

Review of 'EMO-5: A high-resolution multi-variable gridded meteorological data set for Europe' by Vera Thiemig et al.

This is a second review of this paper following the open public review period. The authors have addressed some, but not all, comments provided by myself and the other reviewer. The work undertaken to address these review comments has undoubtedly served to improve the paper and increase potential uptake of the product by users. There remain a number of points that I believe require to be addressed before this can be published to enable the analysis to be understandable to the ESSD readership and to enable reproducibility of the results.

Major

- 1.** Lines 89-96 have now arguably gone too far the other way. You probably want to say something like: 'Users should be aware that EMO-5 is prepared principally for near real-time rather than climatological applications. While the series are available from 1990 users intending to apply the dataset for climatological applications should take care in its application and consider, in addition, the use of other products to ensure the robustness of their analysis to the choice of dataset. For the station database aspects of the product users may also consider the C3S holdings (Noone et al., 2021) who undertake an expanded suite of delayed mode quality checks and with whom we are actively collaborating regarding the sharing of data sources where the data licensing permits to improve both products. For gridded data products users may consider the E-OBS product and various flavours of global and regional reanalysis served via the C3S climate data store in addition to EMO-5 to assure themselves of the quality of the various products and the robustness of their analyses.' This or similar text would appropriately caveat without ruling out the potential use of EMO-5.
- 2.** I leave this to the editor to determine but my view remains that the list of providers table should be in the main text and not the appendix and that the text introducing them in lines 104-106 should be somewhat expanded.
- 3.** The methodology to my view remains insufficient to enable reproducibility of results. I note that the authors were unclear what I meant here. It is not that the steps aren't present but rather that too many of the steps are described to a perfunctory level and without settings / parameter values given and that this would preclude a reasonable effort at independent replication. For example, the enumerated list line 156-161 solely hints at what was done for some aspects which the table does not cover. E.g. what are the monthly statistics check? Some kind of climatological check? If so what period of climatology and what are the thresholds? Note that I am using this as an example only. I would urge the authors to carefully reread the methodology and consider whether each and every step is described in sufficient detail that a reader might be able to reasonably approximate their method based upon the description given alone. Too often I am left feeling that there is grossly insufficient detail to enable a reasonable attempt at being able to reconstruct the method. Given that reproducibility is the central tenet of the scientific process I would urge the authors to carefully redraft their methodology providing sufficient details as to approaches and specific parameter choices to enable an independent replication.

4. Table 3 could be expanded to provide the precise parameter settings used in your approach. This is presently given solely for Modified SPHEREMAP but presumably both remaining approaches also had to have some of the parameters set to give values. This comment is by way of a further example whereby the method reproducibility is questionable.
5. You need to at least briefly describe what the Yamamoto method for uncertainty quantification is and if there were parameters that needed to be given a value the values you chose should be given. Hence there is a need to revisit the paragraph starting line 206, again with a view to method reproducibility.
6. In the paragraph starting line 251 I think identical stations is perhaps a misleading term. It's a single station but it has redundant records arising from two or more distinct sources so this isn't a case of two or more stations but rather two or more copies of the records from a given station. I think it would be better to talk about redundant versions of records from some stations that have been shared multiple times and that you make steps to identify such records and mangle them to produce a single record for any given station. I would suggest a rewrite of this paragraph accordingly so that it is clearer to a reader what is going on here and use redundant records rather than identical stations as the term in particular to be much clearer what is the issue.
7. The data availability is still to me an issue, although the authors are thanked for making some efforts in this direction. Specifically it helps to have specified the file type. The point about meeting journal minimum requirements is noted. But I assume that the authors wish their data to be used by the broadest possible audience and therefore they should aspire to more than simply treating it as a journal tick box exercise. I am missing here details that may really help a reader to have confidence in the data. So, I would retitle section 4 to be "Data availability, versioning and user support". What is there is good but needs augmenting with, for example:
 - a. At what delay are various products made available and how are users alerted to e.g. period of record updates
 - b. What version control exists, if any?
 - c. What user support functionality exists?
 - d. Where and how are data issues and notices handled

This section really should be building the confidence in the user that this is a well documented and well maintained database that they can rely on with confidence. At present it's not quite there. The section also may benefit from moving later in the order to come just prior to the conclusions.

