

September 9, 2016

Dear Anonymous Referee #2,

thank you for your detailed comments. Here we try to address the concerns you expressed in your report. We start with some general proposals for restructuring the paper to make the information contained more accessible and address the individual comments thereafter.

#### **A. General remarks and proposals for restructuring**

Several comments (especially from Referee #1) are asking for more information on individual data sources and their processing. This information is often given in the appendix of the paper, so it seems that the information in the appendix is not well accessible. We thus merged parts of the appendix into the main text (Appendices B, C) and improved references to the other sections of the Appendix (A, D, E). All references made in this document are to the original Appendix numbering.

Below we answer each individual comment and explain which changes we made to the manuscript.

#### **B. Answers to general comments**

**Comment 1** *Overall, this seems like a careful and constructive effort toward a very useful product. I applaud the authors for thinking to make this data publicly available and for the substantial effort to provide a reliable and well-documented description.*

*The manuscript as submitted suffers from some intellectual and compositional sloppiness. For one glaring example, without searching separately this reader still would have no idea what the acronym PRIMAP refers to?*

**Answer 1.** Thank you for this comment.

**Change to Manuscript 1.** Changes to manuscript are explained in answers to detailed comments.

**Comment 2** *Several of the Figures have serious presentation deficiencies that render them almost useless. These deficiencies subtract substantially from the overall quality of the product. Find a communication officer at PIK and use their help to change, revise and overall improve the graphics.*

**Answer 2.** Thank you for pointing this out. The presentation deficiencies of the figure are display issues. The figures display correctly in the submitted pdf, however, after the ESSDD header is added almost all text disappears in some pdf viewers. We have submitted corrected figures to the discussion page of the paper and will work with the publisher to make sure the display issues are fixed for the revised version of the manuscript.

**Change to Manuscript 2.** Figures are correct in the revised version of the manuscript.

**Comment 3** *The overall discussion - very necessary - on data uncertainties seems to present serious logic failures. See detailed comments below.*

**Answer 3.** See answers to detailed comments below.

**Change to Manuscript 3.** See changes for detailed comments below.

### **C. Answers to more specific comments**

**Comment 4** *Page 1, line 24: We need definition of the EDGAR acronym here, where it first appears?*

**Answer 4.** Thank you for pointing this out.

**Change to Manuscript 4.** The definition of the acronym has been added.

**Comment 5** *Page 2, line 10: We have no definition of the acronym PRIMAP?*

**Answer 5.** PRIMAP is the acronym for *Potsdam Real-time Integrated Model for probabilistic Assessment of emissions Paths* and the name of the research group at the Potsdam Institute for Climate Impact Research which mainly authored this study.

**Change to Manuscript 5.** The definition of the acronym has been added.

**Comment 6** *Page 2, lines 13,14: "For details and sector names we refer to Table 1 9." Confusing! This does not seem to point to Table 1 on page 14 but rather to Table 9 in Appendix B. Rather than referring the reader to an end-of-the document appendix, why not put the Table directly here where readers would find it useful?*

**Answer 6.** Thank you for pointing out the wrong reference and the suggestion to add the table to the main text. We placed it in the appendix because we assumed only few readers would look at the details but we are happy to change this.

**Change to Manuscript 6.** The table has been moved to the main text.

**Comment 7** *Page 2, lines 29,30: “In the supplementary information we present a list of territories included in the emissions of UNFCCC 30 Parties as well as information on the territories that are treated separately (Section C).” Again confusing. ‘Supplementary information’ to this reader implies a supplement but this paper has no supplement and in any case ESSD and Copernicus do not archive supplements. Does these refer to Table 10 in Appendix C? Again, why not put it here if useful, or at least provide a hot link.*

**Answer 7.** A former version of the manuscript was split into the main text and supplementary information instead of an appendix. The reference has not been adjusted when switching from supplementary information to an appendix. The reference is indeed to Appendix C.

**Change to Manuscript 7.** We have integrated Appendix C into the main text.

**Comment 8** *Page 3, line 15: “... preprocessing is available in Section D.” This refers to Appendix D?*

**Answer 8.** Yes.

**Change to Manuscript 8.** The reference has been corrected.

**Comment 9** *Page 5, line 8: The authors defined KP (Kyoto Protocol) in a footnote but not yet in the main text?*

**Answer 9.** Thank you for pointing that out.

**Change to Manuscript 9.** KP is spelled out at its first occurrence.

**Comment 10** *Page 5, line 11: which convention?*

**Answer 10.** The United Nation Framework Convention on Climate Change (UNFCCC).

**Change to Manuscript 10.** “Under the convention” has been removed from the sentence as the preceding sentence already references the UNFCCC.

