Comments on: "EDGAR v4.3.2 Global Atlas of the three major Greenhouse Gas Emissions for the period 1970-2012" (essd-2018-164) by G. Janssens-Maenhout et al.

REPLY TO THE REVIEW OF MARCH 2019 BY PROF. T. 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.

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."

Table S5 – Improvement of the spatial proxy data from EDGARv4.2 to EDGAR v4.3.2: indicating those sectors that were considerably improved for the spatial distribution of the sectoral emission totals per country.

EDGAR sector	Sector description	Gridmaps v4.2	Gridmaps v4.3.2
Total		114 maps	297 maps (also sometimes changing over the 42 yr time period)
AGS/ ENF/ MNM	**Agriculture**	Per type of animal: FAOgeonetwork (2007)	Per type of animal: FAOgeonetwork (2014)
		Per type of crop: FAOgeonetwork (2007)	Per type of crop: FAOgeonetwork (2014)
CHE/ IRO/ NFE	**Production of chemicals**	In-house EDGAR proxy, gapfilled with **population** as default	In-house EDGAR proxy per type of non-ferrous metal or per type of chemical product, improved with **point source data** from EPRTRv4.2 for Europe, USGS for the rest of the world, gapfilled with **urban population** as default
NMM	**Cement**	In-house EDGAR proxy, gapfilled with **population** as default	In-house EDGAR proxy, improved **with point source data** from EPRTRv4.2 (2012) for Europe, and CEC (2015) for the rest of the world with global cement shares per province for China and with **urban population** as default
ENE	**Power industry**	53981 Power plants (public + autoproducers) from CARMA (2007) without distinction for fuel type	68931 Power plants (public + autoproducers) from CARMAv3.0 (2012), distinguished per fuel type and with correction for missing or inverted coordinates and additions for China and Russia
PRO	**Fuel exploitation**	In-house EDGAR proxy, with distinction per fuel type and surface and ground mining of brown and hard coal.	In-house EDGAR proxy per fuel type, improved for coal mining with **point source data** from EPRTRv4.2 (2012) for Europe, and Liu et al. (2015) for China
REF	**Oil refineries**	In house EDGAR proxy, with gas flaring from **Elvidge (2009),** and gapfilling with **population** as default	In-house EDGAR proxy, improved **with point source data** from EPRTRv4.2 (2012) for Europe, USGS (2014), gas flaring from **NOAA (2015),** oil terminals from World Port (2015), gapfilled with **rural population**
SWD	**Landfills and waste incinerators**	In-house EDGAR proxy, gapfilled with population	In-house EDGAR proxy, improved **with point source data** from EPRTRv4.2 for Europe, gapfilled with **urban population**
TNR_ Aviation	**Aviation**	In-house EDGAR proxy with distinction between take-off/landing, climb-out/descend, cruise, supersonic based on **AERO2K** dataset (Eyers et al. 2004)	In-house EDGAR proxy with distinction between take-off/landing, climb-out/descend, cruise, supersonic based on **Airline Route Mapper** (http://arm.64hosts.com/)
TNR_ Ship	**Shipping**	EDGAR proxy based on Wang et al. (2008)	In-house EDGAR proxy based on Wang et al. (2008) improved with **LRIT** information (Trombetti, 2017) for European seas
TRO	**Road transport**	Convolution of **roads** of OpenstreetMap **(2008)** and the **population** map for all vehicles except trucks; roads of OpenstreetMap (2008) for trucks	New OpenStreetMap **(2015) with distinction between 4 different road type classes**, used differently for the different types of vehicles (trucks, passenger cars, busses, twowheelers)

WWT	**Waste water handling**	Total population for developed countries, urban population for developing countries	EDGAR proxy improved with point source data from EPRTRv4.2 (2012) and CEC (2015), gapfilled with urban population

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.

