

Dear editor and authors,

The paper by Campeny et al is an interesting investigation of REE potential in the Fuerteventura carbonatites. This is also interesting because oceanic carbonatites have never been thoroughly assessed for REE mineralisation before (as far as I know). There is also scientific value in that the rocks obviously contain antiskarns, a very timely research topic (currently unrecognised by the authors, see comments below). I recommend the paper to be revised.

The authors greatly appreciate the overall positive comments on the article provided by Dr. Anenburg, as well as his corrections and proposed changes. We believe that they are very constructive and significantly enhance the entire manuscript. Now, we will proceed to address his specific observations, aiming to provide as detailed a response as possible.

line 25: Here, and after, please use significant figures correctly. A number like "10301.83" is meaningless because it implies that you know it to a precision of 0.01 ppm, and it's distinct to 10301.84 or 10301.32. Something like "about 10000 ppm" or even "about 1 wt%" should be ok, and please learn on correct usage of significant figures.

The authors agree with this comment and the entire manuscript concentration numbers have been amended according to it.

line 28: "enrichment" indicates a process. You just mean that the silicate rocks aren't as REE-rich as the carbonatites?

The authors agree with this comment. The term "enrichment" has been replaced by "contents".

line 67: Not accurate. Light REE are coming from magmatic rocks, primarily carbonatites. Heavy REE are coming from soils and weathering products.

The authors agree with this comment. The sentence has been amended according to this good appreciation.

line 72: The 50% limit by Le Maitre is restrictive and misleading. The carbonatite community is moving away to define carbonatites as rocks that form from carbonate melts, regardless of carbonate mineral content. See Yaxley et al 2022 here <http://www.annualreviews.org/eprint/JVDPC4NDH4BAFJNWDVJ/full/10.1146/annurev-earth-032320-104243>

The authors agree with this comment. This sentence has been amended and we also added the proposed reference.

line 73: "basic" is outdated - please use mafic, ultramafic.

The authors agree with this comment. This sentence has been correspondingly amended.

line 86: Since you're specifically talking about REEs in carbonatites, the processes outlined by Anenburg et al 2021 are probably very relevant here <https://doi.org/10.2138/gselements.17.5.327> and also Yaxley et al 2022 discusses this in detail.

The authors agree with this comment. The references have been added accordingly.

line 87: This paragraph will benefit from reference to Weidendorfer's work, for example <https://doi.org/10.1130/G39621.1> and <https://doi.org/10.1007/s00410-016-1249-5>

The authors agree with this comment. The reference has been added accordingly.

line 92: Which "aforementioned approach"? You're doing mineralogy and geochemistry, but you hardly talked about any mineralogical and geochemical approach above.

First paragraphs want to introduce the topic of Rare Earths and their significance from a general point of view. However, this introductory sentence ("aforementioned approach) has been removed to avoid misunderstanding.

line 123: "The FBC unit..." (other places in the places where you can safely switch word order and get rid of the "of the"...)

The authors agree with this comment. This sentence has been amended.

line 131: Partial fusion of what? The country rock?

The authors agree that this term could generate misunderstanding. Considering that the intention of this section is only to report a general geological setting, the sentence has been simplified.

line 139: Dikes of what? Carbonatites? Something else? Implied by your next sentence but worthwhile to clearly say this.

The authors agree with this comment. This sentence has been amended complementing the information about the composition of the FBC dykes.

line 141: Can you mark on the figure exactly where the fenites and carbonatites are?

Unfortunately, fenitization areas cannot be easily recognized in the presented pictures and this is why they are not marked in the referenced figure.

line 147: "Pyroxenite" cannot really be a magma type - it is a cumulate rock formed by crystallisation from a magma, with the magma migrating elsewhere. Alternatively, "pyroxenite" metasomatic zones around carbonatites are probably antiskarns - see for example <https://doi.org/10.2475/03.2018.03> or <https://doi.org/10.1016/j.chemgeo.2022.120888>

The reviewer is likely correct, and these zones are probably anti-skarn formations. However, in the FBC they haven't been thoroughly studied from this perspective in any previous research. As this is an introductory section on the geology of Fuerteventura, we believe we should adhere to the data provided by other authors and refrain from making any conjectures. Nonetheless, we understand and agree with the comment regarding the pyroxenites, so the sentence has been simplified to avoid this error.

line 157-184: If your paper is on REE, and these units have no REE, why are they in the paper? Consider removing this.

This section aims to provide an introductory text to the geology of Fuerteventura, intending to familiarize the reader with the main geological units of the island and to aid in the interpretation and comprehension of the geological map presented in Figure 1. Therefore, although these units have not been assessed for their Rare Earth Element (REE) content, it is not problematic to discuss them in this introductory section of the manuscript. Hence, despite appreciating the reviewer's observation, the authors have chosen not to eliminate this section and to maintain it in its original form.

line 191: Remove commas from this sentence

The authors agree with this comment. This sentence has been amended.

line 192: Again, the Anenburg et al 2021 paper is probably relevant here

The authors agree with this comment. The reference has been added accordingly.

line 196: Not only that, sometimes weathering can make a deposit into an economic one, with the two best examples being Araxa and Mount Weld: <https://doi.org/10.1093/petrology/egae007> and <https://doi.org/10.1016/j.jsames.2023.104311>

The authors agree with the reviewer that both proposed references were appropriate in this sentence. In addition, Chandler et al., 2024, as a new cite, has been also included in the reference section.

line 252: Check usage of word "basic"

The authors agree with this comment. This sentence has been amended and the term "basic" has been replaced by "mafic".

line 256: "primarily aegirine-augite and biotite" - the "primarily" indicates there are other mafic minerals. What are they?

