

## ***Interactive comment on “The operational methane retrieval algorithm for TROPOMI” by Haili Hu et al.***

### **Anonymous Referee #2**

Received and published: 23 August 2016

**General Comments** This paper introduced the operational XCH<sub>4</sub> retrieval algorithm in high precision and accuracy, which is valuable for application of CH<sub>4</sub> monitoring using the Sentinel-5 precursor satellite, and its performance tested on realistic simulated measurements. There are sensitive studies on XCH<sub>4</sub> retrieval errors caused by atmospheric scattering properties, atmospheric data and instrument calibrations. It is useful in future improvement of the retrieval algorithm. This paper is valuable to be published, but need some modification. The author should pay more attention on the following point,

1. As the retrieval algorithm is firstly introduced in this paper, the authors need to explain the detailed description of the retrieval algorithm. For example, in Table 1, the authors should summarize the detailed a priori information, its structure and units as well as the state vector elements used in the algorithm.

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explain the detailed description of the retrieval algorithm. For example, in Table 1, the authors should summarize the detailed a priori information, its structure and units as well as the state vector elements used in the algorithm.

2. The authors should highlight the advantage of the retrieval algorithm, as compared with other algorithms for CH<sub>4</sub> monitoring.

3. As described in Section 2.1.1, the aerosol type in this retrieval algorithm is characterized by the refractive index and size distribution, which are assumed and fixed parameters in the algorithm. However, aerosols information is the one of the most important factors on XCH<sub>4</sub> retrievals and thus the authors should consider the effects of assumed aerosol information on XCH<sub>4</sub> retrievals.

4. There is unclear description on the following point, A. In Section 2.3, authors describe the filtering criteria to remove the retrievals with bad quality. B. In line 233, authors applied the filtering criteria for the ratio of retrieved H<sub>2</sub>O column between at weak and strong band. Authors should describe the reason why the ratio is lower than 0.08.

5. In Section 3, the authors described the sensitivity of XCH<sub>4</sub> retrievals to atmospheric input data and instrument errors. The authors would better describe about the sensitivity to assumed information in the algorithm. In addition, the authors would better show the sensitivity to aerosol information, such as aerosol column, aerosol size parameter and aerosol height parameter.

6. In Section 4, cloud information derived from the MODIS products, such as cloud fraction, cloud optical thickness and cloud top height. The authors should briefly explain the method to obtain the cloud information.

7. In Section 2.3, the authors described the method to filter out scenes including cloud screening. Moreover, in Section 4, the authors also described about cloud screening method and its performance in terms of comparison of two filtering method. The meth-

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ods are mixed in these sections and is unclear. Please make sure the filtering criteria for post-screening and cloud screening in individual section if you want to simultaneously show its performance.

### Minor Comments

1. In Fig. 3, please add a legend label.
2. In Fig. 4, is it monthly mean value of retrievals? Please show the period that you have these results. Also, you can plot again with large legend.
3. Table 2 shows the summarized the effect of instrument calibration errors on the XCH<sub>4</sub> bias and precision. The authors would better summarize the effect of atmospheric input data and assumed scattering simultaneously.
4. In Fig. 9, authors describe the panel (c) and (d) give the valid retrievals after cloud filtering with MODIS and the backup cloud filters. The authors should revised that panel give the XCH<sub>4</sub> biases of the valid retrievals after filtering.
5. In 471, please check spelling in the sentence

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