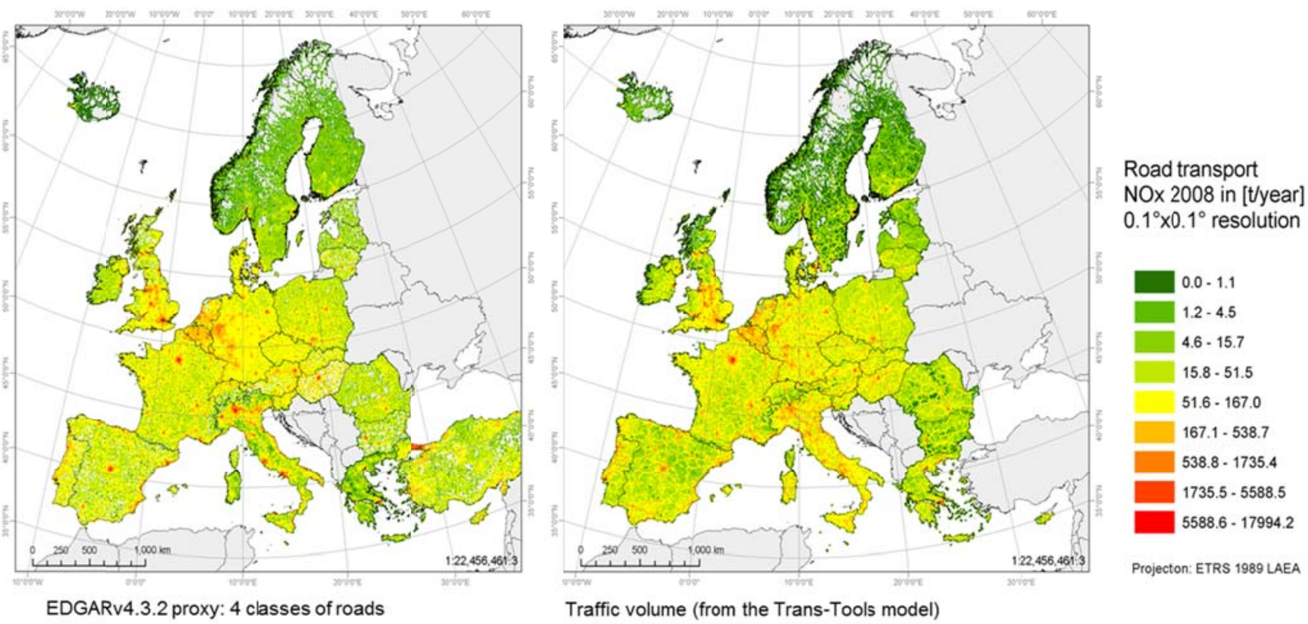

Fig. 1: Visual comparison of the distribution of road transport emissions, using the EDGARv4.3.2 proxy (based on 4 classes of roads) and using the traffic volume from the Trans-Tools model.

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)[1].

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[2] 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

[1] Crippa, M., Solazzo, E., Huang, G., Guizzardi, D., Koffi, E. Muntean, M., Schieberle, C., Friedrich, R., Janssens-Maenhout, G.: Towards time varying emissions: development of high resolution temporal profiles in the Emissions Database for Global Atmospheric Research, Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2019-47, in review, 2019

[2] https://atmosphere.copernicus.eu/

summarized in the table below the different steps undertaken to convert it to our EDGRv4.3.2 spatial proxy dataset for the power sector.

Steps on the data source	Description of the content
CARMAv3.0	68931 power 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	All points are aggregated to 0.1x0.1 cells. These are in total 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

P1, L20: The wording "disaggregated" is replaced with "broken down" to avoid confusion with the spatial disaggregation.

P1, L25: The wording "fully traceable", has been replaced by "transparent to the extent possible", to avoid false expectations. (Underlying datasources such as activity data and proxy data can not be shared, as these are not proprietary of JRC.

P1, L25: The wording "IPCC-based methodology" is replaced by "IPCC-compliant methodology", as suggested.

P1, L26-: The authors agree that terms “short_cycle” and "long-cycle" are helpful for the EDGAR users, but prefer to introduce these in section 1.

P3, L29: The authors do think so. Arguments are given under "policy application" paragraph above. Limitations are addressed in section 6.2 of the manuscript.

P3, L35. Footnote 5 is taken up in the main text as suggested.

P4, L5: The authors agree and added “emission disaggregation” to this sentence.

P5, L6: EDGAR provides bottom-up inventories for any activity within the territory (conform IPCC GL). The boundaries of the territories are the current political boundaries of the countries, as delineated by the European Commission (http://publications.europa.eu/code/en/en-5000500.htm). While Germany is the aggregate of West and East Germany, a split-up was needed for the former Soviet Union and former Yugoslavia. The pre-1990 data were allocated to the countries using the same share of sector- and fuel-specific country shares in the activitiy data from the countries in 1990. The authors refer to the footnote 1 of Table 1b.

