

Interactive comment on “Uncertainty information in climate data records from Earth observation” by Christopher J. Merchant et al.

Anonymous Referee #1

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In this review paper, the authors discuss some issues and necessities related to the communication of uncertainty information in climate data records. This is an important topic, which has too often been neglected in the provision of Earth observation data. I hence very much welcome this review, and recommend publication after some revision.

Regarding that revision, I have an overarching recommendation, which I am not sure the authors can fulfill. After reading the paper I felt that it could possibly have an even larger impact if it were to provide more concrete guidance on how to report uncertainties.

I am, however, uncertain if such concrete guidance is possible in the scope of this review paper, or whether this would be too large a task. I will leave this for the authors to consider and eventually decide - the paper certainly carries enough significance

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even if it largely remains in its present form.

Given the very wide coverage of topics suggested by the long list of authors, it seems possible to suggest a rather concrete best practice on how uncertainty information should be communicated in concrete products. I expect that within the ESA Climate change initiative, quite some discussion must have revolved around this question. For example, many of the records included here will have issues related to re-gridding, sensor drift, physical limitations, etc. Can standard procedures be defined on how these should be reported?

Also in chapter 5, for each sub-topic a possible recommendation would be helpful, going beyond the mere description of possible issues. For example, in 5.2, it would be helpful to learn how non-gaussian uncertainties should be reported, and how gaussian uncertainties should be reported. Just by providing standard deviation?

As I only see this overarching issue as a recommendation, I ranked this as a minor revision.

Additional issues:

- The abstract can and should be improved. It currently remains unclear how the abstract relates to the actual paper. The crucial information that this is a review paper is only given towards the end of the introduction, and only then it became clear that what was said in the abstracts refers to this paper rather than to some general previous knowledge.
- p.1, l.30: I recommend indicating that these are just examples
- p.2, l.21-24: perfect for abstract
- p.3, l.3: The term 'climatic' implies a time frame of around 30 years, but artifacts can arise on shorter time scales. I suggest to simply drop "climatic" from this sentence
- p.3, l.8: Bellprat, 2016 is missing from the reference list. I did not check all references,

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but given that apparently the reference list has not been included automatically, the authors should carefully check its completeness.

- p.3, l.16: Might be helpful to also be explicit about "The first example" and "The second example", as I wasn't quite sure what the "third" referred to.

-p.3, l.16: maybe add "and seasonal or decadal forecasts" after "data assimilation"

- Section 3: Maybe this section should be renamed to "Terminology" to clarify what it actually is about?

- Section 4: I also here found the heading a bit too generic, as also the previous section deals with "lessons from metrology" when defining terminology. Would "Traceability of uncertainty" work?

- Section 5: I did not fully follow the logical flow of 5.1 to 5.4 in reference to the scenario described in the first paragraph. It might be helpful to describe in some order the actual steps one has to take to come up with an uncertainty estimate for the concrete scenario. (i.e., 1. Explain how one would estimate uncertainties at each step including issues from quantisation. 2. Explain how one can then propagate uncertainties 3. Explain how things then become difficult when moving to spatial fields). So most of the information is already there but some more guidance and re-structuring might be helpful for the reader. Simply moving the first sentence of section 6 to before section 5.1 could be a very simple step forward.

- Section 6: It would be helpful to better understand why the particular choices summarized in table 2 have been made. While it's interesting to see the range, it would be helpful to have some understanding of its underlying cause. Could the range have been made narrower if there had been more communication/funding/time?

- Section 7: The structure of this section was not fully clear to me. It introduces the issue of validation, but from line 25 onwards there is an unclear logical flow. After introducing an equation, an example is given, then triple collocation techniques are

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introduced, and finally instrument noise is addressed. Could this be structured more clearly? This would certainly help the reader in understanding how best to validate which kind of uncertainty.

- Reference list: Kobayashi, 2015 should be before Mahlstein, 2012. The list is not always consistent, for example some journal names are not in italics or are not abbreviated. Please double check, or switch to an automated system to create reference lists :-)

In any case, I am grateful to the authors for compiling this review, and hope that it will help to raise awareness of these important issues.

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