Public justification (visible to the public if the article is accepted and published):

We report here below the comments received and the answers of the authors in red.

Copernicus will want full version of DOI: https://doi.org/10.5281/zenodo.7516361. Works for me but you (and ESSD) want to save users a cut-and-paste step.

The DOI has been updated accordingly to the suggestion:

https://doi.org/10.5281/zenodo.7516361

No page numbers so hard to identify specific changes!
The reviewed files included page numbers and with all modifications in track changes.

By my counting, page 7 (US EPA methods), line 25, "Foley et al." needs proper citation. 2022 or 2023? I think Copernicus imposes a necessary procedure for, or disallows, manuscripts "submitted"?

The citation of the paper by Foley et al. has been updated in the revised version of the manuscript as following:

Foley, K. M., Pouliot, G. A., Eyth, A., Aldridge, M. F., Allen, C., Appel, K. W., Bash, J. O., Beardsley, M., Beidler, J., Choi, D., Farkas, C., Gilliam, R. C., Godfrey, J., Henderson, B. H., Hogrefe, C., Koplitz, S. N., Mason, R., Mathur, R., Misenis, C., Possiel, N., Pye, H. O. T., Reynolds, L., Roark, M., Roberts, S., Schwede, D. B., Seltzer, K. M., Sonntag, D., Talgo, K., Toro, C., Vukovich, J., Xing, J., and Adams, E.: 2002–2017 anthropogenic emissions data for air quality modeling over the United States, Data in Brief, 47, 109022, https://doi.org/10.1016/j.dib.2023.109022, 2023.

Again, my counting, page 17, lines 24 and 38: Section numbering confusion, e.g. both sections labelled as 3.4?

We changed the second label of section 3.4 as 3.4.2.

One serious remaining issue: uncertainties? Uncertainty introduced in particulates sections but reader never finds a composite uncertainty or discussion of how such uncertainty might vary by pollutant? Even if regional emissions products fail to declare quantitative uncertainties (allowing you as compiler to add, multiply, etc.), compositing processes (e.g. gridding, sectoral combinations, temporal extrapolations, etc.) undoubtedly introduce additional uncertainties. No doubt final uncertainty estimate will involve mostly 'expert' judgement but readers need your best estimate! For example, can we really accept global SO_2 "decrease" of 100 to 73 over 20 years? What basis does reader have to accept 99.4 vs 100 or 72.9 vs 73? Or global NO_x increase from 110 to 117? Users can only get trustworthy assessment of uncertainties from you. Or, in absence, they need to guess? Even a sentence or two about, or a short table of, uncertainties globally and by pollutant? Huge effort but we all know outcome retains significant uncertainty! Tell us!

We acknowledge the remark on the uncertainty and we introduced a new section (3.5) in the manuscript to address this point, as reported here below.

3.5 Qualitative assessment of the uncertainty of a global emission mosaic

Assessing the uncertainty of a global emission mosaic is challenging since it consists of several bottom-up inventories and by definition it prevents a consistent global uncertainty calculation. Each emission inventory feeding the HTAP_v3 mosaic is characterized by its own uncertainty which is documented by the corresponding literature describing each dataset (see Table 2 and section 2.3) and which should be cited by the users of the mosaic for a quantitative assessment of regional uncertainties. However, the mosaic compilation process may also introduce additional uncertainties compared to the input datasets. In order to limit these additional uncertainties, we made the following considerations:

-for each emission inventory both the national totals and gridded data by sector were gathered. This process allows the mosaic compilers not to introduce additional uncertainty compared to the original input regional datasets. In fact, additional uncertainties may arise from the extraction of the national totals from spatially distributed data (e.g. country border issues which were one limitation of previous editions of the HTAP mosaics). Therefore, when regional trends are described by region and pollutant (see section 3), no additional source of uncertainty has to be considered from the mosaic compilation approach.

