EGUsphere, referee comment RC1
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Comment on egusphere-2022-1490

Ray Nassar (Referee)

Referee comment on "Monitoring and quantifying CO_2 emissions of isolated power plants from space" by Xiaojuan Lin et al., EGUsphere,
https://doi.org/10.5194/egusphere-2022-1490-RC1, 2023

Lin et al. "Monitoring and quantifying CO_2 emissions of isolated power plants from space" builds off previous work on quantifying power plant emissions using OCO-2 and OCO-3 observations together with models. It is good to see this effort toward development of a more systematic and automated method that leverages what has been demonstrated by others in past case studies. Furthermore, the comparison between the Gaussian plume method (GPM) and Integrated Mass Enhancement (IME) method is a useful investigation that highlights the importance of the satellite coverage and resolution and the different nature of CO_2 and CH_4 plumes since the conclusion differs from that based on high spatial resolution CH_4 observations in the literature. Overall, this is a useful study that helps to bring the field a step closer to the implementation of an operational system for CO_2 anthropogenic emission monitoring as planned for CO2M. Following some minor revisions related to the specific points below, I would recommend its publication.

Specific Points

Line 43-44: These are not really the primary references regarding the difficulty to achieve accurate and detailed consumption data

Line 63: Reuter et al. (2019) derived emission estimates for power plants, urban areas and wild fires

Line 66: Nassar et al. (2022) https://www.frontiersin.org/articles/10.3389/frsen.2022.1028240/full is a key OCO-3 example worth mentioning

Line 71: Schwandner et al. 2017 is not the best choice of reference. Although the paper mentions power plants, it really focuses on XCO_2 enhancements in an urban area (later understood to be topography related biases), while the only emission estimate is of volcanic emissions from one cloudy overpass

Line 74: "manually-selected" is perhaps a better descriptor than "hand-picked" (slang)

Line 79: Intermittency of U.S. sources has previously been studied by Hill and Nassar (2019) https://doi.org/10.3390/rs11131608 and Velazco et al. (2011) www.atmos-meas-tech.net/4/2809/2011/, so these two past studies should be cited.

Line 97: "≤ 1.29 x 2.25 km^2" (It is worth noting that this is the maximum footprint size,

since it is usually smaller due to solar angle and viewing geometry)

Line 97: "~52" degrees is recommended since the value can be exceeded by a few tenths of a degree in some cases

Line 111: daily global coverage before loss of data due to clouds

Line 119: This EPA link has annual power plant emission data, but is it the correct link for the hourly data too?

Line 257: Nassar et al. 2021 used the assumed height of the chimney plus an assumed 250 m for typical plume rise above the stack height

Line 295: For clarify, it would be helpful to specify that the x-axis is labelled with YYMMDD.

Line 374: Should revise language about GeoCarb as it has recently been cancelled by NASA.

Line 375: CO2M is a Copernicus mission with ESA and EUMETSAT involvement