Dear Prof. Dr. Landulfo,

thank you very much for handling our manuscript.
Based on the comments from REF#1, we have thoroughly modified the abstract and introduction, shortened the manuscript and made it more specific to the objectives of this study. We have moved two subsections (CH_4 background signal and fitting of CH_4 emission rates) to the appendix, and deleted some technical parts in the main text.

Response to Referee #1

We would like to thank the reviewer #1 for taking the time to review this manuscript again and provide valuable and constructive feedback that further improved the manuscript. We are very sorry that our prior modifications did not fulfill the reviewer's requirements. Below, we address the list of points raised by the referee. All the points one-by-one raised by the reviewer are copied here and shown in bold text, along with the corresponding reply from the authors in plain text.

1. It is not clear how this case study of Madrid landfills is of sufficient general scientific interest to justify publication in ACP.

Our study develops a novel method to estimate the CH_4 emission rates of landfills in metropolitan areas by using satellite and ground-based observations.

In case of the study region (Madrid) we used for demonstrating our method, all emission rates estimated from the different observations are significantly larger than the emission rates provided via the official Spanish Register of Emissions and Pollutant Sources. We expect that inventories in other parts of the world are also underestimating these kinds of emissions.

From the global perspective, the CH_4 emissions from landfills are significant contributions to anthropogenic emissions. We added several references in the introduction, showing the importance of estimating emissions from landfills.

2. The paper is far too long. For example, the introduction starts with platitudes about the global methane budget that have little to do with what the paper is about. There is a lot of anecdotal detail about the results that may belong in a technical report to the city of Madrid but not in a scientific paper.

We have thoroughly modified the abstract and introduction, shortened the manuscript and made it more specified on the objectives of this study. We have moved two subsections (CH_4 background signal and fitting of CH_4 emission rates) to the appendix, and deleted some technical parts in the main text.

3. The English suffers from wordiness, bad grammar, and poor style.

We have checked the grammar again and further revised the language of the manuscript. The final version will undergo language proofreading by the Copernicus editing group before publication.

4. I am not convinced of the quality of the TROPOMI data, and the authors have done nothing to allay the concerns of my original review.

We do not understand the concern of the referee with respect to the quality of the TROPOMI data. The TROPOMI data have been successfully validated and applied in our study for estimating emissions from landfills. We even demonstrated a reasonable agreement between the emission rate obtained from TROPOMI and the rate obtained from independent COCCON observations.

The TROPOMI XCH_4 has been validated with TCCON (-3.4 ± 5.6 ppb) and GOSAT (-10.3 ± 16.8 ppb) by Lorente et al., (2021), whose results is added to Sec.2.1.2. The mean bias between TROPOMI and COCCON is 2.7 ± 13.2 ppb, which is below the absolute bias between TROPOMI and TCCON. This information is also added to Sec.3.1. The following statements have been added to the manuscript:

Sec.2.1.2.: "This study uses the TROPOMI data set of XCH_4 from Lorente et al., (2021), for which an updated retrieval algorithm was implemented to obtain a data set with less scatter. This updated XCH_4 has been demonstrated to be in good agreement with TCCON (-3.4 ± 5.6 ppb) and GOSAT (-10.3 ± 16.8 ppb), with a bias and precision below 1%."

Sec.3.1.: "The mean bias in XCH_4 between TROPOMI and COCCON is 2.7 ± 13.2 ppb, which is below the absolute bias between TROPOMI and TCCON (3.4 ± 5.6 ppb, Lorente et al., 2021). The higher scatter of the validation with COCCON reflects the shorter temporal and spatial collocation, but the agreement It indicates that TROPOMI data have good quality and a low bias."