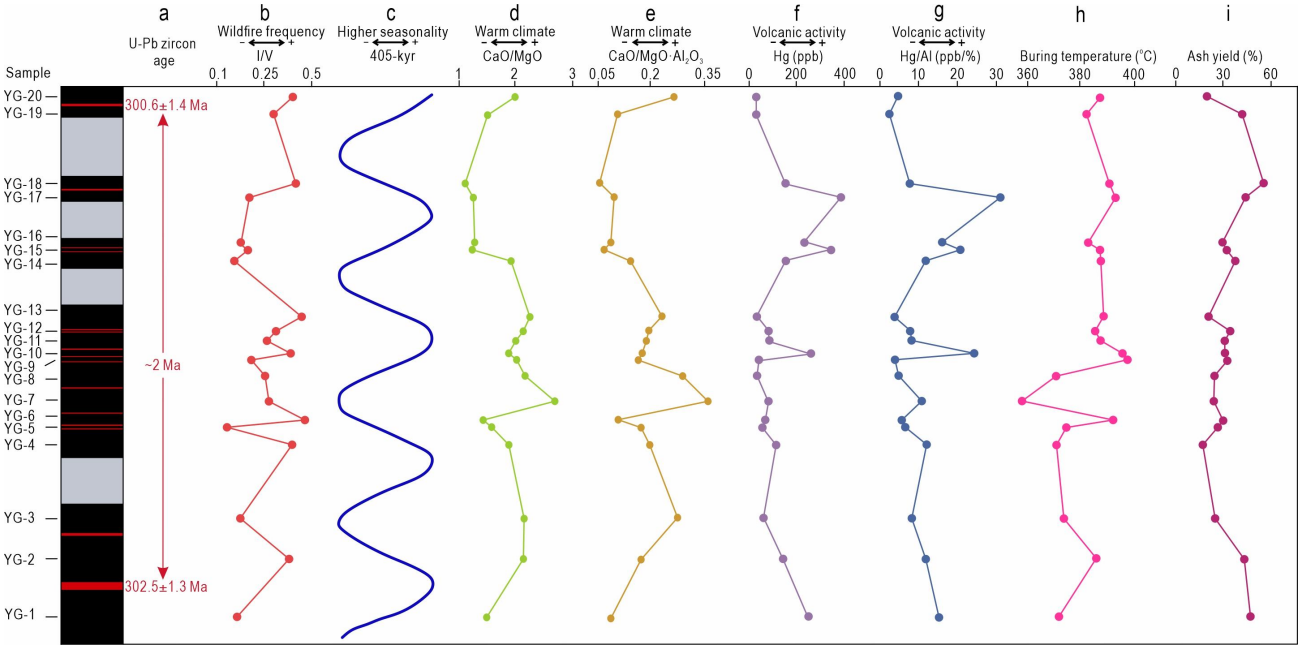

Fig. 5 Comprehensive analysis map of No.9 coal in Yaogou Mine. (a) Age of No. 9 coal, referred to Zhang et al. (2023a). (b) Inertinite/ Vitrinite variations in 20 coal samples. (c) Long eccentricity orbital cycle variation, referred to Wu et al. (2023). (d) CaO/MgO trends in 20 coal samples. (e) CaO/MgO • Al2O3 trends in 20 coal samples. (f) Hg content trends in 20 coal samples. (g) Hg/Al trends in 20 coal samples. (h) Combustion temperature trends in 20 coal samples. (i) Ash yield trends in 20 coal samples.

14. If I am understanding correctly, you are suggesting that various curves here reflect the eccentricity curve, based on visual comparison. But to really be convincing, I think this would require a more quantitative analysis, and probably with many more data points (than the 20 here).

Thanks for your suggestions. Indeed, with our 20 data points, it is not possible to establish an astronomical orbital cycle. Following Reviewer 1's suggestions, we compared our data again using the known orbital cycle model (Wu et al., 2023) and our age constraints. We found that the results were consistent with our previous assumptions.

15. Line 351: Although such metrics have been used to assess weathering and, by extension, climate, recent studies have called this into question owing to the strong (overriding) control of provenance on these oxides.

Thanks for your suggestions. As you mentioned, these oxides are greatly influenced by the provenance, which introduces interference in our quantitative data analysis. Therefore, we conducted only qualitative analysis to explore the impact of astronomically driven climate change on wildfire activity.

16. Line 360: typo

Thanks and done.

17. Line 377: The 1.9 Ma is not a depositional age, but I think you mean duration here, which means the units should be My. But that's not quite correct, because you have not considered the error bars. Considering the errors on both dates, the duration could be as long as 4.6 My, or as brief as 0.8 My.

Thanks for your suggestion. This sentence has been rewritten.

18. Line 379-380: I do not think that a visual comparison, with so few data points, is sufficient to make this claim.

Thanks for your suggestions. Our work is merely an attempt to propose a hypothesis, and we will further explore this aspect in future studies. We also hope to spark interest among other scholars in the study of the influence of Late Paleozoic orbital cycles on wildfire intensity.

19. Line 382: typo

Thanks and done.

Reference

Wu, H., Fang, Q., Hinnov, L. A., Zhang, S., Yang, T., Shi, M., and Li, H.: Astronomical time scale for the Paleozoic Era. Earth-Science Reviews, 104510, https://doi.org/10.1016/j.earscirev.2023.104510, 2023.

Zhang, Z., Lv, D., Hower, J. C., Wang, L., Shen, Y., Zhang, A., Xu, J., and Gao, J.: Geochronology, mineralogy, and geochemistry of tonsteins from the Pennsylvanian Taiyuan Formation of the Jungar Coalfield, Ordos Basin, North China, International Journal of Coal Geology, 267, 104183, https://doi.org/10.1016/j.coal.2023.104183, 2023.