Thanks very much for your comments. We very much appreciate the time and effort the reviewer dedicated to revising our manuscript. We will address them in detail in the revised manuscript. We will address some of the reviewer's comments at this stage.

***Comments**: My first consideration deals with the title of this manuscript "paleoclimate reconstruction". After read the work, authors do not really inform nor describe the climate characteristics of the Brazilian late Aptian type: tropical (equatorial??), subtropical, temperate, dry, rainy, with rains only in a particular season, etc??*

We would like to clarify that the intention of our article was to take into account the existing climatic maps (Chumakov et al., 1995, Scotese, 2016, Hay & Floegel 2002) that suggest an arid climate during the Aptian period. However, our study, along with another research, including our own, indicates that especially in the late Aptian, the climate conditions were not entirely arid. We have observed evidence suggesting a transition to a more humid condition during this period, which can be attributed to the establishment of the South Atlantic Ocean and the intensification of the humid belt (ITCZ).

This change towards a more humid condition aligns perfectly with the well-known three paleoclimatic phases (pre-evaporitic, evaporitic, and post- evaporitic) observed in some Brazilian sedimentary basins.

***Comments**: They only consider the variation of five bioclimatic groups, which built from group taxa according their botanical affinity. These affinities considered comparing the identified palynological taxa from similar found in recent floras. Concretely, authors mentioned the literature of Dino (1994), Carvalho (2004), Souza-Lima and Silva (2018) and Jansonius et al. (1976-1996). However, they do not consider the "Sporomorph Ecogroup Model" of Abbink et al (2004) nor other studies carried on the northeastern Gondwana (Boukhamsin et al., 2023). These works indicate that the Araucariaceae are mainly linked to coastal environments being not frequent in uplands.*

We understand that palynological records are one the best indicators of the dynamics of climate changes during the late Aptian. The palynological record is rich, and variations in the composition and abundance of palynomorphs have been crucial for understanding these changes. Therefore, to gain a better understanding of climatic dynamics, we grouped the palynomorphs into bioclimatic groups, with botanical affinity playing a significant role. These affinities were established through extensive effort, considering articles and personal communications (e.g. Prof. James Doyle) with various specialists in the field. While this work is continually evolving, we believe that the table of affinities presents robust results. We utilized the excellent work of Abbink et al. (2004) in Carvalho et al. (2022. Unfortunately, in the case of *Araucariacites*, we do not fully agree with the attribution of being "mainly" associated with coastal

environments. Indeed, currently, especially in New Caledonia, the occurrence of Araucaria near the coast is recorded. However, the majority of occurrences are in upland environments, with humidity coming from the sea but not in coastal regions. Furthermore, it is worth noting that in several studies of the Aptian in Brazilian basins, the genus *Araucariacites* is always associated with fern-assigned spores from upland areas (e.g. Dicksoniaceae), and its significant abundance coincides with low abundance of xerophytic elements from coastal environments.

Regarding the study by Boukhamsin et al. (2023) in the Gondwana region, we did not mention it because we received it after the submission of the manuscript in question. This work specifically focuses on the early Aptian, which climatically does not show significant changes (always arid), unlike the upper Aptian period we studied.

***Comments**: ……that Cheirolepidiaceae could inhabit different environments, and that several Anemiacean spores were produced by ferns of Ruffordia type indicatives of savannas (Mohr et al., 2015).*

Regarding Cheirolepidiaceae, it is indeed recognized that this genus is associated with arid climates, and they can also be found in other environments. We mentioned this in other studies (Carvalho et al., 2017, 2019, 2022). The association with coastal environments often arises from the connection of these elements with evaporitic deposits (Francis, 1983). Although this study does not focus on such deposits, it is worth noting that in records with high values of *Classopollis*, it is not uncommon to find elevated values of *Subtilisphaera* (dinoflagellate cyst), which is typical of coastal marine environments (Arai et al., 2000). As for the Anemiacean spores, although it is possible to find these elements in drier environments (Duarte et al., 2019), the majority of studies associate them with more humid environments, as ferns depend on moisture for their reproductive cycle.

***Comments**: Together the miospores, do the studied samples include dinoflagellates cyst, acritarchs, Tasmanaceae or foraminifera test lining? Are the studied samples marine influenced? Please, briefly explain.*

Despite the presence of evaporite layers, no marine elements were recorded in the studied samples. We briefly mentioned this in line 302.

***Comments**: The IndVal index is not well explained. I would greatly appreciate a longer explanation considering the meaning of "specify" (line 198) and "fidelity" (line 199).*

The IndVal index, short for Indicator Value index, is a statistical measure used to assess the fidelity and specificity of a particular species or taxon to a given habitat or environmental condition, in our case, the paleoclimatic phases. It quantifies the association between a species and a specific habitat, providing insights into its ecological preferences, in our case the paleoclimate conditions.

In the context of our study, "specify" refers to the degree to which a species or taxon is restricted or specific to a particular climate phase or environmental condition. A high specificity value indicates a strong association between the species and the paleoclimate, suggesting that its presence is indicative of that specific climate phase.

On the other hand, "fidelity" refers to the degree of fidelity of a species/taxon to a particular climate condition. It measures how consistently the species occurs in that specific climate condition compared to other climates. A high fidelity value indicates that the species is strongly associated with the climate conditions (e.g., arid) of interest and is likely to be a reliable indicator of that climate.

In our study, we used the IndVal index to assess the ecological significance of the palynomorphs and their potential as indicators of specific paleoclimate phase (pre-evaporitic, evaporitic and post-evaporitic). By calculating the IndVal index for each palynomorph and bioclimatic group, we were able to determine which taxa showed a strong association with specific climatic conditions.