**Comment 11** *Page 6, line 27: Here we read that, under UNFCCC CRF, the 2015 edition used IPCC 2006 categories. But a few lines earlier (line 15) we read about IPCC 2006 categorisation as a disqualifying factor. Do we need more-exact definitions of the IPCC 2006 categories? Do we have a terminology problem? We need clarification. From subsequent text, e.g. lines 2 and 3 on page 7, we get the impression that 2006 IPCC categories represent a future and desirable standard not yet implemented in this data set? Clarification needed! Perhaps Table 9, which in the caption refers to IPCC 1996, provides some hints? If so, we need a stronger declaration here, we should NOT need to look at Table 9 and guess.*

**Answer 11.** As you pointed out it is desirable to move to IPCC 2006 categories. However, so far only few data sources are available in this categorization and even those are not complete yet. UNFCCC CRF data, 2015 edition was not available for all countries by the time the manuscript has been submitted. Of the Biennial Update Reports only very few were submitted using IPCC 2006 categories. It is possible to transform datasets from 1996 to 2006 categories, but we did not want to do that without even one relatively complete dataset in 2006 categories. The next update of the dataset will use updated CRF data and IPCC 2006 categories.

**Change to Manuscript 11.** We have added information on the reasons for using IPCC 1996 categories.

**Comment 12** *Page 7, line 15: “United Nations energy statistics” these presumably come from a different source than United Nations FCCC but from where? Do we get a reference or we need to go to the source materials?*

**Answer 12.** The CDIAC website<sup>1</sup> states that the UN Energy Statistics Yearbook<sup>2</sup> is used.

**Change to Manuscript 12.** The reference has been added.

**Comment 13** *Page 7, line 20: “... as well as other substances.” Other regulated substances?*

**Answer 13.** Some of the other substances are controlled by the Montreal Protocol (e.g. HCFCs), others are not controlled (e.g. black carbon, organic carbon)

**Change to Manuscript 13.** This information has been added to the manuscript.

**Comment 14** *Page 7, line 22, 23: Confusing use of punctuation in this section. Presumably Unep means UNEP?*

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<sup>1</sup>[http://cdiac.ornl.gov/trends/emis/overview\\_2013.html](http://cdiac.ornl.gov/trends/emis/overview_2013.html)

<sup>2</sup>United Nations. 2016. 2013 Energy Statistics Yearbook. United Nations Department for Economic and Social Information and Policy Analysis, Statistics Division, New York.

**Answer 14.** Thank you for pointing that out. Unep means UNEP, the Bibtext style changed the case automatically.

**Change to Manuscript 14.** We have adjusted the punctuation and moved the references to the ends of the individual sentences to make the text less confusing. The case problem in the UNEP reference has been fixed.

**Comment 15** *Page 8, line 1: FAOSTAT - does this source report annual data?*

**Answer 15.** Yes.

**Change to Manuscript 15.** The information has been added.

**Comment 16** *Page 8, line 22: “past 1990”. Prior to 1990? Since 1990? Figure 1 implies that one can use Houghton et al. data back to 1850?*

**Answer 16.** We mean “since 1990”. Houghton data can be and is used back to 1850.

**Change to Manuscript 16.** We have clarified the “past 1990” statement and added the information that the time series starts in 1850.

**Comment 17** *Page 8, line 24: implies that CMIP5 comes from IPCC but in fact it comes from World Climate Research Programme?*

**Answer 17.** Thank you for pointing this error out.

**Change to Manuscript 17.** The error has been corrected.

**Comment 18** *Page 8, line 28: give explicit credit for the MAGICC6 chemistry model (NCAR etc.)?*

**Answer 18.** Good idea.

**Change to Manuscript 18.** Explicit credit is given.

**Comment 19** *Page 10, line 24: Although referenced together in this sentence, Table 6 occurs several pages after Table 5.*

**Answer 19.** You are right that this is unfortunate. Tables 5 and 6 are placed in the sections with the detailed information on the creation of the time series for the respective gases and sectors.

**Change to Manuscript 19.** We have adjusted the reference on page 10. The tables are kept where they are in the respective sections with detailed source creation information.

**Comment 20** *Page 12, Figure 2: A useful but graphically fairly simple figure. Could the authors redraw it to show exactly the sequence used by the CSG for this data product?*

**Answer 20.** The steps used in this dataset differ per gas and sector. They are summarized in the Tables 1–5. Figure 2 shows the detail for an individual CSG step.

