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Interactive comment on "EDGAR v4.3.2 Global Atlas of the three major Greenhouse Gas Emissions for the period 1970–2012" *by* Greet Janssens-Maenhout et al.

Greet Janssens-Maenhout et al.

greet.maenhout@ec.europa.eu

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Dear Prof. Oda,

The authors thank Prof. Oda for the positive and constructive review and have put extra efforts for providing full transparent and inclusive documentation of the EDGARv4.3.2 dataset, which we hope supports the future GHG monitoring and verification capacity.

1. Detailed comments/suggestions/discussions Data tables The table 1b has been further improved by splitting the columns for the activity data and emission factor data into four columns in total: the AD data source (carefully mentioning the edition/ version of

the dataset used); the AD data reference; the EF data source; the EF data reference, where the second column addresses the reference. Tables S4a and S4b of the supplementary have also been improved in a similar way with the temporal data source respectively gridmap data source split from the data reference.

Differences with previous EDGAR datasets The authors agree to inform the readers of the difference between the different EDGARv4 datasets. Therefore, section 4 of the Supplementary Information addresses the differences between EDGARv4.3.2 and previous versions v4.2 and v4.1, which have not been documented in a publication but which have been used by atmospheric modellers. The differences shown in Figures S3 are explained by the continuous improvement the EDGARv4 database has gone through since its first release. Such improvements are detailed in the revised manuscript via an explicit reference in the main manuscript at the end of the section 1 "Historical evolution". We wish to stress that the EDGARv4.3.2 is the result of a steady improvement of the EDGARv4 database over more than a decade, also thanks to the feedback of users. In particular we note that: - For the main differences between EDGARv4.2 and v4.1 we refer to http://edgar.jrc.ec.europa.eu/Main_differences_between_EDGARv42_and_v41.pdf. - For the main differences between EDGARv4.3.2 and v4.2 we refer to the Supplementary of the paper, section 3 and Table S5 with the findings of studies, using EDGARv4 as input. For Table S5 we refer to the Supplement here.

Evaluation of gridded maps The authors agree that the spatial distribution is the major cause of the differences in the gridmaps and we therefore propose to include an overview of the improvement in the gridding with the table below (which is included in the revised manuscript, Table S5). Section 4 of the Supplementary refers to the findings of Gately & Hutyra. (2017) and is expanded with the findings of Maasakkers et al. (2016) and Oda et al. (2018) as follows: "Improvement of the spatial distribution of the fossil fuel production emissions in EDGARv4.2 was shown to be necessary for USA by Maasakkers et al. (2016) and for China by Saunois et al. (2017) and addressed accordingly by extending the dataset with extra point sources for the extraction and mining sites. The importance of point and line source data has been also illustrated by Oda et al. (2018) but needs further observation-based verification." As proof of the improvement of the road transport spatial distribution proxy, we show in the figure here below the map of the NOx emissions due to road transport making use of traffic volume data for Europe (right) and the EDGARv4.3.2 road transport (left) gridmaps. We do refrain from deriving insights from cell-to-cell differences or ratios between gridmaps, as we experienced that these are not revealing of useful information on where to improve (due to displacements and skewness, for example). We observe that the spatial changes are in the expected direction, with the same patterns in most EU countries (e.g. UK, Germany, Poland) but also differences (e.g. in Italy, where the road transport network between cities needs to be more pronounced). In our view, the magnitude of the improvement can only be assessed and quantified by confronting to the observed data that we want to represent with the spatial distribution.

Hot spot analysis Indeed EDGARv4.3.2 is not mechanistically modeling urban emissions, unlike Gurney et al. (2018) but do start with sectoral country totals, to avoid the need of selecting a definition for an urban area. For CO2 emissions, which are dominated by fuel combustion, the national fuel statistics, driving the emissions, are known with a much smaller uncertainty than what is available at city level by e.g. the Covenant of Mayor data in Europe. Whereas subnational or urban emission gridmaps might be more subject to the uncertainty on the activity data that are to be defined as representative for the local area, the uncertainty in the EDGAR gridmaps is mostly determined by the assumptions on the representativeness of the selected spatial distribution proxy for the entire country. With increasing granularity of the spatial distribution per sector and using where point source data, this uncertainty reduces. EDGARv4.3.2 uses 297 distinct datasets for the different subsectors. At least for Europe, the authors believe that the hot spot analysis remains useful, in particular because of the use of the many point sources for any industrial or commercial activity. The authors would assume a better spatial representation of the emissions than what is obtained with e.g.

the CCFFDAS model or even with the ODIAC model, but the validity can only be proven by an observation-based verification with e.g. space-borne XCO2 measurements as a next step. The authors realise that this goes hand in hand with the improvement of the temporal profiles and want to refer to the recent work we submitted to ESSD by Crippa et al. (2019) .