The authors agree with this comment, this sentence has been amended to avoid misunderstanding.

line 258: Described where? Here? If yes, then rephrase without "described" because it's implied...

The authors agree with this correction and the sentence has been correspondingly amended.

line 295: What you're describing are precisely "antiskarns", a very hot topic of research these days. Concept first introduced by Anenburg & Mavrogenes (2018) which I referenced above, also see in depth discussion in Yaxley et al 2022. Vasyukova and Willy-Jones also talk about this (not sure if they use the name "antiskarn" though). Some other examples where similar textures and styles are observed: <https://doi.org/10.1016/j.lithos.2023.107231> <https://doi.org/10.1016/j.lithos.2023.107480> <https://doi.org/10.1016/j.lithos.2022.106647>. The britholites you're seeing are also very typical. Experimentally recreated here: <https://doi.org/10.1126/sciadv.abb6570> (see experiment CbSi), and also observed in nature here <http://hdl.handle.net/1885/154263> There's also a paper should be out in Contributions to Mineralogy and Petrology on the topic very soon with thermodynamic modelling. If it's not out by the time you do the revision, then contact me and I'll send it to you.

The authors totally agree with this comment. Indeed, we agree that this term can be used to describe some areas related with the Fuerteventura carbonatites. Therefore, we have added a small paragraph commenting on it and included some of the references suggested by the reviewer.

line 300: Correct spelling is sulfates, not sulphates (f- spelling endorsed by the UK Royal Society of Chemistry for example). Also IMA-approved spelling is baryte, not barite

The authors appreciate this comment. Both terms have been amended in the entire manuscript.

line 320: Reduction in illite? This means you some to begin with, but this is the first time you're mentioning illite and chlorite

The authors agree with the reviewer's comment. There was a mistake in the sentence and it has been correspondingly amended.

line 329: Why don't you just say which elements, instead of referring to a supp table?

The authors agree with this comment. The sentence has been amended to avoid misunderstanding. However, we consider that the reference to Table S4 is useful and it has not been removed.

line 333: Please use this for typical crustal values <https://doi.org/10.1016/B978-0-08-095975-7.00301-6>

The authors accept this comment. Reference values for comparison have been replaced and used from Rudnick and Gao, 2014.

line 337: See previous comment on significant figures. You can leave this precision for the supp tables (as long as uncertainty is reported with it), but not in the main text.

The authors agree with this comment and the entire manuscript concentration numbers have been amended according to it.

line 352: You still haven't said which elements these are. What is "significant"?

The authors agree with the reviewer that the sentence is not very accurate and it does not provide significant information. Then, we decided to remove it to avoid misunderstanding,

line 355: How do you reconcile it with the fact that you had pyrochlore? Could this be an analytical artifact?

The authors agree with the reviewer that the results of HFSE are underestimated. For sure it is an analytical artifact generated by the poor digestion of pyrochlore. The section has been amended clarifying this point.

line 387,395: Significant figures

The authors agree with this comment and the entire manuscript concentration numbers have been amended according to it.

line 388: Use Rudnick, not Balaram

The authors accept this comment. Reference values for comparison have been replaced and used from Rudnick and Gao, 2014.

line 422-427: I recommend removing this. The topic is much more complex than you put it, and not really in the scope of your manuscript.

The authors agree with this comment. This sentence and their references have been correspondingly removed.

line 434: Why is this noteworthy? Calcite is overwhelmingly the most common mineral in all carbonatites worldwide. This is akin to saying that cpx is noteworthy in basalt or quartz in granite...

The authors completely agree with the reviewer that the sentence was not well written. This has been amended according to this comment.

line 503: This cannot be understated - Fuerteventura is an UNESCO biosphere reserve!

line 538: One final sentence could be useful here: "Given the non-exceptional REE grade of Fuerteventura compared to other deposits, most REE being hosted in unexploitable and refractory britholite, irregularly distributed mineralisation with low overall tonnage, and Fuerteventura being a UNESCO biosphere reserve, we conclude that economic development of any REE resources on the island is extremely unlikely to occur." And something similar in the abstract as well. Just saying, because on a bigger scale you don't want to start any unnecessary hype that Fuerteventura is "the next big thing" because no good can come out of this.

We had already considered the need to clarify this aspect as a final culmination of the discussion. In fact,

we already included a paragraph in the original manuscript (see lines 497 to 504) about this topic. However, we have adapted our final discussion sentences as well as the abstract, with some phrases proposed by Dr. Anenburg that we believe enhance the initial writing and provide greater solidity to the arguments presented.