Review of AMT-2023-111

Level0-to-Level1B processor for MethaneAIR

By Eamon K. Conway, Amir H. Souri, Joshua Benmergui, Kang Sun, Xiong Liu, Carly Staebell, Christopher Chan Miller, Jonathan Franklin, Jenna Samra, Jonas Wilzewski, Sebastien Roche, Bingkun Luo, Apisada Chulakadabba, Maryann Sargent, Jacob Hohl, Bruce Daube, Iouli Gordon, Kelly Chance, and Steven Wofsy

General comments.

  The authors present a processing chain from Level 0 (raw observation data) to Level 1B (radiometric calibrated and georeferenced data) for MethaneAIR data. I understand that this activity is important to retrieve a good CH_4 products, which will use for identifying the oil and gas filed hot spot, from MethaneAIR data. However, some description is unclear or missing in the text. Unfortunately, it is hard to follow the processing chain. So, I recommend the authors will add the sentences and clarify for some of unclear sentences.

  For these reasons, I recommend this paper for publication with major changes to the technical content.

Specific comments.

Affiliation

1. Page 1: Change from "Center for Astrophysics | Harvard and Smithsonian" to "Harvard - Smithsonian Center for Astrophysics," and remove ".02138".

Abstract

2. Page 1, line 1: Spell out "L0" and "L1B".

3. Page 1, line 4: Spell out "EDF".

4. Page 1, line 5: The accuracy is defined as concentration in unit of ppb. In the nominal case, emissions are expressed as flux. Then, the readers have incongruous with emission accuracy in unit of ppb. Recommend the rewording.

5. Page 1, line 8: Spell out "ISRF"

1. Introduction

6. Page 2, line 35: Same comment as comment #4.

7. Page 2, line 45: Correct "Greenhouse Gas …" to "Greenhouse Gases …".

2. The MethaneAIR Instrument

8. Page 4, Figure 1: The flight route for RF10 is not presented in Fig.1. However, in table 1, the flight duration is presented as 4.7 hrs. It is unclear that RF10 is actual flight or on-ground activity. If RF10 is still on flight activity, the fight route has to be indicated in Fig.1.

3. L0-L1B Development

9. Page 5, line 4: The processing time is 180 times longer than that of actual observation duration. Then, it seems that the selected scene data is only processed with this proposed processing chain. In this case, the authors also have to touch on the scene selection process before Level 0 to Level 1B processing as well as some limitation such as duration for one selected scene.

10. Page 5, line 159: How to determine the "electronic offset" value?

11. Page 5, Figure 2: How to handle the aircraft window transmission in the processing chain? The processing box is presented in Fig.2.   However, it is no explanation in the text. The authors have to touch on this topic.

12. Page 7, Eq.2: What is the meaning of λ', $\delta\lambda$, Al_k and B_j ?

13. Page 9, Figure 3: What is the required output spectral range for MethaneAIR CH_4 retrieval? In the text at line 39, the spectral range from 1598 nm and 1683 nm is defined for observation. However, the plot for CH_4 is started around 1602 nm and ended around 1655 nm. The authors have to be clearly described the output spectral range for MethanAIR L1B file both CH_4 and CO_2 bands.

14. Page 11, Figure 4: It is hard to distinguish between "Gaussian Filtered ISRF" and "LUT ISRF", due to the same color. Update to clearer plot with changing the color or the size of symbol.

15. Page 12 line 285: The onboard avionics are mounted on the aircraft and these data are used for aircraft operation. The mounting geometry between the aircraft and instrument platform is not taken account in the first guess. Then, the systematic

error source for line of slight (LOS) is the 3D-rotation of instrumental platform against the aircraft base. Is this understanding correct? Usually, including the satellite sensors, the position and rotation angle of optical bench during observation is monitored and applied for LOS processing. Why the additional IRU unit is not mounted on the optical bench? It seems that the processing cost for first guess will be reduced by applying onboard IRU data.

16. Page 13, line 313: Spell out "IERS".

17. Page 13, line 319 and 321: Typo "MethanAir"

18. Page 17, line 407: The across-track offset is estimated as 150 to 200 pixels (rows). O_2 and CH_4 camera have 1280 pixels in rows. In this case, co-aligned pixels are almost 1000 pixels in rows. In the text, L1B files which indicated in Fig.2 is not described and it is unclear that all the output information of this processing chain. The authors have to describe the output (L1B file) of this processing chain. It seems that the effective across-track information is around 1000 location instead of 1280.

Reference

19. Page 22, line 554, Staebell et al., now published in Atmospheric Measurement Techniques. The authors have to be updated the reference.

End of document