Response to anonymous referee #1 for manuscript Osborn & Jones, ESSDD

Tim Osborn and Phil Jones **18 December 2013**

We thank the referee for his/her careful assessment of our manuscript, and for the very positive words about our work.

> *Page 598, line 16. Many of us recognise 'Met Office' as in fact the UK Met Office, but not all readers or users of the data will know that shorthand? At least in this first instance, specify it as UK Met Office?*

"Met Office" is the official name for what used to be known as the "UK Meteorological Office". Nevertheless, we will add "UK" prior to its first use.

> *Page 602, lines 2 to 15 -I understand Xi, in units of 5o, -177.5 to +177.5, to specify centres of the 5 deg gridboxes. But, I do not understand (lines 6 and 7) Xi-0.5 and Xi+0.5 to specify the longitudinal edges of a given grid box. Why does this formula not increment by 2.5, rather than 0.5? E.g., for 5 deg box centred at 172.5, western edge would lie at Xi-2.5 (170), eastern edge would lie at Xi+2.5 (175)? Likewise for latitudinal boxes (lines 12, 13)? Perhaps this reader has missed something? This formula also occurs on page 607, lines 11 and 12. Remnant text from a 1 deg grid, but needs correcting for this grid?*

Our terminology had meant to indicate that it was a half-index lower or higher than the centre of a box, and hence represented the edge of the box. However, both referees raised concerns, so we will change our terminology so that we only use integer index values and instead we will denote the edges of the grid boxes by the centre plus or minus half the grid-box size. The new terminology, in the revised manuscript, should be less confusing, e.g. the western edge of grid box *i* is $x_i - \Delta x/2$.

> *Page 604, line 2 - For the CRUTEM4 30-year reference period (1961-1990), the max value of Ns,m = 30? Therefore a minimum criteria for calculating a mean T for, e.g., September requires data in approximately half (>=14) or more of the 30 Septembers included in the reference period?*

Yes

> *Page 604, line 22, continuing to 605, lines 1 and 2. The authors write "then we estimate the 1961–1990 normal for the station using its 1951–1970 normal adjusted by the difference between the grid box averages for 1961–1990 and 1951–1970." I understand the objective, but I do not understand the approach. Shouldn't the final adjustment in these cases derive from the difference between grid box averages for 1951-1990 and 1951-1970? Evidently the current data, CRUTEM4, no longer use this option, but important to have it correctly documented for prior versions.*

We will clarify the text by stating that it is the differences between the 1961–1990 and the 1951–1970 means **in the earlier version** of the data that are sometimes used to estimate the adjustment to the normal for the current station data. The earlier version gives us the change between these two means, which is then applied to the current station's 1951–1970 mean to convert it to an estimate of its 1961–1990 mean, so the choice of periods is correct.

> *Page 605, line 10 An important point, to remind users of the data of the important role of the WMO and of the unfortunate irregularities in national data policies and the pass-through of national data through the WMO information system. Can the authors quantify how many stations over what time period - perhaps what portion of the full data record - fall into this category? An answer will represent useful information, but perhaps not essential to the quality of the data itself.*

Of the ~6000 stations, we rely on WMO normals for ~150 stations (i.e. 2.5%). We will add this statement to the revised manuscript.

> *Page 606, line 12 This seems a bit confusing. In section 2.5, just before, we learned about conversion of all "observations" into anomalies, but we read nothing about taking standard deviations of those anomalies, only about standard deviations of station observations (in section 2.4). I suspect the problem here lies in language, and particularly in this phrase: "standard deviation of monthly temperature anomalies". Again at page 607, line 3 "standard deviation of the monthly temperature anomalies". These in fact represent normal s.d. calculated as square root of (difference (obs - mean) / divided by N), and since (obs - mean) also here means 'anomaly' by definition, then in fact standard deviation of observations in fact equals standard deviation of anomalies. I believe the authors have everything correct, just described in an awkward manner?*

The referee is correct and the text will be simplified to say "standard deviations of monthly temperatures for station…" in both locations.

> *Page 607, line 15 (equation 6) The denominator should read _s,t,m?*

Corrected, thank you.

> *Page 610, lines 2,3 This "to obtained the CRUTEM3v grid-box mean temperature anomaly time series" should read instead "to obtain the CRUTEM4v grid-box mean temperature anomaly time series"?*

Corrected, thank you.

> *Page 610, line 13 Say something about the lag times, between end of month and appearance of updated CRUTEM version including that month? 2 months? 6 months? I found this information - 3 to 4 weeks - later, at the bottom of page 610. Perhaps it would fit better here?*

OK, we will add this information ("normally 3-4 weeks after the end of the month") there.

> *Page 612, line 2 Unshaded (empty) grid boxes - I see empty blocks in northern Canada and some in Quebec, 4 or 5 in Amazonia, several across the Sahara into Saudi Arabia, several in Siberia, and a substantial empty block across central and eastern Indonesia. As a general check, does my view concur with others? With the expectations from the data?*

Yes, these are correct.

> *Page 612, line 3 A square "balloon", but yes.*

Well, KML calls them "balloons".

> *Page 612, line 8 larger image of the anomaly annual time series*

It is clear from context what the series is, which was described in full "annual-mean temperature anomaly timeseries" earlier in the paragraph, so no change needed here.

> *Page 612, lines 3 to 11 I checked for several grid boxes. Confirm image, larger image, seasonal, and text file. Also, in all that I checked, a list of stations. And, in the text file, this further data qualification statement: "Each seasonal mean requires at least 2 out of 3 months to have data. Each annual mean requires at least 8 out of 12 months to have data." Does that represent a filter for display convenience, or something that needs explicit mention in this paper? In my version of GE, I see the url at the top when I open the pre-created data link, and click-through takes me straight to the CRUTEM file - nice!! I*

notice that in the station 'balloons' - I checked Darwin and Barrow - the doi link to Jones et 2012 JGR shows as hot (clickable), but in the grid box balloon that doi link does not show as clickable. Something similar will happen for ESSD links? Make them all click-through?

Thank you for your careful checking. The requirements for 2/3 and 8/12 months to be present are specifically for the seasonal means presented in those data files and so these statements are best left in the header to each data file concerned. The doi links should all now be clickable, for both grid box and station balloons.

Page 612, line 23 As written "monthly, seasonal and annual temperature values for this grid box". Should read "monthly, seasonal and annual temperature values for this station"?

Corrected, thank you.

Page 617, figure legend for Fig. 3. The legend describes the black line as a 20-year smoothed plot. But, the GE balloons do not include that info? E.g. we see the line clearly in the grid box and station balloons, but do not get the info that the line represents a 20-year smoothed average. To our eyes, we clearly see the line as smoothed, but do we need to know the 20-year info? Add it as a standard graphic label / element to each pre-created image? I only raise these questions, I trust the authors to know the 'cost v. benefit' of this particular idea. We should have this information somewhere, however, other than in this figure legend?

This information (i.e. that the black line is a 20-year smoothing) will be added to every balloon containing the annual images.

Page 619, figure legend for Fig. 5. Here we read that the dashed line shows the reference (normal) data if at least 18 annual values exist for that station. But earlier, in the text we learned about 14 annual values per each month per station as a minimum criteria. Something different here? Annual criteria vs monthly criteria?

The reference lines in these images are for display purposes only and are not intended to exactly recreate the process used in the dataset construction, which has changed with each version as described in the main text.

Overall, an excellent and enjoyable interface to a very important global data set!

Thank you.