From: Kristi Wallace

Subject: **Review comments for manuscript**: "TephAta – An online data collection of tephra data from the Atacama Desert" by Niklas Leicher et al.

Dear Editors,

Thank you for the opportunity to review this important manuscript. Below are my comments on the subject paper. I have used the review tools in Adobe Acrobat to add comments directly on the PDF (essd-2025-422_KW) and have also summarized them in bullet form below.

This manuscript describes an important regional tephra database for the Atacama Desert and Northern Andes, including detailed metadata on field sites, samples, chronology, stratigraphy, and glass geochemistry (major, minor, trace elements, and some isotopes) for 106 mid-Pleistocene tephras. I commend the authors for adopting best practices established by the global tephra community (Wallace et al., 2022) in building the TephAta database. Specifically, the authors have documented and reported key metadata (using predefined lists even), provided raw point geochemical data rather than averages, and included both primary and secondary analytical standards along with detailed methods.

This dataset represents a significant contribution to the literature and the scientific community. It will enable a wide range of applications across multiple disciplines, including volcanology (e.g., eruption histories, ash impacts, hazard assessment), archaeology (e.g., impacts, chronology), climate studies, and more. TephAta is the first accessible tephra database for this region and sets an excellent precedent for making tephra data FAIR, while encouraging future growth through contributions of new data and well-vetted legacy datasets. Furthermore, the authors have registered all stations (field sites) and samples with IGSNs, further adhering to FAIR data standards. The incorporation of tephra community best practices into the database design also establishes a strong model for future users and data collectors. Finally, the database includes a user-friendly front end, which will broaden accessibility and facilitate contributions over time.

GENERAL COMMENTS

Overall, the content of the manuscript is excellent. However, I recommend a thorough copy edit to improve clarity and readability in English especially in the abstract and introduction sections (subsequent sections are in better shape). While reviewing, I found numerous sentences that could benefit from rephrasing for clarity. Addressing all of these would require considerable time, so after a few pages, I shifted my focus from detailed copy edits to broader comments and technical issues. My review therefore emphasizes the manuscript's content, overall impact, and the value of the TephAta database it introduces, rather than line-by-line language corrections.

I appreciate the front-end user interface and the ability to plot data on maps and in geochemical space. Great job incorporating these tools, they not only enhance usability but also make it easier for me to evaluate the data within the database.

Thank you for acknowledging our work and providing valuable comments for further improvement of the manuscript. We followed your suggestions and appreciate your efforts in improving clarity and readability of the text. A point-by-point reply is found below, listing our statement (red text) and adjustments made in the manuscript (blue text in italics).

I am not a petrologist/geochemist and therefore unable to add substantiative comments on trace element geochemistry and groupings (lines 452-495)

Line 26: please include physical and chemical characterization of tephra layers (location, geochem, age, physical characteristic) and not just geochem and age especially since the term tephrostratigraphic framework' is included in the sentence.

We rephrased the sentence:

To develop tephrostratigraphic frameworks, precise physical, geochemical and chronological characterization of tephra layers and their sampling site is needed.

Line 30: not sure "volcanic glass" is need in parenthesis here as the stratigraphy is documenting the tephra layer itself which contains glass, minerals, lithics and suggest indicating what you analyze (glass phase) later in the manuscript or insert "glass" geochemical composition of Pleistocene tephra layers…

We rephrased the sentence:

There, glass phase geochemical compositions of Pleistocene tephra layers were recently systematically investigated for their stratigraphy and chronology within the scope of the Collaborative Research Centre 'Earth – Evolution at the Dry Limit' (CRC1211).

Line 42: remove 'so-called' and just use the term volcanic 'ash layers' or 'tephra layers', no parenthetical needed (you already did so on line 23)
We rephrased the sentence, please see the comment on line 42-44 below.

Line 42-44: awkward sentences and suggest revising to be more concise. Suggestion: Volcanic ash deposits are found within many types of sedimentary successions and serve as excellent chronological and stratigraphic marker horizons. This makes them highly valuable for stratigraphic and chronological studies, such as those in geoscience and archaeology (Lowe, 2011), through the application of tephrostratigraphy and tephrochronology.