8. As the authors note in their responses to the initial review in section 5 they are characterising the dataset. I would therefore be more comfortable with section 5 if it were titled 'characterisation' or 'product characterisation'. Evaluation has implications – at least to a native English speaker - that inferences are being made about the correctness or verity of the product. As noted in my initial review the very nature of the problem precludes such an assessment, sadly. Similarly I would change the opening paragraph of this section accordingly.
9. The text on lines 527-529 would need revision to account for the comment above.
10. Figures 1-3 remain an issue for me in that too many of the details are simply impossible to discern and the use of multiple different symbols is really hard to untangle. Much of the key text which might help to disentangle and understand the

figures is so small as to be indecipherable without zooming in. Considerable efforts are required to make figures 1-3 more user friendly and, in particular, please ensure all text and numbers are readable at the intended final figure size as readers who print it off shall not have the luxury of being able to zoom.

11. Figures 8 and 9 please make the font sizes in these figures larger so they can be read. The keys are impossible to read even scaled to 200% resolution so would be entirely indecipherable for a reader of a printed copy.
12. Figure 12 is somewhat improved but still to me very hard to decipher. I find the colour scheme non-intuitive. I'd expect heavier precipitation amounts to be blue not brown. The colour scheme is also not colour blind friendly
13. Following on from point 12 this colour blind issue actually pertains to all figures. None of the colour schema chosen for figures are colour-blind friendly. A substantial proportion of the global population are colour blind. Several colour blind palettes exist see e.g. <https://colorbrewer2.org/> including sequential schema that the authors could choose from. For example figure 12 could use <https://colorbrewer2.org/#type=sequential&scheme=BuPu&n=9> with the lightest hues pertaining to the lightest precipitation. This schema would be visible and interpretable to all variations of colour-blindness.

Minor

1. The opening paragraph of the introduction feels like it is missing important context. What aspects of the data quality? Is it their absolute quality? Assurance of their quality? Something else? What do you mean by environmental and risk indicators? Perhaps give an example?
2. Line 78 I would suggest 'substantial' rather than 'long'. 1990 is not long in the grand scheme of things from a climatological perspective.
3. There should be a line break after line 88 assuming this is intended to be a new paragraph?
4. Line 111 I think you need to say [...]others provided data only for [...]
5. Line 184 ECA&D
6. Line 199 I am unclear what you mean by 'given that the resulting grid quality of all variables allows this' – it makes no sense to me, at least in the context in which it is given. Please clarify.
7. Line 246 please be specific which variables or is it all remaining variables in which case say all remaining variables. Also, does this mean that the gridding only considers stations with some minimum set of observed variables and how does this impact station counts etc from sources that have not all variables? Again, this lack of detailed description is precluding reproducibility (see major comments)
8. Line 281 – please specify which land sea mask is used to enable reproducibility
9. Line 290 – which DEM is used? Again, you need to specify to enable reproducibility
10. Line 302 – add 'as follows' to the end of this sentence to be clear that the modifications are then described in the next paragraph. Either that or describe what those modifications were here.
11. Line 315 – presumably the 5.5 has units. What are these? K^2 ?
12. Line 359 if a new paragraph should have a line break. Same at line 365

13. Lines 378-380 the enumeration should match the section ordering that follows
14. On line 430 'two blue patches' is very colloquial. Can more scientifically robust language be used in redrafting please?
15. Line 454-455 was there really somewhere in Norway with no precipitation for 1400 consecutive days or is this some aggregate of this statistic over some region? As written this is really unclear and a redraft is required for clarity here.
16. Line 463 if a new paragraph should have a line break added
17. Line 496 substantial rather than larger (I think)
18. Line 507 station at end of sentence should be stations?
19. In figure 7 could more sensible bin boundaries be used? It feels really odd to use counts ending in random numbers rather than 0, 40,000, 80,000 etc.