-the sector definition and mapping has been accurately developed following the IPCC categories and when no data was available for a certain combination of sector and pollutant a gapfilling procedure is applied using the EDGAR database. Also in this case no additional uncertainty should be considered compared to the input datasets.

-any additional uncertainty introduced by the temporal disaggregation can be deemed as negligible since each inventory already provided monthly resolution emission gridmaps and time series.

In this work we also provide a qualitative indication of the emission variability by HTAP sector and pollutant at the global level. Table S6 summarises the variability of global HTAP_v3 emissions by sector for the boundary years of this mosaic (2000 and 2018) compared to the global EDGARv6.1 data. EDGAR emissions are considered as the reference global emission inventory against which comparing the HTAP_v3 estimates although these two global products are not fully independent. The variability of the global emissions is calculated as the relative difference of the estimates of the two inventories, i.e. (EDGARv6.1-HTAP_v3)/HTAP_v3). Emission variabilities are also classified as low (L, L<15%), low medium (LM, 15%<LM<50%), upper medium (UM, 50%<UM<100%), high (H, H>100%), based on the EMEP/EEA Guidebook (2019) information. The largest variability is found domestic shipping emissions (CO and NMVOC), energy (OC, BC), agricultural crops (PM), road transport (PM, NMVOC) and industry (NH3, NMVOC). In absence of a full uncertainty assessment the variability can be used as proxy of structural uncertainty, keeping in mind that variability could be biased towards overconfidence, thus underestimating the uncertainty. Furthermore, the uncertainty of the spatial proxies has not been assessed and maybe subject of future activity updates.

Table S6 – Variability of global emission estimates by sector and pollutant, calculated as the relative difference between HTAP_v3 emissions and the EDGARv6.1 estimates. Variability ranges are based on the qualitative classes defined in the EMEP/EEA Guidebook 2019 as low (L), low medium (LM), upper medium (UM), high (H).

Emission sector	Substance	(EDGARv6.1-HTAP_v3)/HTAP_v3, year 2000	(EDGARv6.1-HTAP_v3)/HTAP_v3, year 2018	varibility range, year 2000	varibility range, year 2018
HTAPv3_3_Energy	OC	69.3%	128.7%	UM	H
HTAPv3_3_Energy	BC	-1.9%	77.8%	L	UM
HTAPv3_3_Energy	SO2	-0.3%	44.5%	L	LM
HTAPv3_3_Energy	NOx	15.8%	24.4%	LM	LM
HTAPv3_3_Energy	CO	22.3%	20.7%	LM	LM
HTAPv3_3_Energy	NMVOC	34.9%	15.5%	LM	LM
HTAPv3_3_Energy	PM2.5	-16.4%	-1.2%	LM	L
HTAPv3_3_Energy	PM10	-17.2%	-2.7%	LM	L
HTAPv3_3_Energy	NH3	-1.9%	-39.5%	L	LM
HTAPv3_4.1_Industry	NMVOC	59.3%	96.4%	UM	UM
HTAPv3_4.1_Industry	SO2	-15.8%	85.5%	LM	UM
HTAPv3_4.1_Industry	OC	-24.0%	50.3%	LM	UM
HTAPv3_4.1_Industry	BC	-3.7%	47.8%	L	LM
HTAPv3_4.1_Industry	PM2.5	-46.6%	40.2%	LM	LM
HTAPv3_4.1_Industry	NOx	-1.6%	21.5%	L	LM
HTAPv3_4.1_Industry	PM10	-60.3%	-0.5%	UM	L
HTAPv3_4.1_Industry	CO	-25.8%	-2.6%	LM	L

