General comments:

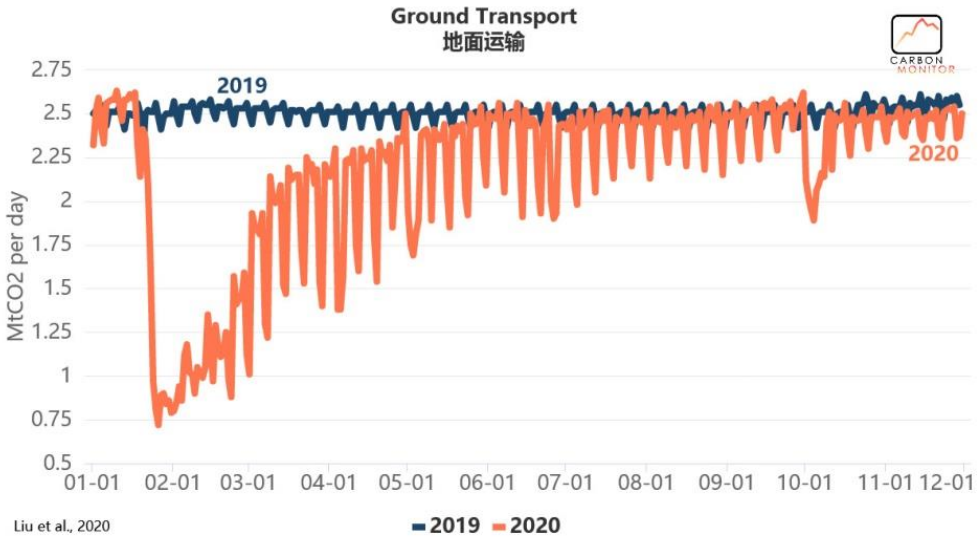
Doumbia et al. present an interesting and important dataset on changes in global air pollutant emissions during the COVID-19 pandemic focusing on adjustment factors (AFs). This dataset is not only useful for global and regional emission inventories development, but also for atmospheric chemistry modeling, which is worth publishing in ESSD. I have several concerns on this paper.

1. Concerning the spatial distribution, the Methodology does not provide enough details on how the 0.1×0.1 dataset was created, how to support the 0.1×0.1 resolution? And the Results part showed only one spatial pattern figure (Fig. 8), which also need to be largely expanded not only for NOx.
2. Since the COVID-19 pandemic is still severe and the confirmed cases are increasing (https://www.worldometers.info/coronavirus/), this important dataset can aim to update it continuously, not only to the end of 2020 (lines 92-93).
3. How the AFs are calculated for different pollutants is not so clear with specific equations, especially when there are multiple sources activity data (e.g. industrial processes);
4. Why are there larger decreases (30-50 %) in South America than other areas (e.g. China, EU and US) for NOx, NMVOCs and CO. And Fig.8 seems to show that China has the largest decrease, rather than South America?

Some minor comments:

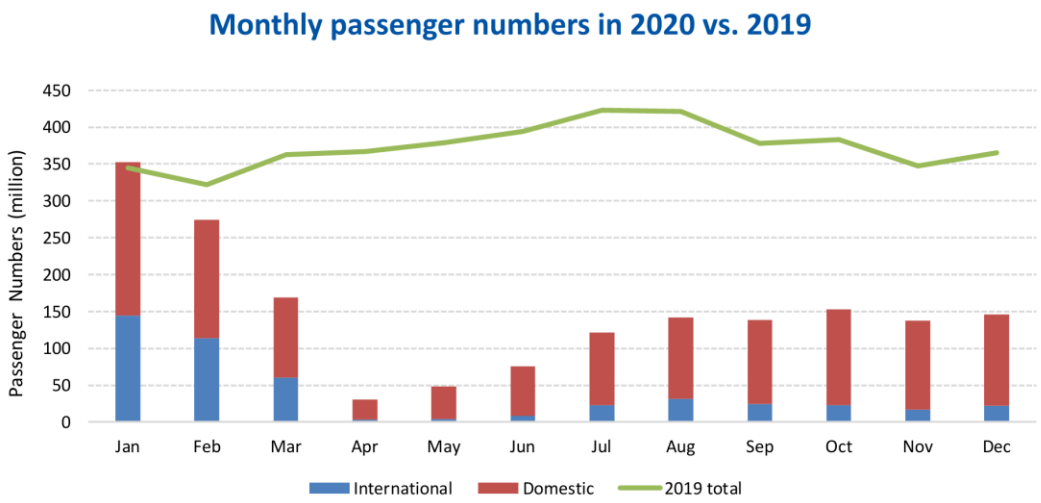
1. The title might be too limited for only “atmospheric chemistry modeling”;
2. Line 51 are repeated for CO with lines 48-49;
3. Line 65 for greenhouse gas, there are other references (Han et al., 2021; Zheng et al., 2020);
4. Line 81-82, need to expand the meanings of this dataset? e.g. provide assessments on COVID-19 restrictions on pollutant emissions;
5. Line 95, could CO2 be included? It would be better for homology studies.
6. Lines 116-117: Add some introduction on CAMS -GLOB-ANT;