P5, L14: The authors confirm that the emission seasonality is not country-specific in EDGARv4.3.2.

P5, L15: We did use the three different reference years of the CARMAv3.0 datasets (2004, 2009 and "future-2014"). For the intervening years, we used the reference year that was the closest. The total emission was distributed making use of the intensity parameter, given by CARMAv3.0. The authors refer to the explanation in section 3 of the Supplementary. For more details on the QA/QC and the corrections made, we refer to the "Quantitative information on CARMA corrections" paragraph above.

P6, L2: EDGARv4.2 has included Large-Scale Biomass burning (incl. post-burn effects) for forests from GFED (Van der Werf et al., 2010) and for peat land from Joosten (2009)[3]. This has led to confusion in the IPCC AR5, because this subset covered only partially the emission sources of the land use, land-use change and forestry, whereas it was compared to datasets which covered the LULUCF sector in a more comprehensive way. Petrescu et al. (2012) calculated the emission sources and sinks of the forest land (remaining forest land) with gains (from forest growth) and losses (from harvest, net deforestation and fires) following IPCC (2003) and (2006) methodology but had to conclude that the different losses can not be superposed without risk of double-counting. Careful top-down analysis would be needed to resolve this problem, which is outside the scope of the bottom-up inventory of EDGAR. Therefore it was decided for EDGARv4.3 not to cover the LULUCF sector, but the agricultural field burning and the crop waste burning, based on the agricultural area and crop yield as activity data remain included.

P6, L31: The authors meant indeed to say that EDGAR follows a Tier 1 or Tier 2 approach of the IPCC (2006) Guidelines with sub-activity data and avoid modeling the processes. The reasons are the missing parameters for some world-regions and the consistency of applying one selected Tier level for all world countries in EDGAR.

P7, L5: Temporal profiles in EDGAR have been developed in 2010 for the FP6 and FP7 research projects CIRCE and PEGASOS, because the global air quality models needed monthly disaggregated air pollutant emission gridmaps as input. The temporal profiles are a first rough bottom-up estimate of the temporal variation for major sectors, based on the insights of regional air quality models. The authors added this as underlying “narrative” to section 2.3, but refer to the recent work on temporal profiles, that was submitted to ESSD by Crippa et al. (2019)[1].

[3] Couwenberg J, Dommain R, Joosten H (2009) Greenhouse gas fluxes from tropical peatlands in south-east Asia. Global Change Biology, doi: 10.1111/j.1365-2486.2009.02016.x

P7, L11: Huang et al. (2018) is a report as deliverable for a contractual work. The results have been taken up in the recent publication submitted to ESSD of Crippa et al. (2019). The authors exchange the reference.

P7, L11: The authors agree that the temporal profiles of Andres et al. (2011) are based on a different approach and deleted this reference to avoid confusion.

P7, L15: The authors agree and deleted the word "global".

P7, L18: The authors corrected the term "linear" by "line", as suggested.

P7, L21: The area average for a grid cell with point sources only changes when the point sources for that grid cell change.

P7, L25: The authors agree and exchanged "reported" with "likely located".

P7, L27: The authors are aware that Oda et al. (2018) also uses CARMA for point sources, but we aimed to indicate some alternatives for the other sources. We changed the sentence as follows: "Alternatives can be night light satellite data, as used by Oda et al. (2018) for those emission sources that were not yet covered with point sources (such as the power plants).

P7, L28: The authors agreed to add "sectoral" before "emissions".

P7, L30: The authors agree that the uncertainty analysis for the proxy data themselves are not useful for inverse modeling and/or data assimilation and consider a full analysis of the representatives of the 297 selected proxy datasets beyond the scope of this paper. The sensitivity of the proxy data and the evaluation of grid maps are ongoing, also for the H2020 research projects CHE and VERIFY. The authors want to refer here to the H2020 research project CHE and move the explanation of the CHE project from the next section up to this section. Since we are not in the position to quantify and assess the magnitude of improvement of the different spatial proxies used (like for all inventories, we imagine), we stress the fact that the continuous improvements the EDGAR' s mapping has gone through, has been mainly dictated by policy and scientific demand. An indirect evidence of the improvement of the mapping comes from the applications to air quality model evaluation activities and global modelling. Indeed one of the benefits and strengths of EDGAR is its transversal support to regional and global modelling communities as well as to climate and policy. Recent modelling activities (AQMEII, HTAP among others) have reported improvements for EDGARv4 inputs, which were taken on board in an iterative and informal way and reported significant improvements of model performance.
In addition, we are not familiar with the literature the reviewer refers to in this instance. If the reference is to the last paper suggested in the references list (Oda et al., 2019, accepted for Mitigation and Adaption Strategies for Global Changes), we note that we have no access to that specific manuscript.

