**Climate
of the Past**

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Discussions

Interactive comment on "Identifying homogenous sub-periods in HadISD" *by* R. J. H. Dunn et al.

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We thank Enric Aguilar for his detailed review and respond to each point individually below.

1) Reviewer

. . .The title, though, does not entirely cover the contents of the manuscript: I suggest to include on it a reference to the study of the homogenization process performed, as this is a very important part of the article. . ...

- Page 1569, line 3: Where says "Two main approaches exist for determining the location of change points" I would add a reference to the superiority of relative methods over absolute methods: "It is widely accepted that relative homogenization (based in comparison between candidate and neighbouring series) is preferred to absolute ho-

mogenization (based in the analysis of candidate stations data alone).

- Page 1569, line 12: Please, notice that MASH is the homogenization package and MISH is an interpolation package; SPLIDHOM is different than the rest as it does not detect inhomogeneities but adjusts previously detected inhomogeneities in daily data. I also miss here a little more information on the properties of HOMER, MASH and ACMANT. For example, a reference to the detection principles in HOMER (based on the ancient prodige (Caussinus and Mestre, 2004 and on a joint segmentation algorithm initially code in genetic science (Pickard et al, 2011). Also, it should be necessary distinguish the scope of HOMER - very suitable for medium size networks, were the climatologist input is possible, meanwhile other approaches, such as PHA will do a much better work with large networks, such as HadISD or larger, where in-depth station by station analysis is not practical/possible.

Response

The new title we suggest is "Pairwise Homogeneity Assessment of HadISD"

We have added additional information and references into the introduction and section 2 regarding the homogenisation algorithms mentioned, along with the suitability of PHA for automatic processing of larger networks.

2) Reviewer

- 1570, line 23 and adjacent: distinguish between methods which adjust daily data from those which detect inhomogeneities in daily data. Most of the quoted references rely on other methods applied to lower resolution data (monthly or annual) for detection.

Response

In combination with comments from Victor Venema's review, the references have been expanded upon and split into different categories.

3) Reviewer

- 1571, line 3: where says "Following the terminology used in the ISTI.." I would say : "Following the widely accepted terminology, adopted in the ISTI..."

Response

Sentence amended

4) Reviewer

- 1571, line 15: could you give some details on which studies are sensitive and which are not?

Response

Example applications where the homogeneity may or may not be important to take into account have been given.

5) Reviewer

- 1572, line 12: COST-HOME networks were small networks, i.e. no larger than 20 stations, in occasions as small as 5. This was most likely a drawback for PHA when applied to COST-HOME I think it is worth to mention here.

Response

Sentence added stating small network size of COST-HOME and what effect this may have had on PHA's performance. We note conflicting comment from Reviewer 3 – Victor Venema.

6) Reviewer

- 1573, line 1: I wonder how PHA would perform replacing in this step 2 SNHT by other algorithms. Any available analysis on this?

Response

When PHA was developed the SNHT was chosen because of its superior performance

in locating change points under a wide range of scenarios - see Menne & Williams 2009, DeGaetano et al 2006 and Reeves et al 2007. We have added a sentence to this effect in this section.

7) Reviewer

-1573, line 12. "The PHA code ... converted to monthly values" ... Although you discuss in the following sections how the monthly means are computed, I suggest to give some details here or refer to adequate sections.

Response

Link to later section given

8) Reviewer

- 1574, line 11: this comment is linked to the previous one. I wonder if you have assessed potential problems and inhomogeneities introduced by how monthly values are computed. Most likely, in some stations the available hours, even the number of daily observations are changing from through the data record. Also, computing a month with 20 values is far, for example, from WMO's 5/3 rule. Any evaluation on the impact of this?

Response

The issue of introducing inhomogeneities by calculating monthly averages from the hourly data is now described in the introduction [see also Major point 2 from Blair Trewin]. As part of the validation step (section 5), reporting frequency changes were linked to detected change points. However we have also carried out an assessment of what using the WMO 3/5 rule (fewer than 5 days missing per month, no more than 3 can be consecutive for the monthly average to be calculated from the daily values) would do to the number of stations processed by and the results from PHA. There is a ten-fold increase in the number of stations that could not be processed by PHA, and a doubling of the number where no change points were found. However, this makes the

assessment of the homogeneity of HadISD less useful to users of the dataset. Also, applying such a severe criterion could degrade coverage, with undesirable consequences according to our results in Section 7.

9) Reviewer

- 1575, line 1: according to the claim here, roughly 1 out of 5 stations is homogeneous. This is a but surprising. In the forthcoming sections you discuss on the role of the length of record and the availability of well correlated neighbours. I think it would be necessary to advance some hints on why so many "homogeneous" stations.

Response

Additional text around (what is at present) line 365 specifies possible reasons: stations with short records and / or few correlating neighbours. However a similar fraction in a densely observed country, the UK, were found to be homogeneous (section 5).

10) Reviewer

- 1575, line 7: "There is no pattern to the stations which could not be processed". I think here it is necessary to stress two concepts, additionally to the lack of completeness which you mention: low station density and large decorrelation due to complicated geographical patterns. Low density surely applies to Africa and, for example, in western South America, the presence of the Andes range introduces changes in altitude and very different climatological characteristics in relatively small distances, thus making the selection of well correlated neighbours more difficult.

Response

Thank you for this comment - we have added this information into the section and clarified what the distribution of stations could result from.

11) Reviewer

- 1576, line 18: does this mean underdetection in low density areas?. I think it is

important to stress it.

Response

Added sentence to explicitly state this

12) Reviewer

- 1579 line 20 to -580 line 13: this part is difficult to read. I suggest to reword it.

Response

We have expanded on this section and reworded parts to clarify what was done and what was found.

13) Reviewer

- 1580, line 29: any explanation on this? Incomplete metadata? Homogenization artefacts? Averaging artefacts?

Response

Incomplete metadata would account for a large fraction as for some stations none could be found. There are also changes inside and outside of the enclosure which would affect the measurements but are unlikely to be noted in the digitised metadata for each station. Discussion of this has been included in the manuscript.

14) Reviewer

- Figure 3: indicate which two methods.

Response

Caption updated

15) Reviewer

- Figures 4 and 9 are difficult to interpret.

Response

We have updated the caption for Figs. 4 and 9 to clarify what is being shown and also expanded on the discussion in Section 3 to help with the interpretation of these figures.