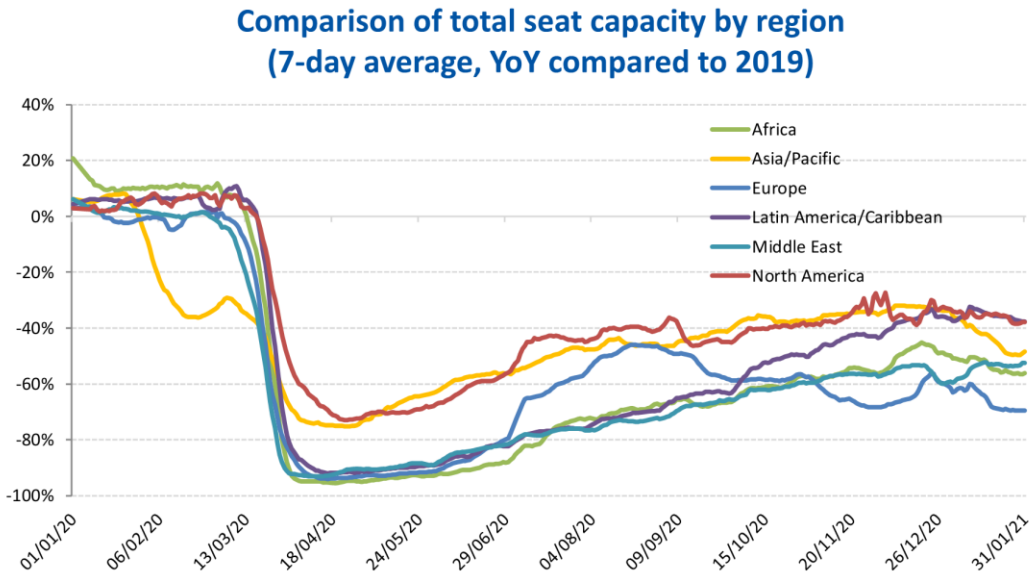
7. Lines 119-120 repeated with Lines 92-93;
8. Line 157: In reference to (Han et al., 2021), monthly road (and also ship) transportation data for China can be obtained at http://www.mot.gov.cn/tongjishuju/, but it needs some translation and digitalization work to obtain the data. And it is up to the authors to decide whether to include such data;
9. Lines 197-198: Maybe need some discussions. The assumption is not very consistent with Liu et al., 2020, see (https://www.carbonmonitor.org.cn/user/data.php?by=cn );