P7, P31: The authors introduced the CHE project in the following section dedicated to uncertainty and propose these explaining sentences to the section 2.4 upfront.

P8, L5: The authors agree that this sentence does not fit too much here and propose to move these sentences up to section 2.4.

P8, L11: The eq. (4) provides the uncertainty for the CO2eq as reported in policy documents for the Paris Agreement and include all three gases (neglecting the F-gases). For the sake of clarity, the unit CO2eq has been added.

P9, L3: The authors agree and aimed to point to the difference: by adding the small sources on waste incineration, urea and liming activities but with much larger uncertainty than the major source on fossil fuel combustion, the resulting uncertainty is a higher (9.0% instead of 8.4%).

P9, L12: The authors take note of this and put "Note Andres et al. (2016) limited the result by saying CASE FOR CDIAC" as footnote.

P9, L17: The authors extended section 2.4 on an assessment of the representativeness of the 297 spatial proxy datasets and the assessment of the representativeness in the CHE and VERIFY projects. A reference to the previous section is taken up here.

P9, L28: The authors agree to delete "and are of prime interest to scientists". However, the enhanced transparency framework for the Paris Agreement was set up with the publicly available bottom-up inventories for all world countries and their NDCs. Only in 2017 the SBSTA recognized officially the use of Earth observation data for assessing the bottom-up inventories.

P9, L35: The authors agree that inverse modeling is also limited and added the following sentence: "Although the posterior feedback on the prior emission gridmaps is very useful, it remains limited because of the uncertainties related to the transport model, the atmospheric chemistry model, the meteorology input and the in-situ or space-borne observations.

P10, L1: Even though the different gases CO2, NOx, SO2, and CH4 behave differently in the atmosphere, they all need to be transported by an atmospheric model using meteorological input. The sources of emission for the first three gases show similarities: they are co-emitted in the case of fossil fuel combustion, at high temperature, when the fuel is coal or heavy residual fuel oil. The location of the point sources for all three gases should be therefore consistent. For CH4 the emission sources are quite different from CO2.

P10, L21: The reference for the EDGARv4.2 flaring gridmap, Elvidge et al. (2009)[4], has been replaced with the new reference: NOAA – NGDC (2015) [5]. We followed the indications on

[4] DMSP data collected by the US Air Force Weather Agency

[5] Image and Data processing by NOAA's National Geophysical Data Center

https://www.ngdc.noaa.gov/eog/viirs/download_viirs_flares_only.html to extract the locations of flaring from all the light sources.

P12, L14: The term "verify" has been selected in consultation with our policymakers at the DG CLIMA. The authors propose to insert the following footnote: "The term *verify* is selected in consultation with the EC policymakers for Climate and refers to the detection of biases in emission inventories."

P15, L7: While the representativeness of the selected proxy data needs further evaluation, the authors consider this beyond the scope of this paper (In this paper we wanted to focus on documenting v4.3.2 with activity data, emission factors, proxy data). Instead the authors provides a warning for the sensitivity of the proxy data on the results and refer to section 2.4 for the assessment of the representativeness of the proxy data and to section 4 of the supplementary (with extra Table S5) for the continuous improvements made from the EDGARv4 database, tripling the number of proxy datasets and addressing the issues with e.g. road transport distribution as pointed out by Gately & Hutyra (2017).

P16, L2: We refer to the "Quantitative information on the CARMA corrections" paragraph here above.

P18, L2: The authors are grateful for that.

