

## ***Interactive comment on “HadISD: a quality controlled global synoptic report database for selected variables at long-term stations from 1973–2010” by R. J. H. Dunn et al.***

**Anonymous Referee #1**

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Review of Dunn et al

This is a long paper, which is partly like a user’s manual of the datasets and partly like a paper. The author’s are to be applauded for taking the time and trouble to write it, and also for doing all the work that is involved in the dataset construction.

The issue with it being a paper though is that issues with the data will be found in the future, so I hope there will be a user’s manual (not necessarily called this) where improvements can be documented.

There is a lot to read in the paper and it is difficult to know if the various thresholds are the correct ones. The more people use the dataset the more that some of these

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thresholds will need revision.

One thing I would recommend to add to the paper is a quick analysis of the surface temperature data. The aim of the dataset is to look at extremes, but how does it compare with another well-known dataset of average changes. So for daily mean temperature (calculated based on some basic requirement – say the stations that achieve the station distributions in the middle panel of Figure 2 on page 1813) calculate monthly average then grid the data a la CRUTEM4 using the 1976-2005 base period. You could do this at your 1.5° grid resolution or go up to 5 by 5. You could then do the calculation with the flagged data and without. Say how much has been omitted and what difference (little) has been made. I think a diagram like this will get the paper more widely read and the dataset more widely known.

The other principal point is that all the tests have to be undertaken on each variable in isolation – well mostly without consideration of the others. Does the flagging of suspect data in this way lead to the data getting checked to see if data for other variables for the same time of observation of data have also been flagged? The question here is it just a mistake for the one variable or is the whole message sent somehow wrong. I think you tend to think the former, but maybe the latter is a possibility in some places. Perhaps you should consider whether there is more than one flag set for a particular set of observations, then perhaps the rest for that time interval should also be flagged?

A few more comments

1. p1765, what does geographically invariant in their application mean? Is this another way of saying the stations don’t move?
2. The last sentence on lines 21-23 is a point to remember. This should also be in the conclusions and in any online pages with the data. Some NMSs do QC on their data. Whilst we’re on this point, I wondered several times if there was the opportunity for NMSs to send you the same data from their archives rather than you using your archive of it – or does this happen? Some NMSs know there are issues with their data and this is what restricts access some times.

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There is an opportunity here to offer a service to some to say you'll go through their data. This may be thinking too much aloud, but is this a possibility? This is a problem of peer-review on occasions – you get quirky suggestions! 3. Why has ISD become HadISD? 4. On p1768 it is not clear how the number 14 was chosen on line 15. I think this just comes a little early as the Appendix hasn't yet been introduced. 5. On p1768, the discussion about duplicate IDs in the database begins. This is returned to several times. You have taken all these stations, started with just over 6187 and ended up with 3375 that are usable as they have enough data for doing something useful climatically. The BEST group claim to have 39,000 stations! They have additionally got monthly only data sources, so these are additional, but you all know and I know that their dataset must contain many, many duplicates. There will be duplicates in HadISD and also in the monthly stations such as GHCN. Do you care to try and estimate what the true number of possible unique stations really is? WMO numbers only allow for 10K and then there are numerous missing country IDs, so the true maximum is smaller. Some countries put out more monthly series, but not that many more. Maybe what I'm asking is a statement of how many more GHCN has than your 6187 at the start. 6. With test 4.1.1, the wording could be changed to make sure you don't lose any station data. I'm sure you don't, but what you say could be taken to mean this. For example if there are two stations and one runs from 1976 to 2005 and the second runs from 2000 to 2010, you say you remove the shorter, but this loses 5 years worth of data. 7. With the station IDs can you explain how the number is derived? I know where they come from. The first is the WMO station ID with an extra zero. Presumably there are some where this extra zero isn't a zero (e.g. Canada where they have recycled numbers)? The second part of the ID is the national number – well it is for the US stations! Why not put these in for some of the other countries. This is a pain, I know, but it is useful to explain this. For many other countries the national IDs are much longer than the five digits available. Don't just say you'll pass this on to the ISD team at NCDC, as many on the author list are part of the ISD team at NCDC. 8. This issue of IDs in certain countries (former DDR, Balkans, etc). I am just wondering here (in more detail

