Interactive comment on "A global anthropogenic emission inventory of atmospheric pollutants from sector- and fuel-specific sources (1970–2017): An application of the Community Emissions Data System (CEDS)" by Erin E. McDuffie et al.

Anonymous Referee #1

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McDuffie et al. Describe an update to the global emission inventory of atmospheric pollutants from the Community Emissions data System (CEDS). The updated dataset improves upon the earlier release of the CEDS inventory by adding additional emission sectors, separating emissions by fuel type, extending the timeseries to 2017, and updating the regional inventories used to "calibrate" the emissions corresponding regional sections of the global domain. The new CEDS inventory is currently the most up to date global emission inventory available to the community that is based on reported data. This fact, along with the new features provided with this data release, should

make the inventory very attractive to global atmospheric chemistry modellers.

The manuscript describing the dataset is generally organised and written well. A lot of detail goes into such emission inventories, and the authors have found a good balance between including information in the manuscript, the supplement, and as references to other work. As well as describing the methodology of constructing the inventory, the resulting dataset itself is also presented and described, as well as compared to other global inventories, including the previous version of the CEDS inventory. Uncertainties are also discussed.

My only major comment on the manuscript concerns the calibration procedure. It is obviously a strength of the CEDS approach that regional emissions are scaled using detailed regional inventories where they are available. In this way, more detailed local information can be incorporated than would typically be the case for completely globally consistent inventories such as EDGAR or GAINS. What is not clear to this reviewer is the necessity of also scaling the "default emission estimates" calculated in "Step 1" of the CEDS workflow to "existing, authoritative" global inventories (such as EDGAR and GAINS). Given the general uncertainties in emission inventories, would it not be valuable to have an additional semi-independent global inventory in addition to these two established inventories? Of course, a lot of the information used in constructing the CEDS inventory is shared with, or derived from the other global inventories, so a completely independent emissions inventory would be very difficult to compile. This reviewer would however like to see some more discussion of why it is necessary to calibrate the total CEDS emissions using other global inventories. Related to this point, it would also be very interesting to know the size of the "scaling factors" which are applied in "Step 2" to calibrate the CEDS default emissions with the other global inventories. These numbers to not appear to be presented in the manuscript or the supplement.

I also have one minor, and one extremely minor comment.

The minor comment relates to data availability. It is great that the CEDS inventory as

well as the code is made available to the public. But what about the input data which are necessary for the CEDS code to run? While the data sources do all appear to be well referenced, it would be nice to see some comment in Section 5 on how freely available the input data sets are. This would of course influence the feasibility of other groups being able to reproduce the CEDS emissions using the CEDS code.

The extremely minor comment relates to the presence or absence of seasonal cycles in the gridded emission data. While it seems clear that the gridded CEDS data do include a seasonal cycle, in two places (lines 250 and 790), these data are referred to as "annual" fluxes, implying strongly that they are annual averages. Perhaps this should be corrected to something like "seasonal cycles of annual . . . fluxes".

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