P18, L22: The authors agree to rephrase the sentence as follows: "Although modelling uncertainties and the uncertainties of natural emissions remain large, the atmospheric models provide observationally constrained top-down input and it is expected that inverse models increasingly contribute to the independent verification of the total fluxes." The authors want to refer to the fact that in the IPCC 2019 refinement of the 2006 Guidelines (forthcoming May 13th, 2019), an extra chapter in volume 1 is taken up on inverse modeling and its use for national GHG inventory reporting

P19, L7: The authors confirm that they did not want to limit the Earth observation data to satellite imagery only, but in fact, as shown by Bergmaschi et al. (2015) the in-situ ground stations are even of larger importance for constraining the prior emissions, in particular for N2O. Therefore the authors propose to replace "satellite data" with "space-borne or in-situ Earth observation data".

P19, L11: EDGAR does include regional specificity (cfr. the 24 geographical groups), but not subnational specificity (because the activity data is national). The authors confirm that this is consistent with the first bullet point at L15.

P19, L17: The authors agree to exchange "disaggregation" with "downscaled".

P19, L20: The authors agree that this gapfilling comes at the expenses of consistency loss and propose to add this with the following additional sentence. "These gapfillings come at the expense of losing consistency within the reported emissions as inventory."

P19, L31: This is indeed a general statement, of less relevance for CO2, but of significance for some CH4 and N2O emitting subsectors (e.g. CH4 from coal mining at surface or underground, N2O from nitric acid processes).

P19, L36: The authors refer to the section on "Quantitative information on CARMA corrections" for the power plant point sources.

P20, L9: Ideally the point sources should be allocated the emissions accounted for that point source, but we do not have a global point source database for all industrial facilities (such as EPRTR for Europe). When using CARMA, the total emissions need to be distributed over the different point source locations, using a parameter, such as emission intensity, capacity of the plant etc. Ideally this should be complemented with the real share of the plant in the national total emissions and its temporal profile. More global point source data is needed for improving EDGAR here.

P20, L31: The strength of EDGAR is that it calculates emissions for GHG and for air pollutants using consistently the same activity data and the spatial proxy data. As such co-emitted species are represented with one single multi-pollutant source. The CHE project is investigating how these ratios (changing over time and space) can be used to characterize and extract the fossil fuel signal from the total in the space-borne observations.

P21, L1: Data availability section is improved with a short overview table of the data.

P40, Table 3. The authors took into account the ODIAC timeseries 2000-2016, that was documented in Oda et al. (2018) and we took the year 2010. Indeed, different release of energy statistics as basis for the emission calculations might be the reason for the difference. We took this up as small footnote to the table (not only for ODIAC but also for BP).

P48, Figure 10a and 10b: High quality figures will be uploaded and delivered for the final paper.

P49: For the road transport emissions, the authors would like to refer to the section "Evaluation of gridded maps", illustrating how the current EDGARv4.3.2 spatial distribution is calibrated to traffic volume. We do not have volume traffic for the rest of the world. We experienced that the previous proxy using a convolution of roads and population did concentrate the emissions too much within the cities, which has been reported also by e.g. Gately & Hutyra (2017). For the sake of transparency, we provide here below the requested difference of CO2 (long-cycle carbon) emissions of road transport for 2005 produced in EDGARv4.3.2 and EDGARv4.2. The changes are not negligible, but we refrain from such analysis and do not propose this for the paper, because we can only give confidence for Europe that the changes went into the right direction with our comparison to the traffic volume.