We had initially chosen to cite the studies where we used the IndVal index (Carvalho, et al., 2017, Trindade & Carvalho, 2018; Leandro et al., 2020; Carvalho et al., 2022), because they provide a more detailed explanation of the index and its application. However, we understand the importance of providing a complete explanation within our own manuscript.

In light of your feedback, we will expand our explanation of the IndVal index in our revised version. We will provide a more comprehensive description of the index, including its components, and ensure a clear understanding of the meaning of "specify" and "fidelity" within the context of our study.

Comments: *Pteridosperms are truly gymnosperms (see line 209)*

Thank you for bringing it to our attention. We separated it because we found it relevant to highlight this group. However, we will make the necessary correction.

Comments: *The information of lines 214–218 is not a result. It must be moved to the chapter of methods.*

We understand, but in that part, we present the results (percentage of each group) and only mention the sources we used to identify the 69 genera.

Comments: ***Line 236: “trilete psilate” … spores??***

Yes, they are morphotypes (psilate triletes) that we attribute to humid conditions, so that's why we included them in the hygrophyte group. We used *Cyathidites* as an

example, but in this case, it is incorrect because we actually included that genus in the upland group.

***Comments**: In my opinion, the Figs. 3–8 are not useful because their data can be found in Fig. 9. I would move these figures to an appendix as supplementary material. In addition, the samples of each well must include in the diagrams.*

I apologize for any disagreement. The composite profile shown in Figure 9 is indeed crucial, but it provides a more general overview of the entire region. Since the geographical area is quite extensive, we deemed it important to present the information from each well studied by area. This allows for a more detailed analysis and understanding of the specific characteristics within each area.

Comments**: **Line 286: The dendrogram is showed in Fig. 9 not in Fig. 8.

Correct, we will make the alteration accordingly.

***Comments**: On the one hand, the dendrogram of Fig. 9 differentiate-well the Bragança Fm. to the Codó Fm. On the other hand, the dendrogram does not reflect the transition between the pre-evaporitic phase to the evaporitic one. Please, explain these stratigraphic and palaeoenvironmental aspects.*

Indeed, the main "break" differentiates the two formations. However, when we further subdivide into more intervals, we observe a division composed of only one sample (upland peak) in the pre-evaporitic phase, a break that limits the evaporitic and post-evaporitic phases, and the third most important break that limits the pre-evaporitic and evaporitic phases (we can add the division lines in the figure). The transition from the pre-evaporitic to the evaporitic phase is indeed more gradual, as we understand it to be a progressive process of aridification, culminating in the evaporitic phase, including salt deposition. In contrast, the transition from the evaporitic phase to the post-evaporitic phase was a more abrupt process.

***Comments**: This work needs wider explanation about the significate of a pre-evaporitic, evaporitic and post-evaporitic phases, since the description of climatic phases is based on the climate evolution during these three phases.*

We appreciate your feedback and understand the need for a broader explanation of the significance of the pre-evaporitic, evaporitic, and post-evaporitic phases, as the description of climatic phases is based on the climate evolution during these three phases. We did not further extend the explanation because we indicated the references (Milani et al., 2007; Carvalho et al., 2022) that detail the climatic and

geological aspects of the three phases. However, we can delve deeper into the topic in this article.

***Comments**: Line 351. Please, revise the age of Santos et al. (2022) considering the reference in line 546.*

We will correct in the reference list; the correct year is 2022.

***Comments**: Line 360… "with sections in the Espiritu Santo Basin, located much farther south (at 20˚S)". Be careful. According to the Fig. 11B, the Espiritu Santo Basin is between 20˚-25˚*

Approximately ~20°.

***Comments**: Line 399-401. "Considering the distribution curves of bioclimatic groups, as well as the indicator species (IndVal) and diversity, a clear upward trend toward increased humidity was observed". However, climate was still arid/semiarid (xerophytes dominated)!! The same with respect the post evaporitic phase (lines 408-410). Please, could you explain more accurately these conclusions?*

In fact, the entire section is dominated by the genus *Classopollis*, which indicates arid conditions. We attempted to show that in the pre- and post-evaporitic phases, although still dominant, the genus shows a decreasing trend, accompanied by an increase in elements associated with more humid conditions, as is the case in the post-evaporitic phase. This trend is more evident in some sections. In Figure 9 (composite profile), there is a clear increase in elements (tropical lowland, upland, hygrophytes) associated with a more humid condition.

***Comments**: Lines 368 and 407. "Afropollis spp. as an indicator species, indicated some periods of humidity". Please, explain this subject considering the paper of Carvalho et al. (2022).*

In the study conducted by Carvalho et al. (2022), correlation analysis indicates a weak negative correlation between Afropollis (tropical lowland) and Classopollis (xerophytes). This pattern suggests that Afropollis may be adapted to a hot environment similar to Classopollis, but with relatively higher moisture levels.

***Comments**: Authors have to revise the latin names of different species such as "Callialasporites dampiere" in the caption of the Plate 5 and "Arecipites microfovolatus", in the caption of the Plate 9.*

Correct, we will make the alteration accordingly.

***Comments**: In Figure 1, please, provide a small map of the NW Brazil where will indicate the studied area.*

Correct, we will add the map.

***Comments**: In Figure 11B, could you put the same colour to the dots representing the Espiritu Santo well? Likewise, authors have to indicate the meaning of the green and yellow colours either in the figure or in the footnotes.*

We will make the correction.

***Comments**: In the Table 2, please, revise the names of the taxa (e.g., "Granulatusporites") and the botanical affinities (e.g., "Schzaeales"). In addition, Eucommiidites has to be related to the extinct family Erdtmanithecales and not to Gnetales (Friis et al. 2011).*

We will make the correction.