Comment on acp-2022-193

Anonymous Referee #2

Referee comment on "Biomass burning CO, PM and fuel consumption per unit burned area estimates derived across Africa using geostationary SEVIRI Fire Radiative Power and Sentinel-5P CO data" by Hannah M. Nguyen et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-193-RC2, 2022

The paper presents the retrieval of carbon monoxide emissions over Africa from a 16-year archive of geostationary satellite images, with several auxiliary data derived from other satellite instruments, such as Tropomi. It's a dense technical document, which certainly represents a huge amount of work. The reader of the ACP might be surprised by its contents, because in the portfolio of the EGU journals, it would fit much better with the AMT ("advances in remote sensing") than with the ACP ("studies investigating the Earth's atmosphere and the underlying chemical and physical processes"). That aspect aside, it is full of technical processing details and acronyms that do not make it easy to read, but I still did not find some of the key information I was looking for, leaving me to wonder about the quality of other information about which I know less:

- What Tropomi data was used? NRTI, OFFL? The document states that the 2020 data was used at 7 km resolution as for 2018, but the Tropomi data was at 5.5 km resolution along the track during the second period: how was the degradation of the resolution made? Was data with variable "qa_value" less than 1 correctly discarded? How were the stripes of CO data in the direction of flight treated for the two time periods? Can the selection of Tropomi data bias the results towards certain types of fires (with low aerosols optical thicknesses for example)? With these questions in mind, I cannot confidently endorse the results.
- How is the plume buffer computed (I cannot guess it from Fig 1)? It is easy to bias the "background" estimation high or low with a slight change in the buffer definition, in particular due to the unstable choice of the minimum value.
- What is the time scale of the FRP temporal integration? Can some of the CO have been oxidized during that time?
- How are the boundary conditions treated in the model simulations?

Apart from the uncertainty of the slope (and not the "error" of the slope as wrongly put in the legend, in fact without any definition of the uncertainty variable used), there is no notion of uncertainty in the product shown here. Just by looking at table 1, I understand that the 5 key numbers derived from the Tropomi data are very close to each other: are their differences statistically significant? An error budget for the complete processing chain is surprisingly lacking to support, for example, the discussion of p. 12-13. As of now, this discussion looks like mere speculation.

In addition, two minor aspects should be addressed:

- The title contains a typo ("Sentinal") and a not-so-common acronym (FRP)
- The term "measure" used in many places about remote sensing is not appropriate (see the BIPM metrology definitions).