We rephrased the sentence:

Volcanic ash deposits are intercalated within many types of sedimentary successions. This makes them highly valuable as isochronous marker horizons for stratigraphic and chronological studies in geoscience and archaeology (Lowe, 2011).

Line 50, these terms are becoming onerous and wonder if you should just refer to them as 'Tephrochronology' starting here? Suggest rewording: Tephochronology is a well-developed and frequently used technique for correlating and dating geological sequences and events in many regions of the world including…

We followed your suggestion and now just refer to "tephrochronology" within the manuscript if both terms had been used.

Line 55: please add Alaska (GeoDiva, Cameron et al.,2022). Cameron, C.E., Crass, S.W., and AVO Staff, eds, 2022, Geologic database of information on volcanoes in Alaska (GeoDIVA): Alaska Division of Geologic and Geophysical Surveys Digital Data Series 20, https://doi.org/10.14509/geodiva, https://doi.org/10.14509/30901.

The GeoDiva database and the respective reference was added to the list of databases.

Line 65-69: Be clear what you mean by "pre-requisite" for tephra geochemical fingerprints as magma-crust interactions is too broad of a definition. I think you just mean that distinct geochemistry is ideal for discriminating tephras?
As requested by reviewer I, we rephrased that section.

Geochemical variations specific to individual volcanoes and eruptions are driven not only by parental magma composition and the degree of crystallization, but also by the geodynamic evolution of the Andes. The spatial and temporal differences in the thickness and composition of the crust, led to varying degrees of magma-crust interactions and thus to variable/additional magmatic differentiation of individual eruptions (Kay et al., 2010; Brandmeier and Wörner, 2016; Burns and De Silva, 2023).

Line 274: suggest rewording these sentences for clarity. Suggested rewording: "For homogeneous glass, SiO_2 concentrations obtained from EPMA-WDS data were used as the internal standard during LA-ICP-MS trace element data reduction. For samples with multiple glass populations, additional SEM-EDS analyses were performed and mapped to specific point data to provide internal standards for LA-ICP-MS trace element calculations."

After a comprehensive review of the entire dataset, we re-examined the two samples for which LA-ICP-MS data reduction had been based on grain-specific SiO_2 values. We recognize that our previous description of this approach was unclear and, in part, inaccurate, and we sincerely apologize for this oversight. The grain-specific SiO_2 data in question were obtained during SEM-EDS sessions for which no secondary standard measurements are available. Although these values showed good agreement with the corresponding EPMA-WDS data of the sample, the lack of secondary standard data limits their analytical robustness. Consequently, we excluded these grain-specific SEM-EDS data and instead applied the median SiO_2 concentrations determined by EPMA-WDS consistently across all samples in the dataset as also SiO_2 concentrations appeared homogenous. The methods descriptions within the manuscript have been corrected.

Line 298-300: I am confused by this sentence. Clarify please. Also, were all major and minor oxides analyzed by EPMA or using both EPMA and SEM and if so, is this clear in the Db and have these methods been proven to be comparable on your 2 instruments?

We adjusted that paragraph to avoid confusion. Details about the analytical precision and accuracy of both instruments are given in the chapter about geochemical data quality and demonstrate the overall comparability of the data. Except for three samples, all samples discussed within this manuscript were analyzed by EPMA-WDS, which provides the basis for data classification.

Line 310: Is this 1 standard deviation or 2?

As requested by reviewer I, we rephrased that section. We had calculated the relative standard deviation using a one standard deviation. We have now changed this according to both reviewers' suggestion to relative two standard deviation (two standard deviation/mean).

Line 425: unclear what "For samples listed with an incomplete or missing geochemical characterization…. means? Do you mean those data are planned to be collected but are not in the db now? not sure this is worth mentioning?

Yes, we addressed the samples for which no complete (major, minor and trace element) composition is available at present. We deleted the sentence and integrated this information within the conclusion part of the manuscript.