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on p1793) whether you've done enough to put stations together. In both these two examples it is just of case of pairing off stations without any overlaps. In the German case they generally just went from using 09 to 10 with the rest of the WMO ID remaining the same. In the Balkans it is more complex, but you need to be able to combine series without overlaps. I don't think your methodology allows for that. Perhaps you need an additional test to allow for this. This will be difficult! 9. The comment on p1776 about some Australian observing times at the same time regardless of DST is I'm sure much more widespread. When you say such an error has been noted and reported back to the ISD team at NCDC, shouldn't this note also go to BoM in Melbourne. Similarly with the footnote on p1778 – this should go to JMA. Also report back to the Met Office Obs section as well. 10. Why should a Japanese station be measuring in Fahrenheit? Checking on google reveals that there is no point sending something back to JMA. Google indicates there is a US Naval Facility there, so this is probably the reason. This would be worth adding, as it explains why it probably happened. They just forgot for a period to do the conversion. It is therefore likely that they forgot to convert some other variables? 11. In test 4.1.8 I don't think the word 'streaks' is the right one for a period of days where you have some threshold being exceeded. I think the right word is Spells. We use this for spells of weather, so why not here. You are looking at unusual spell frequency. 12. With Test 12 for clouds and the flagging of middle and upper level cloud as suspect when the low level is 8 oktas, I think you might have made the wrong decision. The very fact there are real values for clouds higher than low might suggest that the low cloud value is at fault. Check the data and see how often full low level cloud occurs and whether there are values for the two levels above. If this number is very small then I think this would agree with my hypothesis. 13. With the Variance Test (#13) do you also check for markedly reduced variance? In this section you use hurricane incorrectly. You mean hurricane forces. Hurricanes are only in the N. Atlantic and E. Pacific. They are called Cyclones and Typhoons elsewhere. 14. With 4.1.14 is it worth flagging data that can't be checked as it is just too far from another station or just too early in time to be checked? 15. Throughout the tests you've often assumed a normal

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distribution. This is a reasonable assumption for many variables, but the Alaskan cold spell got me thinking. Even with monthly average data, the normal distribution isn't a great approximation across Siberia in winter. A 3-parameter Gamma distribution has been used by Briony Horton and is referred to here (Jones et al. 1999). The use of this could allow for the fact that temperature data are often negatively skewed in winter. 16. The point on p1792 lines 4-7 is an exceedingly good one. Did you find more in the tropics than in Siberia in winter? Did you find anything with the Antarctic stations? Some of the data at the US stations used there were measured in deg F, very difficult to note in that part of the world! 17. With the discussion of when the true Tx and Tn occur, you might be interested in reading van den Besselaar et al (2012). I'm not sure your assumption of when the times of Tx and Tn occur is that sound, based on 3-hourly data. This paper shows that for Europe in the winter a much greater proportion of the values given in SYNOP messages do not occur in the 'believed' 12-hour period. I know you're not using these data, but what might be a useful plot from your data is one of the average DTR from the 3-hourly data. I don't think that Fig 21 is that informative. 18. Figure 2. So a dot is plotted at the centre of each 1.5° square coloured to show the number of obs in that square. Why do the dots appear to overlap? Maybe you need to show with slightly larger squares? 19. I have trouble following Figure 9. May is a very odd month in Iceland. Try looking at some annual cycles for Icelandic locations, especially of MSLP. As they are generally good observers I think what you're seeing is probably real, and relates to issues such as possible close sea ice and/or snow on the ground. 20. In Figure 13, it is unclear why 'another' test flagged the pressure data in Feb 1976. 21. Figure 20 shows you're rejecting more data in Africa and South America. This is just the same as looking at monthly average data!

#### References

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