

Reviewer 2

1. Does XCH4 refer to the methane column concentration enhancement in Line 78?

XCH4 refers to the methane column concentration, which can be more accurately named as ‘dry-air column-averaged mole fraction’ (Guanter, 2021). However, in Line 78 we write $\Delta XCH4$, which refers to the methane column concentration enhancement. We are interested in the enhancement since this can be used to measure point source emissions. We change the term to ‘methane column concentration enhancement’ as suggested to enhance clarity.

2. What are the errors of retrieval methane concentration from different instruments? How to consider the impact of background concentration on methane plume detection in Line 83?

The retrieval methane concentration error is measured with $\sigma_{\Delta XCH4}$, which is the standard deviation of the retrieval (Guanter, 2021). The impact of background noise is captured with this magnitude and that is why $\sigma_{\Delta XCH4}$ is used in the detection algorithm. We emphasize this in the text.

Moreover, EMIT retrievals have generally lower $\sigma_{\Delta XCH4}$ than the ones from EnMAP. This can be shown in Figure 7 and is already explained in the text (Line 219-220 from the original manuscript).

Note that we also name $\sigma_{\Delta XCH4}$ as retrieval precision.

3. How to consider the uncertainty of wind fields simulated by WRF-LES model in Line 106?

The U10 related to a synthetic plume is obtained from the mean value of the U10 wind field from the simulated spatial domain covering a representative time before the plume instance time until the instance time itself. As a result, the extracted U10 value is representative of the plume instance methane distribution. However, no uncertainty related to this value is considered as in Varon et al., (2018).

4. Why the U10 is not obtained from the WRF in Line 111? not consistent with the Ueff.

Indeed, Ueff is extracted using the U10 values from WRF simulations. However, to quantify real emissions, we must extract a U10 value for the real emission area at the instrument acquisition time. We cannot extract this value from WRF simulations and therefore we extract this value from GEOS-FP.

5. In Eq.6 and Eq.7, are the parameters same for the EnMAP and EMIT instruments?

No. We change the notation to enhance clarity.