Line 426: I assume new analyses of legacy samples are in the db and not the legacy data itself? Best to only include "best" data in the Db

As requested by reviewer I, we rephrased this section. In addition to newly acquired data for legacy samples, we also added existing legacy data within the database and flagged such questionable data as "not reliable" within the download file of the EPMA-WDS data. We did so to provide a most complete dataset accounting also for existing data. However, we see the point that flagging of the data might by overseen and thus have removed these entries to include only "best" data.

Line 501: do you mean that some tephras in the db were found across the Atacama Desert region? The use of "archive" made me think these tephras are found in other digital or other data archives but I think you mean they are widespread and found in the regional stratigraphy?

We used the term "archive" for different sedimentary deposits. As requested by reviewer I, we changed the sentence.

Some tephra layers were found in different sedimentary archives (e.g., tephra layers of CG1, CG2, CG9).

Line 527: this is really a "tephrochronological" approach - using tephras as time stratigraphic markers by correlating undated tephras to one with a determined age.

We changed the sentence accordingly.

In some archives, tephrochronology also provides an independent validation of direct dating of host sediment.

Line 545: …available for download on or after 2027-10-21. The links all go to the TephAta website and not EarthChem. I appreciate that the data are uploaded to EarthChem repository as a back up in case the TephAta Db goes down and because EarthChem is a global accepted repository standard, but it would be nice to see what those data look like in EarthChem – did you use the Tephra templates provided in EarthChem?:
https://earthchem.org/communities/tephra#tephra-templates.
EC works well for certain data types, such as geochemistry, but it does not store ALL tephra-related information in the database, including some of the data you collected. However, the tephra templates allow you to archive this information in a spreadsheet, even if not all fields are searchable within the database.

We apologize for the confusion regarding the data stored at EarthChem. The uploaded data had to be embargoed to allow data correction being requested within the review process. The data being uploaded at EarthChem was attached as supplementary dataset to this manuscript, somehow this information seemed to be not available within the review files. We have used tephra-templates of EC for uploading geochemical data and provided an additional file summarizing the most important meta data of the samples. The embargo at EarthChem will be released once this manuscript is accepted for publication, so that a backup of the herein discussed data is available.

Line 555: Is IGSN automation a feature of TephAta? If so, how do you ensure legacy samples don't already have IGSN's.

Yes, the IGSN registration is an automated feature of TephAta working together with the GFZ Potsdam IGSN registration facility. So far, legacy samples included within the db, had no registered IGSN. However, we have now implemented a function within the TephAta data submission, which allows us to link the sample with an existing IGSN. If an IGSN is entered for a specific sample, no new IGSN will be minted.

Line 559: unclear what this means? SERNAEOMIN has 400 samples it is ready to upload to TephAta? Can you elaborate a bit here, are they waiting to publish their data and then enter it into TephAta?

We rephrased that paragraph.

For samples listed with an incomplete or missing geochemical characterization, the pending major, minor, and/or trace element analyses data will be complemented within the successive analytical work of the CRC1211. Future expansions will progressively incorporate over 400 additional samples from SERNAGEOMIN and current CRC activities. This set of samples will cover a time interval from the Early Miocene to the Holocene and has a spatial extent from the Chilean coast to the Andes along 18-30°S.

Line 565: Tephra community has been working with StraboSpot for the last several year to

develop a tephra module in Strabospot following the tephra community best practices for field collection and this will align well with TephAta. There will be a workshop at EGU to demo the app and to get community feedback.

This will be of great value for simplifying the process of (meta-)data documentation of tephra layers and is very interesting. We could think of an interface to integrate that within an updated version of TephAta.

Line 567: be sure to include "glass" or glass phase geochemistry here to avoid confusion with whole rock composition of the parent material which of course is rarely rhyolite or at least is less evolved than the glass Geochem. Suggest rewording lines **567-569**: "The Geochemical characterization…."Major and minor …." **to** "Tephras in this study have predominantly rhyolitic glass compositions. Major and minor element glass compositions can differentiate only some tephra layers, whereas most layers are better distinguished by their trace-element glass compositions."

We changed the sentence as suggested.

I wonder if you are able to link any of these tephras to volcanic sources? I notice in the db itself under Tephra Equivalents that Volcano says N/A for everything.