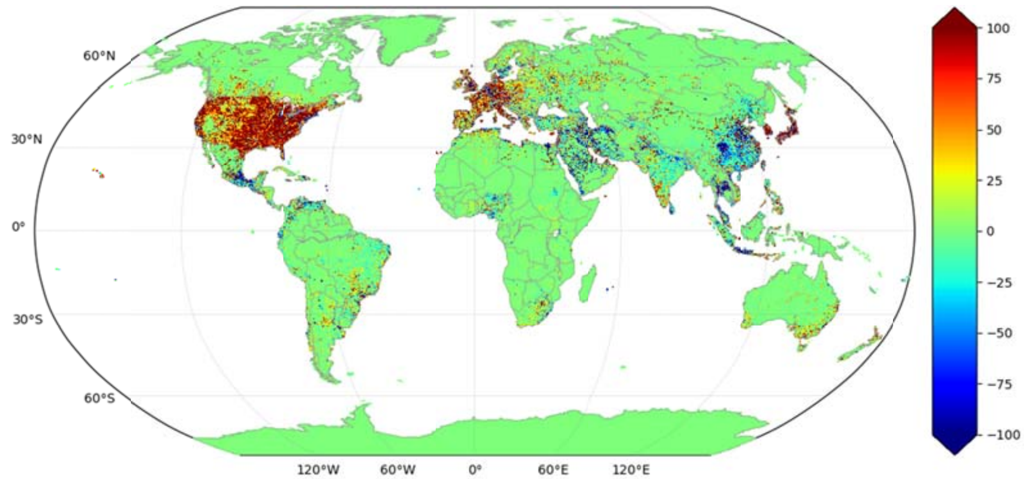

Fig. 2: Difference of EDGARv4.3.2 and EDGARv4.2 emissions of CO_2 (long-cycle carbon) for road transport in 2005.

Supplement Information

The authors confirm that technology-specific data are only used for air pollutant emissions (cfr. Crippa et al., ESSD 2018).

P2, L2: This comment was also raised for P5, L6 and explained there. The Authors refer to footnote 1 of Table 1b.

P14, P4: EDGARv4 does not interpolate the population gridmaps (total, urban and rural) over time. The 1990 population gridmaps were used from 1970 to 1992 and for the more recent years, we used the population gridmaps for the reference year that was the closest.

P14, L13: For the QA/QC and the corrections to the CARMAv3.0 point sources, the authors refer to the "Quantitative information on CARMA corrections" paragraph. The EDGAR team did not sufficiently dispose over resources to check the commissioning and decommissioning of all plants.

P15, L4: The NOAA gas flaring nightlight data maps for 1992-2000-2006-2014 were used with the reference year that is closed by for all intervening years. The spatial proxy data were gapfilled with rural population for those countries that were not covered.

P15, L12: These four times six weighting factors (for the 4 different types of roads and the 6 different types of vehicles) are EDGAR specific and calculated such that in Europe the distribution represents well the traffic volume (available for Europe via the EC in-house data of the Trans-Tools transport model). No population data was any longer used. (This makes the big difference between the new gridmaps of road transport and the old ones. We experienced that the road transport emissions inside urban areas can not be scaled with population data.) The authors refer to the "evaluation of gridded maps" paragraph above.

P15, L24: The authors correct this typo and inverted it to 101 km.

P15, L32: The authors confirm that Friedrich and Reis (2004) is not to most suitable reference to the temporal profiles used for the GENEMIS inventory, which was input to the LOTOS model for assessing air pollution (acid rain). The authors exchanged the reference with Lenhart & Friedrich (1995)[6].

P15, L33: This comment was also raised for P7, L5. The authors confirm that the temporal profiles are mainly based on data from the air quality community in Europe. We refer to the additions in section 2.3 and the recent work on temporal profiles, that was submitted to ESSD by Crippa et al. (2019)[1].

P21: L2: The CARMAv3.0 base years are 2004, 2009 and "future", which we all used without interpolation for intervening years, but selecting the closest reference year (2004, 2009 and future=2014).

P21, L12: The authors agree that this is very much forward looking and deleted the sentence.

P21, Figure S2a shows the temporal profiles in EDGARv4.3.2, which are applied to all 42 years without change in the northern hemisphere. These are indeed based on European sectoral profiles from air quality models.

P22, Figure S2b shows a comparison of the temporal profiles, which are again as default applied for any year in the northern hemisphere for the emissions from the energy and industry sector (large scale fuel combustion). For more details on the temporal profiles we refer to the respective papers of each of the datasets cited in the caption of the figure.

P22, L6: The section 4 of the Supplementary has been expanded with a comparison of the spatial proxy dataset used in EDGARv4.2 and EDGARv4.3.2.

P23, L15: The authors use CARMAv3.0 for the allocation of the national totals for the energy sector using a share for each point source within the country, derived from the intensity given by CARMAv3.0. As such no further adjustment is needed afterwards.

The authors are interested in a copy of the new paper:
Oda et al.: Errors and uncertainties in a gridded carbon dioxide emissions inventory, accepted for *Mitigation and Adaptation Strategies for Global Change, 2019*

---

[6] Lenhart, L., Friedrich, R., European emission data with high temporal and spatial resolution, Water, Air, and Soil Pollution, Vol. 85, Issue 4, pp. 1897-1902, https://doi.org/10.1007/BF01186111, 1995