HTAPv3_4.1_Industry	NH3	-53.7%	-54.2%	UM	UM
HTAPv3_4.2_Fugitive	CO	53.5%	64.1%	UM	UM
HTAPv3_4.2_Fugitive	SO2	31.1%	52.7%	LM	UM
HTAPv3_4.2_Fugitive	BC	36.7%	50.2%	LM	UM
HTAPv3_4.2_Fugitive	NH3	30.2%	19.4%	LM	LM
HTAPv3_4.2_Fugitive	NMVOC	10.7%	13.4%	L	L
HTAPv3_4.2_Fugitive	NOx	29.9%	8.9%	LM	L
HTAPv3_4.2_Fugitive	PM10	-0.6%	0.9%	L	L
HTAPv3_4.2_Fugitive	PM2.5	-29.0%	-23.0%	LM	LM
HTAPv3_4.2_Fugitive	OC	-65.0%	-51.1%	UM	UM
HTAPv3_4.3_Solvents	NMVOC	2.2%	-25.2%	L	LM
HTAPv3_4.3_Solvents	PM2.5	-69.8%	-60.2%	UM	UM
HTAPv3_4.3_Solvents	PM10	-74.5%	-67.6%	UM	UM
HTAPv3_4.3_Solvents	NH3	-99.8%	-99.6%	UM	UM
HTAPv3_5.1_Road_Transport	NH3	52.3%	80.2%	UM	UM
HTAPv3_5.1_Road_Transport	NOx	-4.2%	-16.4%	L	LM
HTAPv3_5.1_Road_Transport	CO	-21.3%	-47.0%	LM	LM
HTAPv3_5.1_Road_Transport	OC	-36.2%	-51.1%	LM	UM
HTAPv3_5.1_Road_Transport	NMVOC	-11.0%	-58.1%	L	UM
HTAPv3_5.1_Road_Transport	BC	-48.3%	-60.5%	LM	UM
HTAPv3_5.1_Road_Transport	PM2.5	-63.2%	-74.5%	UM	UM
HTAPv3_5.1_Road_Transport	SO2	-53.1%	-81.2%	UM	UM
HTAPv3_5.1_Road_Transport	PM10	-90.3%	-93.8%	UM	UM

HTAPv3_5.2_Brake_and_Tyre_wear	BC	26.1%	19.1%	LM	LM
HTAPv3_5.2_Brake_and_Tyre_wear	OC	-33.5%	-25.6%	LM	LM
HTAPv3_5.2_Brake_and_Tyre_wear	PM2.5	-57.1%	-48.0%	UM	LM
HTAPv3_5.2_Brake_and_Tyre_wear	PM10	-84.9%	-80.0%	UM	UM
HTAPv3_5.3_Domestic_shipping	NMVOC	249.9%	191.3%	H	H
HTAPv3_5.3_Domestic_shipping	CO	221.2%	188.7%	H	H
HTAPv3_5.3_Domestic_shipping	SO2	-5.5%	13.7%	L	L
HTAPv3_5.3_Domestic_shipping	PM2.5	11.4%	13.6%	L	L
HTAPv3_5.3_Domestic_shipping	PM10	11.1%	13.5%	L	L
HTAPv3_5.3_Domestic_shipping	BC	5.2%	11.3%	L	L
HTAPv3_5.3_Domestic_shipping	OC	6.3%	6.0%	L	L
HTAPv3_5.3_Domestic_shipping	NOx	-5.2%	3.3%	L	L
HTAPv3_5.3_Domestic_shipping	NH3	-41.5%	-20.9%	LM	LM
HTAPv3_5.4_Other_ground_transport	PM2.5	-34.5%	8.9%	LM	L
HTAPv3_5.4_Other_ground_transport	NH3	-13.8%	-17.4%	L	LM
HTAPv3_5.4_Other_ground_transport	NOx	-55.5%	-33.1%	UM	LM