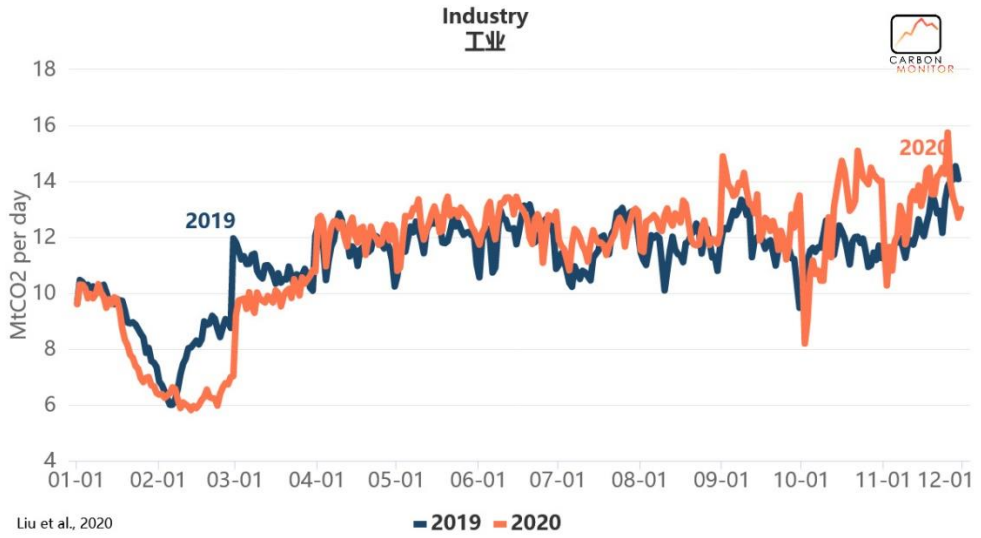

10. Lines 201-202: add a reference;
11. Line 205: May need to add time resolutions (e.g. daily or monthly) for sectors in Table 1;
12. Line 211: Cement is not included in this dataset?
13. Line 216: For China monthly data, the iron, steel and cement production can be obtained at https://data.stats.gov.cn/english/easyquery.htm?cn=A01 in "Output of major industrial products"
14. For Section 2.3, China's power data can be reflected by daily coal consumption at six main power groups, see (Han et al., 2021) Fig.4, and the data is provided at the end of this file.
15. Lines 251-252: Can compare with data from International Civil Aviation

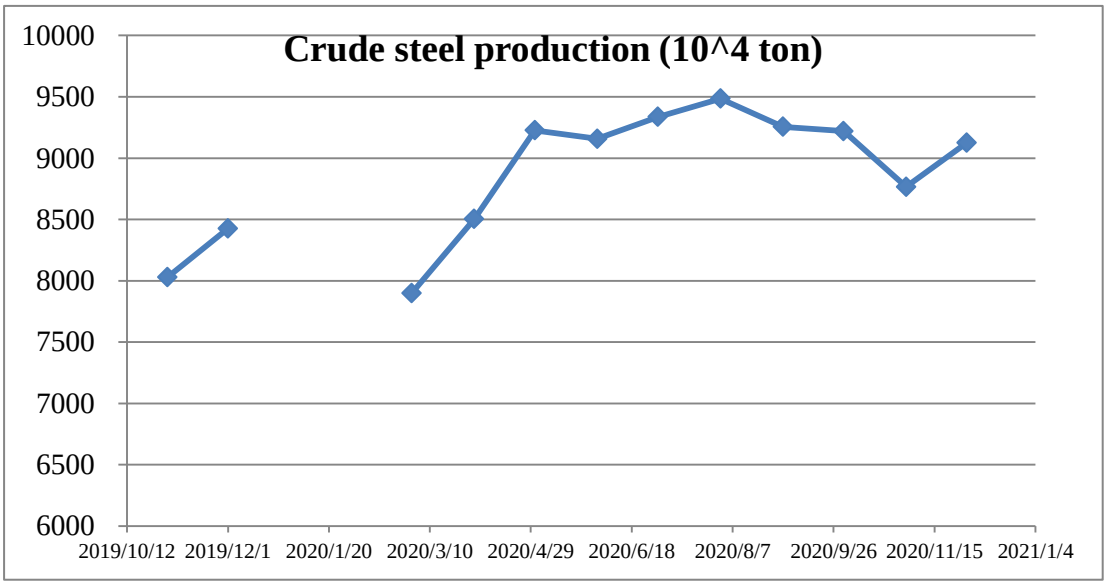
Organization (ICAO). I noticed a report which contained regional/country data (https://www.icao.int/sustainability/Documents/COVID-19/ICAO_Coronavirus_Econ_Impact.pdf ), which you may find useful in cross validation;