This was also commented on by reviewer I. We avoided an in-depth discussion about potential volcanic sources of tephra layers at the present state, as the lack of suitable data (glass geochemical data, precise chronological data of young eruptions) from proximal volcanic deposits does not allow a robust correlation yet and is beyond the scope of the current paper, presenting the database. We plan to investigate the source of the identified tephra cluster within future work, including more proximal data and refined chronological information to ensure robust alignments. Therefore, we already integrated this function within TephAta as a placeholder to document the origin of tephra layers and link those samples to a specific volcano in the future. This will also allow us to search within TephAta for all eruptions of a specific volcano.

TECHNICAL CORRECTIONS

The db name, "TephATA' and 'TephAta' are used throughout and suggest changing them all to one usage. The Website looks like yet another, 'Tephata'

We unified the name within the manuscript and the database website.

Line 36: what is meant by Leicher N., 2027 if we are only in the year 2026)? Does this have to do with an embargo until this paper is published? The data in EarthChem don't appear to be visible.

Yes, this is related to the embargo of the data, in order to be able to incorporate review requested within the datasets. Files will become available after acceptance of this manuscript.

Line 37: change 'origin' to 'originating' from 91 tephra deposits…
Changed as requested.

Line 46: Due to aeolian fractionation during volcanic 'ash' dispersal
Changed as requested.

Line 70: change "discussed" to "thought"
Changed as requested.

Line 71: delete "a" ensured good preservation of…
Changed as requested.

Line 73: add or for use in extended ….
Changed as requested.

Line 75: suggest rewording: "Correlation of tephra layers by their glass geochemistry is rare in the Atacama Desert region"
Changed as requested.

Line 80: suggest rewording: A tephrostratigraphic framework using glass geochemistry and deposit age of widespread marker tephra layers is currently missing at the western side of the Andes.
We rephrased the sentence.

Line 85: other places this is listed as CRC1211 without a space after CRC.
We unified the name CRC1211 within the manuscript.

Line 93-94: suggest rewording: Within the CRC1211, tephrochronology was used for the first time to establish a time-stratigraphic framework for the Atacama Desert.
We rephrased the sentence.

Line 94. Change, "The obtained data" to "these data are stored in a newly developed…, TephAta"
Changed as requested.

Line 95-97: Suggest rewording: TephAta includes a wide variety of tephra metadata, from field context to physical and chemical characteristics.
We rephrased the sentence.

Line 334: tephra samples are source from all types (add the 's') of sediment deposits
Changed as requested.

Line 340: the definition of "crypto" is invisible to the naked eye so crypto in parenthesis here is incorrect or you could update to "sub-cm to crypto tephra deposits." but sub-cm is not synonymous with crypto

We agree on that definition and have adjusted the sentence to clarify the meaning.

COMMENTS ON TephAta Db ITSELF (and data within)

I suggest that the authors focus on making sure the data in the db represents their best curated dataset and removes any questionable data. This means removing all data with low or high totals, those with missing method information and analytical standards data.

We thoroughly revisited all geochemical datasets and removed questionable analyses from the database and the data back-up stored at EC. All geochemical data is removed from the database, and the revisited datasets are currently being reuploaded. A compilation of all reviewed data will be made available within a revised version as supplementary material, which will also be made available at EarthChem.

I suggest changing the name "Geochemistry" to "Glass Geochemistry"
We agree that the current datasets would suggest such renaming. However, the general design of TephAta was set to account for all different kinds of data, including data which might be stored in the future (e.g. compositional data of mineral phases). To guarantee that users are

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aware of which phase was analyzed, a two-fold declaration of the type of data within TephAta is requested. Within the sample meta-data description, users can select from a pre-defined list which kind of geochemical data was acquired (e.g. "EPMA-WDS, glass" or "EPMA-WDS mineral"). Further, within the given templates for uploading geochemical data, users are asked to define the phase being analyzed and which analytical method was applied. Therefore, we did not change the category name.

It would be nice to see more **sample descriptions** in the field like that under sample TA-7 – this is currently listed under the General tab/Comment but wonder if there is a more dedicated place to include a sample description that could be text based and be a catch all for thickness, etc. Putting this in a comments field feels a little out of place and think layer description or sample description would be better.