HTAPv3_5.4_Other_ground_transport	PM10	-47.7%	-37.7%	LM	LM
HTAPv3_5.4_Other_ground_transport	OC	-71.8%	-41.7%	UM	LM
HTAPv3_5.4_Other_ground_transport	NMVOC	-80.8%	-64.6%	UM	UM
HTAPv3_5.4_Other_ground_transport	BC	-86.0%	-73.3%	UM	UM
HTAPv3_5.4_Other_ground_transport	CO	-82.6%	-82.3%	UM	UM
HTAPv3_5.4_Other_ground_transport	SO2	-83.8%	-84.0%	UM	UM
HTAPv3_6_Residential	PM10	30.2%	18.2%	LM	LM
HTAPv3_6_Residential	NH3	15.0%	4.9%	LM	L
HTAPv3_6_Residential	SO2	-8.0%	3.9%	L	L
HTAPv3_6_Residential	PM2.5	-7.4%	-9.5%	L	L
HTAPv3_6_Residential	NMVOC	-17.0%	-18.3%	LM	LM
HTAPv3_6_Residential	OC	-16.5%	-20.5%	LM	LM
HTAPv3_6_Residential	CO	-20.6%	-20.5%	LM	LM
HTAPv3_6_Residential	NOx	-39.0%	-28.8%	LM	LM
HTAPv3_6_Residential	BC	-41.6%	-40.3%	LM	LM
HTAPv3_7_Waste	NMVOC	78.1%	54.9%	UM	UM
HTAPv3_7_Waste	SO2	9.2%	7.4%	L	L
HTAPv3_7_Waste	NH3	-34.5%	-13.3%	LM	L
HTAPv3_7_Waste	PM10	-60.8%	-48.6%	UM	LM
HTAPv3_7_Waste	NOx	-50.5%	-57.3%	UM	UM

HTAPv3_7_Waste	PM2.5	-70.5%	-58.4%	UM	UM
HTAPv3_7_Waste	BC	-81.2%	-74.0%	UM	UM
HTAPv3_7_Waste	OC	-89.9%	-82.7%	UM	UM
HTAPv3_7_Waste	CO	-95.7%	-95.8%	UM	UM
HTAPv3_8.1_Agricultural_waste_burning	OC	7.5%	6.7%	L	L
HTAPv3_8.1_Agricultural_waste_burning	PM2.5	6.6%	6.1%	L	L
HTAPv3_8.1_Agricultural_waste_burning	CO	7.0%	5.8%	L	L
HTAPv3_8.1_Agricultural_waste_burning	PM10	5.6%	5.4%	L	L
HTAPv3_8.1_Agricultural_waste_burning	SO2	5.6%	5.1%	L	L
HTAPv3_8.1_Agricultural_waste_burning	NOx	5.4%	4.9%	L	L
HTAPv3_8.1_Agricultural_waste_burning	BC	3.8%	4.0%	L	L
HTAPv3_8.1_Agricultural_waste_burning	NH3	1.0%	2.7%	L	L
HTAPv3_8.1_Agricultural_waste_burning	NMVOC	-1.1%	0.3%	L	L
HTAPv3_8.2_Agriculture_livestock	NOx	11.5%	10.7%	L	L
HTAPv3_8.2_Agriculture_livestock	NMVOC	-14.7%	-9.4%	L	L
HTAPv3_8.2_Agriculture_livestock	NH3	-25.2%	-20.9%	LM	LM
HTAPv3_8.2_Agriculture_livestock	PM10	-33.8%	-26.7%	LM	LM

HTAPv3_8.2_Agriculture_livestock	PM2.5	-34.8%	-27.8%	LM	LM
HTAPv3_8.3_Agriculture_crops	NOx	13.1%	11.7%	L	L
HTAPv3_8.3_Agriculture_crops	NH3	16.6%	8.7%	LM	L
HTAPv3_8.3_Agriculture_crops	NMVOC	6.9%	6.8%	L	L
HTAPv3_8.3_Agriculture_crops	PM2.5	-82.1%	-77.8%	UM	UM
HTAPv3_8.3_Agriculture_crops	PM10	-92.6%	-91.6%	UM	UM