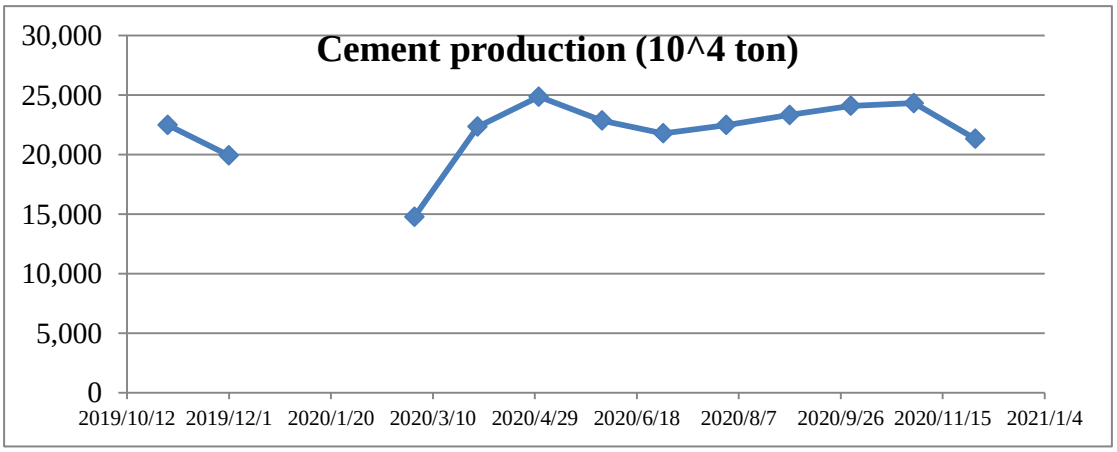



16. Line 324: Also consider these refs. (He et al., 2021; Sun et al., 2020; Zhang et al., 2021) ;
17. Lines 375-377: Maybe not this case (see below 3 figures), and CO2 emissions from Liu et al., (2020) (https://www.carbonmonitor.org.cn/user/data.php?by=cn) and NBS statistical data on iron and steel and cement productions (https://data.stats.gov.cn/english/easyquery.htm?cn=A01) showed that industry in China recovered soon after April 1st , and surpassed the before COVID-19 mean state.




18. Line 406: Should be Figure 6 for power and Figure 4 for Industry?
19. Lines 411-412: Power AFs for China is not consistent with (Liu et al., 2020) and (Han et al., 2021), I provided the daily coal consumption data for six major power generation groups at the end of minor comments for your reference.

20. Line 426: change the red color “is” to black;
21. Lines 449-450: NMVOCs are mainly from solvents and industrial processes (Lines 464-465), and not homogeneous with SO2? Here “rather similar” seems to show some relations?
22. Lines 478-480: Expand this short paragraph a bit;
23. Line 486: “largest” or “large” ?
24. Line 513: “might” or “could” or “did”?
25. Draw vertical lines to show lockdown and unlock date information in time series figures for major countries or regions.

Daily coal consumption at six main power generation groups from (Han et al., 2021). Data were derived from https://www.wind.com.cn/ .

| Date | Daily coal consumptions (10^4 ton) |
|---|---|
| 2019-12-01 | 73.07 |
| 2019-12-02 | 72.67 |
| 2019-12-03 | 69.55 |
| 2019-12-04 | 71.45 |
| 2019-12-05 | 73.03 |
| 2019-12-06 | 76.28 |
| 2019-12-07 | 76.40 |
| 2019-12-08 | 74.67 |
| 2019-12-09 | 75.11 |
| 2019-12-10 | 75.22 |
| 2019-12-11 | 73.95 |
| 2019-12-12 | 73.99 |
| 2019-12-13 | 74.44 |
| 2019-12-14 | 74.31 |
| 2019-12-15 | 71.13 |
| 2019-12-16 | 68.49 |
| 2019-12-17 | 67.36 |
| 2019-12-18 | 69.90 |
| 2019-12-19 | 71.79 |
| 2019-12-20 | 76.26 |
| 2019-12-21 | 76.66 |
| 2019-12-22 | 77.28 |
| 2019-12-23 | 76.12 |
| 2019-12-24 | 76.04 |
| 2019-12-25 | 77.10 |
| 2019-12-26 | 77.43 |
| 2019-12-27 | 77.24 |
| 2019-12-28 | 76.56 |
| 2019-12-29 | 75.27 |
| 2019-12-30 | 75.47 |
| 2019-12-31 | 77.17 |
| 2020-01-01 | 77.65 |