TephAta includes already the requested options for describing samples. Within the general sample tab, a general description can be given as comment, but also many information on how the sample was taken and what analyses were performed can be stored. More detailed sample descriptions are enabled within the subsequent categories. Details on thickness, color, continuity, texture, components and many other observations can be provided within the "Physical Properties" (former Morphology) category. Here a mixture of predefined lists and text/number-based fields is given for sample description.

We updated the supplement material to document a better overview of the input forms within TephAta.

I am noticing that more fields show up if there is information to go in them, e.g., sample "CHU Tephra" has information under Analysis Details/Lab Split info: so it might be nice to explain in the manuscript that data only show up for fields that are filled in. Do you have templates for uploading site & sample data in addition to the geochemical data? I can only find the Geochem templates on the website.

We clarified within the text that only fields which contain data are shown on the website.

Datasets stored within TephAta can be accessed through the categories: "sites" and "samples". All data associated with a given sample or site are presented on a dedicated page that compiles and displays all shared entries.

We also extended the supplementary material, improving the explanatory table and showing all input options, to provide a better overview of the type of data to be stored.
There is no automated data upload via template of site and sample information implemented within TephAta at present. This may be enabled in an updated future version of TephAta. However, in order that users can prepare documentation of such data, we now added a dedicated template form for download on the "TephAta Information" page (https://www.crc1211db.uni-koeln.de/search/tephataInfo.php). Users can use that form for collecting all necessary information, before entering such within the database.

I suggest changing all instances of the name of the Db tephata to TephAta including on the website. Left hand column of menus especially.

We unified the name within the website.

Tephra Equivalents page: Could this section be titled "Unique Tephra Layers" or something similar? The current wording feels a bit awkward, though it's not a major issue. Also, the wording in the green "Equivalents" box says "List of eruptions with associated tephra samples," which is helpful. Including similar explanatory text on the "Tephra Equivalents" page would improve clarity, perhaps noting that these may not represent unique or single eruptions, but

rather tephras that are geochemically indistinguishable and considered equivalent or from the same source volcano at minimum.

We renamed this section into "Tephra Correlation Group" and added additional explanations to the respective webpage.

Samples page: When performing a search on the Samples page, I filtered by SiO_2 range and received a table. Could you clarify what "Title" refers to? Also, table headers like MME-CM or TE-CM are not immediately clear—there seems to be space to spell these out for better understanding. Similarly, does "Site" refer to a site ID, site type, or site location? The terminology is a bit confusing, and adding clarification would improve usability. If you've already considered this extensively, I understand, but clearer labels could add value for users. I do love that correlated tephra are in the output! Also so many great search filters here – awesome! Can you add IGSN to the sample search?

We reviewed all table headers to provide a better understanding of the terms, however available cell space is limited and headers were tried to keep short. We further added text with explanations to the top of the website and updated the mouse-over functions (explanations popping up if mouse is placed on header text). We also added an IGSN filter. (https://www.crc1211db.uni-koeln.de/search/viewAllSamples.php).

Sites page: is title the site ID name? might be better to call it Site ID rather than Title? What is meant by Identifier? I assume this is the site IGSN, can you call it that instead of identifier?

We adjusted the table headers as suggested.

Clarification on IGSN Links and Registration: When I click on the IGSN for sites or samples, it doesn't seem to lead anywhere. Could you clarify which system was used to register these site/samples? For example, I checked SESAR for sample 19MEJ09 (IGSN #10273/GF1211S-4E), but it does not appear there. I haven't tried other systems yet, but it seems there needs clarification on how samples and sites are registered with IGSN numbers.

