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Reply on RC2

David J. Lowe et al.

Author comment on "Global tephra studies: role and importance of the international tephra research group "Commission on Tephrochronology" in its first 60 years" by David J. Lowe et al., Hist. Geo Space. Sci. Discuss., <https://doi.org/10.5194/hgss-2021-22-AC3>, 2022

Response to reviewer-2

We are very grateful to reviewer-2 for the "non-volcano-person" perspective, positive and helpful comments, and a short list of potential references to consider.

General response

Broadly, in response to Reviewer-2 (see below), Reviewer-1 (posted earlier), community comments sent privately, and our own revised thinking, we have rewritten the article quite substantially, starting firstly with a revised title that encompasses the paper's main theme more clearly:

"Global tephra studies: role and importance of the international tephra research group 'Commission on Tephrochronology' in its first 60 years".

Secondly, we have revised the 'Introduction' markedly, rewriting much of it to be far more 'user friendly' to general readers (as suggested by Reviewer-2), and we have included a new table (new Table 1) that summarises key terms used in the discipline of tephrochronology. Here is the revised layout of the 'Introduction':

1.1 Tephrochronology and its functioning

- *Defining tephrochronology*
- *Application of tephrochronology*
- *Defining tephtras and cryptotephtras*
- *Development of cryptotephra studies and the modern post-1990 era*

1.2 Reviewing 'Commission on Tephrochronology'

Thirdly, we have and reworked and shifted material in Sections 2 and 3 and (old) Section 7 to improve clarity.

Fourthly, to improve balance, as suggested by Reviewer-2, we have amalgamated (old) sections 4 to 6 into a single new Section 4, followed by new Section 5 (Legacy and future) and new Section 6 (Discussion and conclusions).

Fifthly, a long list embedded within the text in Section 2.4 (Other activities of COT) has been shifted into a new Appendix B.

Finally, we have updated references and shortened the abstract.

A summary of the paper's revised and now-balanced structure is given in an attached document uploaded as part of this 'author's reply'.

Response to reviewer-2's "General Impressions" and "Specific observations"

We work through the comments essentially from general impressions and from the 'Introduction' onwards. Reviewer-2 *comments are identified* in italics and our responses follow. The "General impression" comments contain some very useful and valid points, most of which relate to the 'Introduction', and so we have concentrated on revising and improving that section as a priority (as well as revising many parts of the rest of the paper), as described above. A tracked MS will be made available to the topical editor when requested to show the extent and detail of our many revisions.

Reviewer-2

It is recommended that the references provided below are inspected (possibly quoted) and taken as examples how a more general introduction can be given and to what extent the use of appendices helps to store noteworthy, often tabulated material, which disturbs in its detail the main narrative thread (which still has to be defined and explained). In form of a journal article the manuscript attempts to provide information similar to, e.g., the IAMAS-commissions for Radiation (IRC; Bolle, 2008) and Ozone (IOC; Bojkov, 2012).

Authors

We have read the references listed, and we cite (quote) three of them in the revised article (Good, 2000; Ismail-Zadeh, 2016; MacCracken and Volkert, 2019). We take the point that the comprehensive introduction could be improved as described already, and thus we have revised and restructured it so that it provides a very clear introduction to (i) the world of tephrochronology and (ii) to the article itself, thereby providing a main narrative thread.

Another critical point to make here, in response to comments made several times by reviewer-2, is that the article is primarily about the Commission on Tephrochronology, and its role and importance in the development of the discipline of tephrochronology. The new title reflects this purpose. The article is not specifically about the development of tephrochronology per se, although of course such development is noted throughout the article in the context of COT's role (through leadership, publications, conferences, support for ECRs, etc) and through various advances in analytical and geochronological techniques that we have identified through Sections 2 and 3 (these sections being written largely in the form of a time line).

In evaluating the articles by Bolle (2008) and Bojkov (2012), provided by reviewer-2 as being of a similar nature to our article, we disagree only in the sense that both those articles are much more comprehensive documents (about much larger groups than COT) that extend - in the case of Bolle - to 150 printed pages with the documentation of 50 scientific meetings (in contrast to COT's 9 specialist meetings) and therefore seem more akin to commemorative books than journal articles. They provide a useful (though very long) template including placement of a lot of detailed information about conferences in appendices. Therefore we have shifted lengthy text material in Section 2.4 into a new table as Appendix B. However, we see the modest number (9 in total) of specialist tephra conferences of COT as central to the narrative of the commission's development and

influence, and so our view is that these are better remaining as a key part of the main text (Section 2.3).

Reviewer-2

In its present form, the manuscript states as its sole purpose to "summarize and comment on the history of global collaboration by tephrochronologists" (lines 108/109). The network of experts, quite naturally, takes its existence for granted and self-evident. However, sufficient general information is lacking about the relevance of tephra studies in geophysics and the various attempts of the grouping to find a sufficiently strong parenting organization (as INQUA early on and meanwhile IAVCEI).

