

Reply to reviewer 2:

1. Line 49: maybe clarify “very little pressure data was ingested into 20CRv3 during these years, ***particularly in the Southern Hemisphere***”. In addition, the authors may wish to include a link to maps of the observations assimilated in 20CRv3 by year: https://psl.noaa.gov/data/20CRv3_ISPD_obscounts/

Thanks, we rephrase the sentence using the clarification and add a link to the ISPD visualization.

2. Line 51: maybe here is a good place to introduce 20CRv3+, since it’s used in the Table caption prior to introduction in the text.

Thanks – the other reviewer commented the same. We now introduce 20CRv3+ already here.

3. Section 2.2: I recommend adding a few more details about 20CRv3 to this section. In particular, note that 20CRv3 does not use HadISST SSTs in the period of study, but rather SODAsi.3 (Giese et. al 2016, <https://doi.org/10.1002/2016JC012079>); there are also places later in the paper where it is stated that 20CRv3 uses SSTs “similar” to HadISST1.1 (lines 160 & 313). It might also be worth mentioning that 20CRv3 uses a cycling EnKF (unlike the offline approach used for 20CRv3+). Finally, it may be worth emphasizing that no station temperature data went into 20CRv3 at all; although the text in this paper is accurate, readers often miss this detail (in my experience.)

Thanks, we gladly add these clarifications.

4. Line 189/Figure 4 caption: Clarify whether this is reduction in time-averaged spread over some time period? If so, is there a reason for not (also) showing reduction in spread for the single date plotted in the lower part of the figure? Also, if this is time-averaged spread, then on line 191, you may want to add “since there were only few ships in the vast space ***and time period***, the reduction is statistically weak”

Yes, it is time-averaged spread. We will rephrase the sentence. We will also add the reduction in spread for the specific case in contour lines.

5. Line 225: Suggest changing “observed SSTs” to “prescribed SSTs”, since 20CRv3 actually uses an ocean reanalysis for its SSTs in this period (see comment 3 above).

Yes, thanks, this is changed.

6. Line 307: clarify what “beneficial” means here, beyond the indication of a robust signal. Maybe, that the comparison also shows where uncertainty remains?

Yes, good point, we will at this statement.

Technical corrections

1. Line 102: “spatial resolution is” should be “spatial resolution of”

2. Line 124: maybe replace \bar{y} with y (or define \bar{y})
3. Line 135: outliers were removed ***when*** $y-Hx\dots$
4. Line 186-187: Clarify that you're referring to 20CRv3+ here
5. Figure 4 caption: clarify what "results" are here (perhaps "analysis fields"?)
6. Line 226: "as the" should be "as with the"

Thanks, the corrections will all be incorporated.