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Atmospheric Measurement Techniques Discussions

Interactive comment on "Quantifying the impact of aerosol scattering on the retrieval of methane from airborne remote sensing measurements" *by* Yunxia Huang et al.

Anonymous Referee #1

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General comments

This paper provides some analysis about how aerosols properties affect CH_4 retrieval, which will attract a lot of interests from the audience of this journal. However, it is suggested that more specific analysis about the aerosol model are needed and the main points about aerosol impact need to be emphasized in both abstract and main part. Moreover, in the two retrieval algorithm used in this study, no aerosol loading is included. I'm just wondering if AOD or other aerosol parameters are retrieved simultaneously with XCH_4, such as adding AOD in the state vector of OE retrieval, will the retrieval bias be improved? If any preliminary results could be shown, it will be interest-

ing. Furthermore, the section 3 has less close relationship with the topic of this paper, the authors are suggested to think it more.

Specific comments

1. In the third paragraph of Introduction, I suggest the authors to add more the description about how to retrieve CH_4 concentration from satellite measurements, especially the advantage of hyperspectral imaging in CH_4 retrieval. I think the description about atmospheric correction has less relationship with the topic of this paper.
2. Line 171-172: How to do normalization for measured radiance? Add some description about this, please.
3. Line 181: Is the typical XCH_4 background of 1.822 ppm shown by the authors here related to the background covariance matrix and mean radiance used in MF method? Some reasons are expected here. By the way, it is better to mention the background covariance matrix and mean radiance in MF retrieval of CH_4 plume case here.
4. In the OE retrieval in section 3, what is the definition of the a priori value of XCH_4? What aerosol model do the authors use? I think some parameters about aerosol model are expected here.
5. In section 4.3, the authors show the variation of OE XCH_4 retrieval bias with SSA, g, AOD, surface albedo and XCH_4. Which parameters affect XCH_4 retrieval bias most? From aerosol parameters, which type of aerosols, such as smoke, dust or sea salt, causes the largest or lowest bias in XCH_4 retrieval? These information will attract the audience's interest and provide guidance to correct aerosol impact in future XCO_4 retrieval algorithm.

6. In OE retrieval, the a priori error of XCH_4 will affect the retrieval bias as well. Maybe the authors could check its impact.

Technical corrections

1. Figure 9a and 9b have some overlaps with the same XCH_4. There is no need to express them using two figures.