Authors

As noted above, we have revised and restructured the introduction so that it provides a clear introduction to (i) the discipline of tephrochronology and its application to the geosciences (which include geophysics), archaeology, and paleoenvironmental reconstruction, its unique terminology, and (ii) to the article itself. That COT has operated under the umbrellas of INQUA and IAVCEI over the past 60 years is spelt out clearly (including in the abstract).

Reviewer-2

The introduction should introduce some science-historical aims of the article besides a sheer exercise in stock keeping and a chronology of tephrochronological cooperation. As an introduction to the topic and its challenges at least parts of the information provided, e.g., in the Wikipedia-entries <https://en.wikipedia.org/wiki/Tephra> and <https://en.wikipedia.org/wiki/Tephrochronology> should be paraphrased. Ideally, the revised manuscript should combine a compact stock keeping of common activities and key persons who influenced the development of CoT over time with a compelling narrative about the methods, changing with time, to arrive at relevant proxy data to infer important details about previous explosive outbreaks of volcanoes.

Authors

We agree generally and, as noted, have revised the introduction so that the topic of tephrochronology and its application, followed by links to COT set out in (new) Sect. 1.2, are more clearly evident. We define the subject 'tephrochronology' in the first part of the revised 'Introduction'.

We have also enhanced the main sections (Sections 2 and 3) in which we describe clearly the main activities and key persons (listed in compact tables) who influenced the development of COT. We also describe how the development of new analytical and dating methods, influenced and promulgated by the COT meetings and their outputs (books, thematic journal volumes, webinars), have impacted on the discipline.

Reviewer-2

The mere listing of numerous review references leaves the argumentation rather empty. Extended references of reviews are preferably placed in an appendix, while a few substantiating sentences should explain nature and relevance of the "discipline and science of tephrochronology" (TC; also, what is behind the distinction of the two? Is TC really a discipline or rather a speciality at the interface of geology and geophysics?).

Authors

We are sure the nature and relevance of the discipline of tephrochronology are now clear in the first part of the revised article's Introduction, as noted in the response above.

We have added a short discussion on the status of tephrochronology as a discipline in the article in response to the philosophical arguments of Good (2000) that were recommended by Reviewer-2; at the same time, tephrochronology is also a science. Such distinctions relate to context according to Good (2000), and we agree. In any event the paired wording "discipline and science" is now removed.

Reviewer-2

The paragraph about "crypto-TC" is somewhat cryptic itself. It is insufficient to declare the rise (in number?) of studies as "remarkable" and "very influential" without any explanation; again, a long list of recent references makes up the best part of the text – which is regarded as insufficient. Please state instead a few selected miles-stone or turning points during the history of CoT. Interested readers should get some feel about aims and challenges of TC instead of heaps of references with hardly any information about their content.

Authors

We define cryptotephra in the first part of the revised Introduction, and in (new) Table 1. We have expanded the opening sentence of the paragraph about the remarkable rise of cryptotephra studies (for which Reviewer-2 sought clarification) to explain what cryptotephra studies involve and how they have been very influential (new wording as follows):

"The rise of cryptotephra studies is remarkable and they have been very influential over the past three decades, largely through the development of new techniques that have facilitated the discovery of numerous non-visible tephra deposits well beyond their previously known occurrences, in some cases by thousands of kilometres. In turn, such occurrences have greatly extended the geographical utility of cryptotephra as isochrons for correlating and dating historical, archaeological, palaeoclimatic, and geological events, and for volcanological applications (see reviews by Lowe, 2008, 2011a; Davies, 2015; Ponomareva et al., 2015)."

The examples of recent applications of crypto-tephrochronology are listed to illustrate the range of studies, their geographical spread, evolving techniques, etc, in support of the argument about their growing importance (we do cite fewer references than in the original text). Milestones and turning points in the development of COT are covered from Section 2 onwards.

Reviewer-2

Section 2 (title in line 189):

The title is regarded as too long (two times "and" of different weight); the sub-sections appear to deal with the entire 60-year period (until line 722) and is structured mainly by six main meetings (in sub -section 2.3.).

Section 3 (title in line 724):

Again, the title is much too long and potentially misleading (which items does "since 2007" refer to – all together or just the final one?).

It is strongly recommended that the main sections of the article refer to equally important periods (of similar duration? Sections 1 and 2 of Ismail-Zadeh [2016] provide as an example of how to define and concisely describe sub-periods for more than a century); the main focus should be placed on scientific needs and content, measuring techniques, key organizational decisions, regional foci versus global perspectives during each of the chosen eras; they are to be presented in the introduction. Certainly, key personalities and important meetings are of high relevance; yet lengthy listings are better placed in appendices.