| | |
|---|---|
| 2020-01-02 | 73.98 |
| 2020-01-03 | 70.26 |
| 2020-01-04 | 75.40 |
| 2020-01-05 | 76.06 |
| 2020-01-06 | 74.17 |
| 2020-01-07 | 70.08 |
| 2020-01-08 | 70.10 |
| 2020-01-09 | 70.49 |
| 2020-01-10 | 71.79 |
| 2020-01-11 | 74.16 |
| 2020-01-12 | 72.90 |
| 2020-01-13 | 68.96 |
| 2020-01-14 | 66.56 |
| 2020-01-15 | 68.39 |
| 2020-01-16 | 67.83 |
| 2020-01-17 | 67.13 |
| 2020-01-18 | 65.65 |
| 2020-01-19 | 62.65 |
| 2020-01-20 | 59.18 |
| 2020-01-21 | 55.79 |
| 2020-01-22 | 51.01 |
| 2020-01-23 | 47.21 |
| 2020-01-24 | 46.93 |
| 2020-01-25 | 45.03 |
| 2020-01-26 | 43.53 |
| 2020-01-27 | 42.73 |
| 2020-01-28 | 41.13 |
| 2020-01-29 | 43.73 |
| 2020-01-30 | 42.83 |
| 2020-01-31 | 39.93 |
| 2020-02-01 | 38.51 |
| 2020-02-02 | 37.55 |
| 2020-02-03 | 38.05 |
| 2020-02-04 | 37.76 |
| 2020-02-05 | 37.66 |
| 2020-02-06 | 37.04 |
| 2020-02-07 | 37.42 |
| 2020-02-08 | 37.52 |
| 2020-02-09 | 37.82 |
| 2020-02-10 | 36.92 |
| 2020-02-11 | 37.20 |
| 2020-02-12 | 37.24 |
| 2020-02-13 | 38.49 |
| 2020-02-14 | 38.11 |
| 2020-02-15 | 38.00 |
| 2020-02-16 | 38.20 |
| 2020-02-17 | 38.80 |
| 2020-02-18 | 38.93 |
| 2020-02-19 | 39.33 |
| 2020-02-20 | 42.14 |
| 2020-02-21 | 42.13 |
| 2020-02-22 | 42.08 |
| 2020-02-23 | 41.88 |
| 2020-02-24 | 42.67 |

| | |
|---|---|
| 2020-02-25 | 41.57 |
| 2020-02-26 | 42.86 |
| 2020-02-27 | 42.75 |
| 2020-02-28 | 43.11 |
| 2020-02-29 | 43.36 |
| 2020-03-01 | 43.36 |
| 2020-03-02 | 45.07 |
| 2020-03-03 | 45.60 |
| 2020-03-04 | 47.68 |
| 2020-03-05 | 49.33 |
| 2020-03-06 | 50.41 |
| 2020-03-07 | 50.81 |
| 2020-03-08 | 52.41 |
| 2020-03-09 | 52.81 |
| 2020-03-10 | 51.56 |
| 2020-03-11 | 52.52 |
| 2020-03-12 | 50.73 |
| 2020-03-13 | 53.38 |
| 2020-03-14 | 53.47 |
| 2020-03-15 | 52.25 |
| 2020-03-16 | 54.17 |
| 2020-03-17 | 51.82 |
| 2020-03-18 | 54.66 |
| 2020-03-19 | 55.03 |
| 2020-03-20 | 54.57 |
| 2020-03-21 | 55.01 |
| 2020-03-22 | 54.77 |
| 2020-03-23 | 55.01 |
| 2020-03-24 | 57.44 |
| 2020-03-25 | 61.67 |
| 2020-03-26 | 58.68 |
| 2020-03-27 | 59.94 |
| 2020-03-28 | 56.44 |
| 2020-03-29 | 55.50 |
| 2020-03-30 | 55.75 |
| 2020-03-31 | 56.10 |
| 2020-04-01 | 57.44 |
| 2020-04-02 | 58.72 |
| 2020-04-03 | 56.53 |
| 2020-04-04 | 56.87 |
| 2020-04-05 | 54.55 |
| 2020-04-06 | 51.72 |
| 2020-04-07 | 52.05 |
| 2020-04-08 | 54.12 |
| 2020-04-09 | 54.08 |
| 2020-04-10 | 55.31 |
| 2020-04-11 | 56.11 |
| 2020-04-12 | 56.12 |
| 2020-04-13 | 53.66 |
| 2020-04-14 | 50.62 |
| 2020-04-15 | 54.82 |
| 2020-04-16 | 57.88 |
| 2020-04-17 | 56.42 |
| 2020-04-18 | 55.65 |