**Change to Manuscript 20.** We will add to the caption of Figure 2 to better explain how it relates to the source creation in our case and add references to the relevant sections and to Figure 3 which gives the details for the creation of one individual time series.

**Comment 21** *Page 13, Figure 3: We need much more information and explanations about the steps, the sequence and the labels (or absence of labels) to find this figure useful!*

**Answer 21.** Explanation of the steps is given in text in Section 4.1 and Section A of the Appendix. The labels and titles are present in the original plots and will be present in the revised manuscript.

**Change to Manuscript 21.** The above mentioned references have been added to the figure caption.

**Comment 22** *Page 14: Presumably one could match the Table 1 steps to Figure 3. Table 1 caption could contain additional useful information? E.g column categories refers to IPCC 1996 categories? Likewise for Tables 2, 3, and 4?*

**Answer 22.** Yes, the steps in Table 1 correspond to the steps in Figure 3.

**Change to Manuscript 22.** We have emphasized the connection between Table 1 and Figure 3 and added information to the captions of Tables 1–5.

**Comment 23** *Page 15, lines 5 to 16: A link to Table 3 in this section?*

**Answer 23.** That link should definitely be there.

**Change to Manuscript 23.** The link has been added.

**Comment 24** *Page 16, lines 1 to 13: A link to Table 4 in this section?*

**Answer 24.** This link should also be there.

**Change to Manuscript 24.** The link has been added.

**Comment 25** *Page 23, Figure 5: axis labels, category labels, panel labels all unreadable or missing. Need a substantial revision of this figure and with a substantial caption! Likewise for Figure 6, page 24!!*

**Answer 25.** The labels and titles are present in the original plots and will be present in the revised manuscript. See also Comment 2.

**Change to Manuscript 25.** See Comment 2. The figure captions have been improved with references to the relevant sections.

**Comment 26** *Page 21 and 22, Section 6: This section has no impact or utility because of the severe deficiencies in Figure 5 and Figure 6!*

**Answer 26.** We believe that with the correct figures it does have impact and utility. See also Comment 2.

**Change to Manuscript 26.** See Comment 2.

**Comment 27** *Page 25, line 9: Does Table 7 come from Andres 2014 or Andres 1996? Confusing.*

**Answer 27.** The tables comes from Andres 2014, however, the grouping was introduced in Andres 1996.

**Change to Manuscript 27.** We have clarified where the grouping and the table come from.

**Comment 28** *Pages 28, 29, Figures 7 and 8: Again basically useless due to lack of panel labels, series labels, axis labels. Did no one look at these figures before submission?*

**Answer 28.** See Comment 2.

**Change to Manuscript 28.** See Comment 2.

**Comment 29** *Pages 22 to 27, the entire Section 7: (Why do we have sub-section 7.0.1, 7.0.2, etc?) The authors correctly describe the extreme challenges of extracting, compiling and reporting composite uncertainty estimates. Table 8 illustrates the problem to the extreme. But then the authors fail to follow their own advice and cautions and build this section largely - to the extent we can only guess from the unreadable Figures 7 and 8 - on comparison of the generated data set to the individual source data included in the composite. They know this is invalid, they say this is invalid, then they do it anyway! The entire section needs revision and rewriting to clarify how much they can not conclude because of this lack of independence of source and product and how much - if anything - they conclude without violating this fundamental requirement.*

**Answer 29.** The subsection numbering is a mistake. Thank you for pointing out that our conclusions seem to be too far fetched. It is a good point that the comparison reads like a validation of our data which it can not be because of the interdependencies between sources and the lack of detailed uncertainty data. Our intention was to show that the data source does not contradict most other sources given the large uncertainty estimates.

**Change to Manuscript 29.** The subsection numbering has been fixed. The section has been revised to make sure it does not say more than intended and justifiable from the data.

**Comment 30** *Section 8: This reader found Section 8 much more realistic and cautious, even if less quantitative, than section 7.*

**Answer 30.** Thank you for your comment.

**Change to Manuscript 30.** No changes to manuscript.

**Comment 31** *Appendices: Some of this information could go more usefully directly in the text. Only Appendix A, D and E seem useful in separate form.*

**Answer 31.** Thank you for the suggestion. It is always hard to judge which details the reader finds interesting and which not.

**Change to Manuscript 31.** We have integrated Appendices B and C into the main text and improved references to Appendices A, D, and E.

best regards  
Johannes Gütschow on behalf of all co-authors