Samples were registered via GFZ Data Services Potsdam. During set up of TephAta we encountered the same issue and contacted the IGSN committee to address that issue. To our knowledge, there is no global IGSN registration list, which allows that samples created by IGSN provider "A", are automatically listed/found at IGSN provider "B". Our latest information is that SESAR and the IGSN committee are working on a solution. We added a paragraph to the database description within the manuscript.
Regarding the comment on IGSN links, the IGSN numbers are linked with a DOI, which is resolved at the TephAta website (see also last comment). For example sample 19MEJ09 has the IGSN 10273/GF1211S-4E, which is registered with the doi link: https://doi.org/10.60510/GF1211S-4E, is resolved at https://www.crc1211db.uni-koeln.de/search/viewIGSN.php?sampleID=53. Therefore, it may appear that the link does not lead anywhere because you are already on the TephAta website. However, if you use that link from an external webpage, such as Datacite or a journal, it will link you to the metadata available at TephAta.

If no IGSN (International Generic Sample Number) was assigned to a site or sample before registration within TephAta, a new IGSN will be minted and connected with the internal metadata upon data submission in TephAta by the GFZ Potsdam Data Services. This new IGSN will then be associated with the TephAta URL, providing a link to the full metadata released within the database. Existing IGSN IDs can be linked to a sample during data submission.

Templates: I downloaded the templates from the website rather than those uploaded to the journal. When I open them, the defined lists for data fields with drop-down menus show an arrow but no actual options. I also received the following error when opening the downloaded

file: **"UNABLE TO REFRESH – We couldn't get the updated values from a linked workbook."** I am noting this in case others encounter the same issue. It might help to include a readme file with the templates or a table of definitions, so users know exactly what each field means. There are good examples and definitions for the horizontal data, but the vertical columns (e.g., *Obligation IGSN?*, *Obligation DB?*) need clarification. Also, the *Extension Keywords/drop-down lists* row shows "N/A" for all LA_ICPMS, but the spreadsheet actually contains several pick lists. Should those fields be marked as "Yes" or "No"? The geochemical data templates are excellent!

We updated the template files and removed broken links, unclear vertical columns etc. All information is now available within the description fields, in addition to information which fields are mandatory for successful data upload.

Enter a new Sample: I'd like to better understand what sample and site metadata are stored in the database. Could you make the interface for entering a new sample available for review purposes? Additionally: Is there a site and sample upload template?

We added an improved documentation about input forms to the supplementary material of this manuscript and provided these files also for download at the TephAta information site. As explained above, we also added template files for site and sample data, which allow specific data collection. However, a manual upload /input of this data is needed, but a direct template upload is considered for a future update of TephAta.

COMMENTS ON SUPPLEMENTARY MATERIALS

Supplementary Table 1:
General comment –include the list of drop down terms for each field that has a pick list.
We updated Supplementary Table 1 and added additional information on drop-down terms.

General comment – this would be easier to review if it were a table formatted to show Category, Field Name, Field type, Description, Pull Down Menu all on ONE page. I had a hard time lining things up to understand the definition of each term.
We apologize for the poor format of the table, which made it hard to access. We adjusted the supplementary material and added additional information (photo-documentation of input-forms).

Site – does this mean Site type? If so can you call it "site type" and show the pick list or drop-down menus
The field "Site" opens via drop-down menu a list with Site IDs/names of all different sites listed within TephAta or allows to enter a "New Site". By selecting an existing site, a (new) sample can be linked to its respective site. Site type is a separate input field (e.g. type of site like riverbar), we clarified that in the description.

Site title – does this mean site ID? Suggest calling it "site ID" instead of "title"
We changed the name of the field to "Site name".

Site Additional Comments: I think this is where some samples have a description of the deposit…? TA-7 for example but it would be nice to have a sample description or deposit/layer description field.

A clear distinction must be made between site and sample descriptions. Information entered as *site additional comments* refers exclusively to the site itself and does not describe individual samples. For example, sample TA-7 originates from site TA-7-8, which has its own site description independent of the tephra layers identified within the outcrop (sample specific information and relation to site are given on sample level).
The site input mask provides several dedicated fields for detailed documentation. The *site description* field is intended for a general overview, while more specific aspects should be entered in the corresponding fields (e.g., site spatial context, section thickness, geolocation type). The *additional site comments* field is for information that does not fit into the predefined

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categories (e.g., noting that site was only accessible due to roadwork etc.).
At the sample level, multiple fields are likewise available to ensure detailed and structured documentation of sample characteristics, as described above and in the revised supplementary material.

