

Atmos. Meas. Tech. Discuss., referee comment RC1  
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## Comment on amt-2021-205

Anonymous Referee #1

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Referee comment on "Remote sensing of methane plumes: instrument tradeoff analysis for detecting and quantifying local sources at global scale" by Siraput Jongaramrungruang et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-205-RC1>, 2021

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### A. General Comments

Atmospheric methane is the second important greenhouse gas, but their emission estimate from different source sectors has large uncertainties. Imaging spectrometers using large number of pixels is a powerful tool to detect CH<sub>4</sub> plumes. Their selection of spectral range and resolution and integration time impact the performance directly.

Existing works mainly study trade-off between instrument noise and spectral resolution using CH<sub>4</sub> absorption spectra only, which results in too optimistic results. In real measurements, surface albedo estimation is one of the major error sources. The simulation tool and analytical methods in this paper are realistic and present consistent results.

Objectives of the CH<sub>4</sub> measurements with a new instrument seem to be both detection of unknown emission source and estimation of emission quantitatively. The former is well written, but the latter is not clear. It will help readers' understanding to list at least the possible error sources and discuss how to reduce uncertainty briefly.

I recommend publication after minor revision.

### B. ☐ Specific Comments

(1) Page 2, line 32, "methane emission"

It not clear. Methane emission of what?

(2) Page 5, Incoming solar irradiance,

Just a comment. Recently published paper "The TSIS-1 Hybrid Solar Reference Spectrum" 10.1029/2020GL091709, discussed uncertainty in the continuum at 1.6 and 2.3 micron regions and includes Toon's line spectra.

(3) Page 13, Figure 6 caption

Brief description of the selected surface area will help readers' understanding. For example, "our database of different surface albedos from the ECOSTRESS spectral library".

(4) Page 18, 3.4.1. Occurrence of false positive and false negative

Larger degrees of polynomial provide better fit. However, too many retrieval parameters also produce larger errors. Authors mention that the optimized degree depends on the spectral resolution of the instrument. This paper described in detail. Once the design is fixed or when readers already used their existing imaging spectrometers, it will be very helpful if there are index or criteria to determine the optimized degree of polynomial.

## C.ñ□□Technical Corrections

(1) Page 3, line 84

The sentence “Hence the origination of this study” looks incomplete.