Authors

We agree on reflection that the (December 2021) MS as reviewed was unbalanced in some sections. Hence we have revised the MS substantially by shifting material between sections (including in response to Reviewer-1), by developing a more detailed and hierarchical structure to Sections 2 and 3, and by amalgamating sections 4 to 6 into a new single Section 4, meaning sections 7 and 8 have now become Sections 5 and 6, respectively. These changes alleviate the concerns of Reviewer-2. In Sections 2 and 3 we have been careful to be accurate in our headings and subheadings, which have also been shortened.

We agree with Reviewer-2 in that Section 2.4 (Other activities of COT) is notably an 'extended listing', and hence we have shifted that bullet-pointed list into a new Appendix B: "Summary of some of the activities (including INQUA/IAVCEI sessions/symposia, regional workshops, etc) associated with COT additional to the nine specialist tephra conferences listed in [new] Table 3".

Reviewer-2

Some of the figure captions appears to be too extended. In general, a caption should provide a concise explanation of the displayed content, while additional details are better described in a few sentences around the position where the figure is referenced.

Author

We agree in many cases and so have trimmed content and in three case (Figs. 7-9) have shifted 'extra' information into the text near where the figure is cited.

Reviewer-2

The 11 figures provide interesting snapshots; however, the chosen content needs to be explained and exemplified better (e.g. in Fig. 2, the presentation of a black-and-white snapshot from Japan with a larger group mainly seen from the back should be used as a starting point of the assumed special character of an early meeting; the nature and purpose of field trips has to be introduced, as field campaigns are of a quite different nature in, e.g., oceanography or meteorology, where the medium of interest is very transient indeed).

Authors

The figures, many composites, have been chosen extremely carefully from hundreds of options. Their purpose is to document as best we can the participants at eight out of the nine meetings we cover using group photographs available to us. Because this is the first-ever review of COT, it has been very difficult to acquire material from the earliest days (1960s on). We think the various photographs are self explanatory as to what they show and why: people involved in COT meetings, the nature of our logos, life membership certificate, special award, most recent executive committee, Bayesian age modelling

workshop, and popularity of sessions on tephrochronology at big international conferences. We have emphasised the importance of our field-based conferences and we describe why in Section 2.3 as follows:

“The field conferences are exceptionally important because they not only facilitate an opportunity for the presentation and discussion of the latest advances in tephra studies or their application, but also they provide exceptional insight into the geological, palaeoenvironmental, and archaeological history of a specific region encompassing the conference location (Davies and Alloway, 2006). Furthermore, Lowe et al. (2018, p. 1) noted that “one of the joys of science, and tephrochronology and volcanic studies in particular, is the opportunity to meet like-minded colleagues and keen students in the field where formalities and reserve seem to dissipate in the face of shared interests, friendly discussions at the outcrop, and in meeting new people and cultures whilst being graciously hosted in new countries.”

In addition, the conferences provide opportunities and critical support (including mentoring) and inspiration for ECRs including PhD students.”

Reviewer-2

Figures:

The manuscript contains 11 figures, most of them multi-paneled. The information provided is

considered important. Still it is suggested to carry out some careful photo-editing to emphasize the points to be made. This may include:

Fig.1: combine a cut of the portrait with the original inscription in Japanese below

Fig.2: cut image and explain its relevance (besides just a group of people during an excursion)

Figs.3, 9, 10, 11: place small numbers on the few persons to be named and refer to these in caption like S.T. (1) and S.S. (2)

Figs.4, 5, 7: in group photographs, place small numbers on persons to be named and refer to these in the caption; display in columns as, e.g., in Figs. 1 and 2 of MacCracken and Volkert, 2019, makes layout compact and quite reader-friendly (reference to an appendix many pages away appears unnecessarily cumbersome – adding a country-code [of work when picture was taken] does additionally provide a concise hint to international cooperation).

Authors

Fig. 1: this is a special portrait derived from the family of Kobayashi and we do not think it is appropriate to modify it in any way.

Fig. 2: we agree this photo has its limitations. We have modified the caption by adding a new sentence: “We include this figure despite its limitations because it is the only known photograph available from the first COT meeting.”

Fig. 3: we have simplified the caption for Fig. 3 and we feel it is sufficiently clear without further labelling.

Fig. 9: we cannot name all the individuals in the upper photo; the protagonists in the two

lower photos are easy to identify

Fig. 10: the individuals in the upper photo are clearly identified

Fig. 11: the individuals we name in two of the photos are clearly identified.

We really appreciate the value of the numbering system used in photos in several publications as mentioned by Reviewer-2 (as in MacCracken and Volkert, 2019), but we have already named as many individuals as we can in Figs. 4, 5, and 7 and they are able to be identified in the images via the list in Appendix A. We cannot name many of the individuals in the other group photos portrayed in the article.

Please also note the supplement to this comment:

<https://hgss.copernicus.org/preprints/hgss-2021-22/hgss-2021-22-AC3-supplement.pdf>