Policy application The European Commission (EC)'s in-house global emissions database EDGAR is, since more than a decade, known and used by the EC's Directorate General Climate Action (DG CLIMA). As such, DG CLIMA has been using emission estimates for world regions/countries in preparation of the climate negotiations at the COP (e.g. presentation of Director General Jos Delbeke in 2012, Staff Working Documents in 2014 and successive years). Most recently DG CLIMA is increasingly asked to look into subnational emission inventories, such as inventories at urban or province-level scale. These can provide actionable information on the implementation of local GHG reduction measures. For the readiness level of the gridded emissions for policy application, the authors refer to the air quality. The air quality (in Europe addressed by a first directive in 1970) and transboundary air pollution (addressed under the UNECE Convention on Long-Range Transboundary Air Pollution - CLRTAP of 1979 (in force since 1983) focused in a first step on emission inventories of air pollutants and the monitoring of the time-series. In a second step, gridmaps were requested and nowadays the Parties need to provide these at 0.1deg resolution on an annual basis. The European Commission – Directorate General Environment appreciated the delivery of default emission gridmaps for the European Commission Directive on the Pollutant Release Transfer Register (E.PRTR) and supported EDGAR with extra funding for further use of the emission gridmaps by the CLRTAP Task Forces of Emission inventories & Projections – TFEIP and of Hemispheric Transport of Air Pollution – TF HTAP. Nowadays, as one of its activities the Copernicus Atmospheric Monitoring Service assesses the bottom-up gridded emissions (and in particular local exceedances of pollution levels) with top-down measurements.

Quantitative information on CARMA corrections The authors agree that the power plants are very important point sources and that the CARMAv3.0 dataset has been carefully screened with an internal QA/QC procedure to avoid large errors. We are not allowed to disclose the CARMAv3.0 dataset, because that is not our proprietary and unfortunately no longer online available. For the sake of transparency, we summarized in the table below the different steps undertaken to convert it to our EDGRv4.3.2 spatial proxy dataset for the power sector. CARMAv3.0:68931 power/heat plants Corrected CARMAv3.0:200 points have been corrected for the missing or inverted coordinates For China: 1200 points have been added manually with internal resources For Russia: 50 points have been added manually with internal resources Resulting EDGARv4.3.2 proxy for power plants aggregated to 0.1x0.1: 16931 cells, of which: 4610 cells are defined for Auto-producers 5199 cells are defined for COAL 3304 cells are defined for GAS 3818 cells are defined for OIL

2. Line by line comments Manuscript Supplementary Information We refer to the Supplement here for the replies (point by point).

We'll upload the revised manuscript and online supplementary information after having completed the review of Dr. R. Andrew as well. Thanks for your understanding and continued interest. Best regards, Greet.

Please also note the supplement to this comment:
https://www.earth-syst-sci-data-discuss.net/essd-2018-164/essd-2018-164-AC2-supplement.pdf

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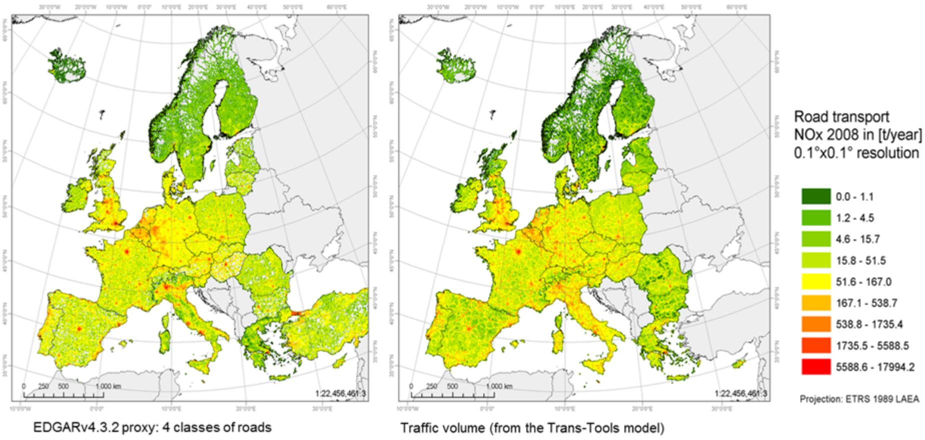

Fig. 1. Comparison of the road transport in Europe gridded with EDGARv4.3.2 proxy and with traffic volume

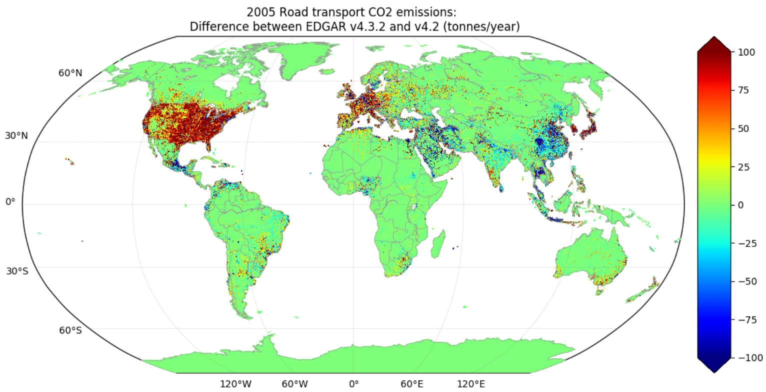

Fig. 2. Difference EDGARv4.3.2 and EDGARv4.2 emissions of CO2 for road transport (in t/yr per gridcell of 0.1deg)