Sample method vs sample collection method? What is the difference? I see now that 'Sample Method' is the position of sample from within a strat layer…that is confusing and suggest replacing 'method' with 'stratigraphic position'.

The "sample method" is following the tephra best practice recommendations, defining on how a specific tephra sample was taken (e.g. channel through entire stratum, handpicked clasts, etc.). The "sample collection method" addressed how the sample was taken in general (e.g. by coring or manually by hammer). We changed the latter one to "Sample recovery technique" to avoid confusion.

There is no sample description – seems like an oversight.

We assume you refer to the fact that there is no dedicated tab/category called sample description. Information about the sample is entered at two tabs. The section "Sample" includes basic/meta information of a sample (names, what, who, when, where and how was sampled), the actual physical description on a macro- and microscopic scale is given under the tab " Physical properties" (former name: Morphology, see comment below).

Morphology – In tephra science, I typically associate morphology with grain shapes. Sup Table 1 is the first place I see what you mean, and it seems that the metadata grouped under "Morphology" actually includes two distinct types of information: the first 17 terms relate to layer characteristics and starting with "microscoped fraction," the rest are microanalytical details. To make this clearer for users, these could be divided into at least two subfields: "Layer" and "Physical Microanalytical", this breakdown would provide a more intuitive structure.

We renamed the category "Morphology" to" Physical properties" and restructured it into macroscopical and microscopical observations.

Stratigraphy – these look like geochronology metadata

We renamed this tab to "Chronostratigraphy".

Data file supplements
The 2 geochemical data files are the tephra templates from EarthChem (established by the tephra community)! Great!
DATA_EDS_WDS:
There are some metadata missing that could be included like **sample description** of the sample material analyzed which would add value; **Analyst** is listed for some but not most?; **Beam diameter** is missing for some analysis – why?; **Data line type** – what is meant by "line"-many samples have this notation? Are these the SEM-EDS data? **Sample mount** – are there not names for all mounts?
We thoroughly checked the dataset and added all such information if available.

Some Method DOIs are links and others are not can you make them all links

Missing links were added.

Great that the table clearly distinguishes which data come from EPMA-WDS and which from SEM-EDS. That clarification is very helpful, as it was initially unclear until I noticed the information in the far-right column (column BB).

I don't see where you show secondary standard analyses on the SEM-EDS? This is very important and needed to show that your SEM-EDS and EPMA-EDS data are comparable.
SEM-EDS secondary reference standards were available for two SEM-EDS sessions, which also documented the comparability with EPMA-WDS data. Data of one SEM-EDS session data without secondary standard data has been removed.

TephAta_Sample Info table
The IGSNs all point to TephAta database and not to another IGSN repository like DataCite?

IGSNs are created within TephAta by GFZ Data Services Potsdam and the IGSN doi registration is issued by DataCite. At DataCite you can search for an IGSN, which resolve basic meta data and the (doi) link to the full meta data stored within TephAta/ GFZ Potsdam. This seems common practice, since also for samples registered via SESAR, DataCite provides just a link to the full metadata set stored at geosamples.org and does not own the metadata.

Brandmeier, M. and Wörner, G.: Compositional variations of ignimbrite magmas in the Central Andes over the past 26 Ma — A multivariate statistical perspective, Lithos, 262, 713-728, https://doi.org/10.1016/j.lithos.2016.07.011, 2016.

Burns, D. H. and de Silva, S. L.: Andesites and evolution of the continental crust: Perspectives from the Central Volcanic Zone of the Andes, Front. Earth Sci., 10, https://doi.org/10.3389/feart.2022.961130, 2023.

Kay, S. M., Coira, B. L., Caffe, P. J., and Chen, C. H.: Regional chemical diversity, crustal and mantle sources and evolution of central Andean Puna plateau ignimbrites, J. Volcanol. Geotherm. Res., 198, 81-111, https://doi.org/10.1016/j.jvolgeores.2010.08.013, 2010.

Lowe, D. J.: Tephrochronology and its application: A review, Quat. Geochronol., 6, 107-153, https://doi.org/10.1016/j.quageo.2010.08.003, 2011.