Comment on amt-2021-16

Anonymous Referee #1

Referee comment on "An algorithm to detect non-background signals in greenhouse gas time series from European tall tower and mountain stations" by Alex Resovsky et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-16-RC2, 2021

The manuscript presents a statistical approach to identify continent-wide terrestrial biosphere changes or synoptic-scale transport signals in CO2 and CH4 time series. It is built upon Thoning et al. (1989) with an additional LOESS function. This manuscript is well written, and the statistical approach can be very helpful to quickly assess some interesting features in the dataset. I suggest a few improvements. Additional data analysis with meteorological data can be helpful to associate the detected anomalies to specific type of drivers, e.g. synoptic weather system or regional to continental extremes. This will give some insight as whether there is "false positive/ false negative" for detected anomalies that are not shared by other sites. Given the disadvantage of the curve fitting routine on time series with long data gap (e.g. > 1 month) that is briefly discussed in the manuscript, I also recommend additional analysis to show at what extend this artifact will impact the ability to detect anomalies, particularly in near-real time dataset. Is this something can partially be overcome by using multi-year averaged seasonal cycles instead of harmonic functions from CCGCRV, similarly as Lan et al. 2019 (https://doi.org/10.1029/2018GL081731)? I believe this will be informative for the users given that instrument issue can very often cause data gap longer than 1 month. In general, I recommend minor revision before publication.

A few detailed comments:

- Section 2.2 carbon cycle group of the CMDL, they are now the Global Monitoring Laboratory instead of GMD.
- Line 134, can you briefly describe the LFIT protocol
- For near-real-time data, can you discuss how the end effect of curve fitting is handled

in your algorithm? CCGCRV is sensitive to end effect.