



Interactive comment on “A Global Compilation of U-series Dated Fossil Coral Sea-level Indicators for the Last Interglacial Period (MIS 5e)” by Peter M. Chutcharavan and Andrea Dutton

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We thank Anonymous Referee #2 for the helpful feedback and technical comments. First, we address the general comments, which focus on possible overlap between this manuscript and the other contributions to the WALIS special issue. The objective of this manuscript was to compile age, elevation and other relevant metadata for the global fossil coral record in a consistent manner. This was done following the approach of Dutton and Lambeck (2012), Hibbert et al. (2016), Medina-Elizalde (2013) and others, which treats each U-series fossil coral specimen as a single relative sea-level (RSL) indicator. Then, the geochemical and other metadata associated with these corals

can be referred to within the context of the region-specific data description papers in the WALIS special issue. The way the WALIS database is structured, as shown in Fig. 2 in the preprint text, is that fossil coral U-series analyses are uploaded into the geochronology section of the database, and then samples that can be used as RSL indicators (i.e., are in primary growth position and have an associated U-series age and elevation) are also included in the “RSL datapoint from single coral” section, which is similar to the approach employed for speleothem data (Dumitru et al., 2020). This is in contrast to the other contributions to the special issue, which focused on compiling data for a particular region.

While we have included example screening criteria to assess the quality of U-series analyses presented in this compilation, we have also emphasized that the screening applied here is only intended to be a first pass to identify clearly altered samples. The inherent meaning of a fossil coral U-series age is inseparable from the existing geologic/sedimentary evidence, and this additional context may, in many cases, necessitate the modification or outright rejection of these preliminary age interpretations. This level of interpretation was outside the scope of the WALIS special issue, but we believe the discussion of paleowater depth considerations, in situ vs growth position corals, and tectonics/GIA is essential. To provide general guidance on the considerations that should be taken into account when interpreting these data within a regional context. Otherwise, we fear the reader will accept the screened data uncritically and assume they are correct without considering these other factors (e.g., “connecting the dots” between coral RSL datapoints to infer global mean sea level without consideration of paleowater depth uncertainty and/or the effects of GIA). We have kept this discussion fairly general to guide the reader in terms of what types of issues need to be considered to avoid unnecessary overlap with other contributions to the WALIS special issue.

We wish to emphasize that the fossil coral U-series database presented here has been cross-checked at multiple stages, both during the present review process for ESSD and through additional peer review for previous versions (i.e., subsets) of the database

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(Dutton et al., 2012; Hibbert et al., 2016). For the present WALIS special issue, contributions were submitted concurrently, so it was not always possible to cross-check the global compilation presented here with the other, region-specific contributions. However, one of the advantages of WALIS is that it has been designed as a “living database” that can be continuously updated and maintained after the initial release. We agree with Referee #2 that additional cross-referencing with the region-specific contributions would be beneficial (e.g., incorporating mass spectrometric U-series ages that were missed in the initial compilation) but posit that this could instead be done as an update after all submissions are received.

We also acknowledge and appreciate the substantial time and effort taken by Referee #2 to provide specific comments/technical corrections related to this manuscript. We broadly agree with the Referee’s feedback and will incorporate their comments as suggested with the limited exception of the following comments outlined below:

SPECIFIC COMMENTS

1. We will cite OBIS when referring to the modern coral depth distributions, as suggested
2. Referee #2 brings up an important point that corals can be transported and yet still appear to be in situ/growth position. Indeed, we have incorporated any additional information contained within the original source manuscripts to verify whether a coral can be treated as primary growth position. For example, in describing the fossil coral dataset from the Bahamas (lines 420-431), we treated corals that were originally reported as “in situ” as not in primary growth position, as they were derived from coral rubble deposits. Similarly, There are three samples from Stein et al. (1993) collected in Papua New Guinea (WALIS U-series IDs 1318, 1319 and 1332) that are reported as being in “growth position” but are ultimately derived from detached limestone blocks and, therefore, were not treated as primary growth position. We agree that, in some cases, this additional context is not provided in the published literature. However, an a

posteriori facies assessment of the outcrops these samples were collected from would require revisiting each of the field sites described here, which is outside the scope of this study and, indeed, the WALIS special issue. We will add wording to section 2.4 to this effect.

3. We will state which samples that passed the screening protocols are in primary growth position in lines 395-396.

4. Referee #2 is correct that the Thomas et al. (2009) datapoints are not MIS 5e. We decided to adopt a wider age range of samples (~150 – 110 ka), as (a) sea-level constraints for mid-late MIS 6 are relevant to understanding the transition between Termination II and the Last Interglacial and (b) samples that are derived from an LIG outcrop can at times display spuriously older ages due to diagenesis. The WALIS database does not explicitly exclude samples that do not fit the strict definition of MIS 5e. There is functionality within the “RSL from Stratigraphy” section of WALIS to include metadata related to sedimentary features at LIG sites that are younger/older than MIS 5e. Similarly, one of the contributions to the WALIS special issue focuses entirely on MIS substages 5a and 5c (Thompson and Creveling, 2020).

5. Regarding the comment about mass spectrometry vs alpha dates: In the introduction to Section 3 (lines 396-399) we state that fossil coral U-series ages that were measured using alpha spectrometry were not included in the current version of the fossil coral dataset. The functionality to input alpha dates, however, is present in the user interface, and some contributors have already begun adding alpha dates to WALIS. This addresses Referee #2’s comments regarding:

a. Lines 618-619

b. Lines 666-667

6. We will correct the error in Line 662 (and within the database) that incorrectly identifies sample KE12-001 as a microatoll when, in fact, it is a massive coral head.

TECHNICAL CORRECTIONS

1. Regarding the comment of text justified vs left-aligned: having the first paragraph of each (sub)section not indented is a formatting requirement set by the ESSD journal. We agree with all other “General formatting issues.”

2. We agree with all “Further formatting issues.”

3. Regarding the “Mistakes in the database”: The reason why the sample/analysis IDs do not always match the study they were published in is because some coral specimens were reanalyzed in more than one publication. This is particularly common in localities such as Barbados and the Huon Peninsula, where fossil coral specimens collected in the mid-late 20th century have been reanalyzed multiple times across several studies. In cases where this occurred, sample/analysis IDs are assigned based on the first publication where U-series ages for a particular coral specimen were reported. This ensures that the user can easily distinguish which samples came from the same coral colony, which was not always clear in earlier iterations of this database. We acknowledge that this was not explicitly stated in the manuscript text and will be sure to do so during the revision process. This explanation is relevant to the issues raised regarding WALIS U-series ID numbers 1292, 1313, 1763-1765, 2086-2088, 2137, 2168 and 2169-2172. We agree that the following errors need to be corrected:

a. WALIS U-series ID 2364: The Analysis ID should be SC78-004-002, not SZ78-004-002

b. WALIS U-series ID 1664 was incorrectly labeled as coming from Stirling et al. (2001) and was actually published in O’Leary et al. (2013).

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