

# ***Interactive comment on “Historical (1750–2014) anthropogenic emissions of reactive gases and aerosols from the Community Emission Data System (CEDS)” by Rachel M. Hoesly et al.***

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### General comments:

Firstly I congratulate the CEDS team on what has clearly been a monumental effort, and one which will benefit the climate modelling community greatly. On this note, it would be nice to say a little more about the CEDS project itself in the introduction: e.g. what is the "community" aspect, what is the formal project goal.

The manuscript gives a detailed and thorough account of the methodology. Some of the detail could perhaps be moved to the supplementary material to reduce the length

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of section 2. This is merely a suggestion: I leave this at the authors' discretion.

Please include some comparison of the spatial distribution of emissions against Lamarque et al. in section 3, at least for the species totals, focussing on 1850 and 2014 since these are important years for CMIP6.

The discussion on uncertainty is very useful, and I am pleased to see that "quantitative uncertainty analysis" and emissions ensembles will be included with future data releases. This will assist in understanding sources of uncertainty in historical radiative forcing due to composition changes; given that this is a major outstanding question in climate modelling I would urge the CEDS project to place high priority on this development

Finally, given the problems in the 2016 data release which emerged after this discussion paper was published, the manuscript should be updated to refer to the methodological changes which have been applied for the 2017 release, and to summarise the impact of these changes.

Specific comments and suggestions:

P2 L53: "(sometimes also as RCP historical data)" this is not a particularly meaningful phrase. I would suggest using only the name "CMIP5 dataset" for the collective historical and future dataset.

P2 L83: "Preindustrial data (CEDS-v2016-06-18), 1750 – 1850, were released in June 2016 and CMIP6 historical data". Insert date range 1850-2014 for historical data.

P3 L97: This list of 6 phases would be clearer as numbered bullet points (i.e. an `{enumerate}` environment in LaTeX).

P4 L113: This seems like a key methodological difference from Lamarque et al: it would be good to say something about the impact this difference has on the resulting dataset.

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P5 L160: Suggest "available" -> "documented" or "detailed"

P6 L180: "Several other changes were made, such as". Clearly this paper cannot list all such changes, but from a methodological perspective, where is the full set of changes documented? In the CEDS code, or accompanying documentation?

P10 L345: "with a time and sector specific options ...". Delete "a".

P12 L396: "Emissions from mineral and manure emissions are often inconsistently reported; 3B\_Manuremanagement and 3D\_Soil-emissions together, so CEDS total estimates should be reliable". I think some text is missing here.

P13 L408: "Gridded emissions are aggregated to 9 sectors for final distribution". Does "final distribution" refer to the temporal distribution described in the next sentence? Please make this clearer. Also, why use the intermediate sectors for spatial distribution and the 9 sectors for temporal distribution?

P14 L424: This seems to be repeating what was said on P13 L 411.

P18 L522: missing "due" after comma?

P23 L690: "In future versions of CEDS, quantitative uncertainty analysis will be included for all time periods, but is not complete as of the CMIP6 data version." Does this mean that there is partial uncertainty information in the CMIP6 data version, or none because you will wait for complete information before publishing any? If the former, please say something about the quantitative methodology.

P23 L694: "emissions concentrations are observed". Would "near-source concentrations" be a more accurate description?

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