

Interactive comment on “Benefit of ozone observations from Sentinel-5P and future Sentinel-4 missions on tropospheric composition” by Samuel Quesada-Ruiz et al.

Anonymous Referee #1

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General comment: In this paper, Samuel Quesada-Ruiz et al. evaluated the benefits of assimilating ozone observations from sentinel-5P and sentinel-4 in the MOCAGE-PALM system using a synthetic study in the European domain. They quantified the improvements and deterioration of O₃ profile results at levels of 200, 500, and 700hPa by adding the new satellite observations. Since the real ozone profiles can not be well known for the real measurements, the synthetic study with CTM simulations of real atmosphere is a state-of-art way for the research purpose. In general, the scientific topic is meaningful, research method is novel, and presentation is quite concise.

I have one general concern. In the simulations of S4 and S5P ozone observations,

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the transformed AK, which is derived from the DISAMAR inversion package, is used to convert the true ozone profile from the nature run to the measured ozone profile. The AK is not only as a function of atmospheric state and measured geometries, but also depends on settings of optimal estimations, e.g. covariance of a-priori and measurement uncertainties. And the measured ozone profiles calculated with the AK can further impact the final ozone profile results from the assimilation run. The benefit of S4 and S5P ozone observations is concluded based on the assimilation run. Therefore the conclusion might be specifically for the DISAMAR inversion package. The benefit might be different if other inversion algorithms are applied to the ozone retrievals of S4 and S5P observations. Considering this, the authors should clarify that the conclusion is based on the DISAMAR inversion package and might be different for other algorithms of ozone retrievals in the abstract and conclusion part.

Specific comments:

- 1) The abbreviations of nature run, assimilation run, and reference run might not be needed. It is easier for readers to understand the paper if the original words are written in the manuscript.
- 2) P3, L3-4: The data assimilated to the MOCAGE-PALM system should not be the ozone data simulated from the nature run. As I understand, the data should be simulated ozone observations with the ozone data simulated from the nature run. Please check the sentence.
- 3) P4, L29: The free run is not explained in the paper. Please check.
- 4) P5, L32: "The simulated ozone observations from GBS" should be based on the nature run results and assimilated into the MOCAGE-PALM. Please check the sentence.
- 5) Section 4.2.1: Since the spectral analysis of ozone is not applied in the synthetic study, how do you consider the uncertainty of spectral analysis for satellite observations?

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