Interactive comment on "An objective determination of optimal site locations for detecting expected trends in upper-air temperature and total column ozone" by K. Kreher et al.

The reviewers comments are written in italics, the authors' response in bold.

Anonymous Referee #1

General comments:

This paper describes (1) about determination of measurement uncertainty criteria of the upper air sounding observation with considering the uncertainty from the sampling errors using CFSR data and (2) about the method to determine the observation sites for 21st century tropospheric temperature, stratospheric temperature, and ozone. About (1), the new point of this paper is (i) using the latest reanalysis data with the raised model top and (ii) analyzing up to the higher level (1hPa) than the referred paper.

About (2), it is very example to determine the historical observation sites objectively while the selection criteria should be discussed further because of the requirements for the other field. Totally, this paper is very informative for the observation network design.

Thank you very much for your summary and feed-back.

Minor comments:

Introduction)

1. In the line 23 in page 1620, the paper refers GRUAN website for its network. But the web site may become obsolete in the future. So that, the current GRUAN network should be displayed explicitly in this paper. How about showing them in figure 1?

This is a good idea, also because the map of GRUAN sites shown on the web page shows a different set of GRUAN sites to that included in this analysis; GRUAN has expanded somewhat since this analysis was completed and the paper written. The GRUAN sites included in this study are now shown as blue dots in Figure 1 and the relevant text in the manuscript has been changed to reflect this.

In section 2)

2. In the line 11 in page 1621, please show the referred paper used NCEP-NCAR reanalysis data since there are several reanalysis data currently and the characteristics are different. So that it should be shown explicitly.

We have added the reference for this paper in the manuscript as suggested.

3. In the line 16 in page 1622, please show the point selection strategy (as a sample and selected randomly) as shown in the caption of the figure. This information is important and should be stated in the main part of the paper.

We have added the requested material to the manuscript text accordingly.

4. About the figure 3, these sampling scenarios should be summarized in a different table.

We have added a table (Table 1) listing the sampling frequencies because instead of "sampling strategies" we now only use "sampling frequencies" and have dropped the additional change in "time of day". We have also applied this change to Figures 2, 3, 4, 5 and 7.

And, since the referred paper mentioned that "made at least twice daily, at least once every two or three days", why are not there scenarios as "noon and midnight for every 2/4/7 days"?

We could have certainly also explored measurement regimens of noon and midnight measurements every 2, 4 or 7 days. This would have added three more measurement regimens to what was already a rather crowded set of regimens and would not have explored anything different to what Seidel and Free (2006) explored. Our goal was not to replicate what Seidel and Free did but to also explore some novel measurement regimens. Therefore, we felt that adding these three measurement regimens would not add significantly to the conclusions drawn and, in the interests of expediency and clarity, omitted them.

5. In the line 11-12 in page 1623, although it mentioned the criteria (0.2K) is not different for the other points / levels, it is better showing one (or two) other point sample (figure) in the other (lower) latitudes. It is hardly understood that one high latitude point situation can represent the globe.

We agree and have added another figure showing the uncertainties on the monthly mean temperatures for 35°S, 45°E. We have changed the text in the manuscript accordingly.

In section 3)

6. Around the line 5 in 1628, what AMSU data is used?

As detailed in the manuscript, the AMSU data set described in Mears and Wentz (2008) was used.

Just TB? How do you deal with the cloud contamination?

We used the version 3.2 merged MSU and AMSU data set exactly as described in Mears and Wentz (2008). No additional processing was applied.

7. In the line 28 in page 1628, it mentioned about GUAN network but no information was provided. Please mention it and it is better to show GUAN sites.

We agree with the reviewer that we need to add more information but we think that it would unnecessarily bloat the paper to include an additional figure showing the location of all 171 GUAN sites when this is available from other sources. Rather we have cited the seminal GCOS document that described GUAN in detail and have included the link to a web page that provides a map of all GUAN sites).

In section 4)

8. Why table 3 and 4 is so different? Please note any idea about it

We have added a paragraph explaining Table 3 and 4 in more detail in the manuscript text. And since we have added another table, Table 3 and 4 are now Table 4 and 5.