| | |
|---|---|
| 2020-04-19 | 56.95 |
| 2020-04-20 | 56.94 |
| 2020-04-21 | 55.91 |
| 2020-04-22 | 58.02 |
| 2020-04-23 | 57.06 |
| 2020-04-24 | 57.23 |
| 2020-04-25 | 55.98 |
| 2020-04-26 | 56.08 |
| 2020-04-27 | 55.01 |
| 2020-04-28 | 52.23 |
| 2020-04-29 | 53.60 |
| 2020-04-30 | 53.88 |
| 2020-05-01 | 53.19 |
| 2020-05-02 | 52.73 |
| 2020-05-03 | 48.74 |
| 2020-05-04 | 50.38 |
| 2020-05-05 | 54.89 |
| 2020-05-06 | 58.10 |
| 2020-05-07 | 59.92 |
| 2020-05-08 | 63.32 |
| 2020-05-09 | 63.24 |
| 2020-05-10 | 65.77 |
| 2020-05-11 | 65.94 |
| 2020-05-12 | 64.20 |
| 2020-05-13 | 66.47 |
| 2020-05-14 | 65.15 |
| 2020-05-15 | 65.99 |
| 2020-05-16 | 68.20 |
| 2020-05-17 | 69.74 |
| 2020-05-18 | 68.51 |
| 2020-05-19 | 69.18 |
| 2020-05-20 | 65.63 |
| 2020-05-21 | 67.84 |
| 2020-05-22 | 67.54 |
| 2020-05-23 | 66.72 |
| 2020-05-24 | 66.96 |
| 2020-05-25 | 65.34 |
| 2020-05-26 | 63.72 |
| 2020-05-27 | 66.23 |
| 2020-05-28 | 62.59 |
| 2020-05-29 | 59.30 |
| 2020-05-30 | 58.76 |
| 2020-05-31 | 58.93 |
| 2020-06-01 | 57.76 |
| 2020-06-02 | 55.79 |
| 2020-06-03 | 58.02 |
| 2020-06-04 | 61.62 |
| 2020-06-05 | 60.09 |
| 2020-06-06 | 63.04 |
| 2020-06-07 | 63.73 |
| 2020-06-08 | 60.30 |
| 2020-06-09 | 57.52 |
| 2020-06-10 | 61.82 |
| 2020-06-11 | 64.73 |

| | |
|---|---|
| 2020-06-12 | 65.96 |
| 2020-06-13 | 67.65 |
| 2020-06-14 | 67.98 |
| 2020-06-15 | 67.06 |
| 2020-06-16 | 66.59 |
| 2020-06-17 | 67.92 |
| 2020-06-18 | 65.22 |
| 2020-06-19 | 67.00 |
| 2020-06-20 | 66.32 |
| 2020-06-21 | 66.55 |
| 2020-06-22 | 63.10 |
| 2020-06-23 | 62.35 |
| 2020-06-24 | 63.59 |
| 2020-06-25 | 65.24 |
| 2020-06-26 | 62.48 |
| 2020-06-27 | 60.11 |
| 2020-06-28 | 61.29 |
| 2020-06-29 | 63.67 |
| 2020-06-30 | 63.84 |
| 2020-07-01 | 64.67 |
| 2020-07-02 | 62.52 |
| 2020-07-03 | 61.97 |
| 2020-07-04 | 62.57 |
| 2020-07-05 | 62.67 |
| 2020-07-06 | 62.27 |

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