

## ***Interactive comment on “An adaptation of the CO<sub>2</sub> slicing technique for the Infrared Atmospheric Sounding Interferometer to obtain the height of tropospheric volcanic ash clouds” by Isabelle A. Taylor et al.***

### **Anonymous Referee #4**

Received and published: 12 February 2019

General comments: This paper described a technique of the CO<sub>2</sub> slicing for the estimation of ash clouds height from satellite infrared sounder data. As the author mentioned, the CO<sub>2</sub> slicing is an established method. However, accuracy of the estimation strongly depends on the selected channels and their combination, as well as the adopted atmospheric profiles. The author investigated the dependence from the results of many radiative transfer calculations. Furthermore, it is found that the CO<sub>2</sub> slicing technique gives better estimates than Optimal Estimation (OE). This paper is well written and including useful and important suggestion to the researchers of volcanic ash clouds.

C1

In this reason, the reviewer concluded that this paper is suitable for AMT publication. Some minor comments are listed below.

Specific comments:

Page 3 line 10: Add version of RTTOV.

Page 3 line 28: The expression “L\_obs  $\nu_1$ ” should be replaced to “L\_obs ( $\nu_1$ )”.

Page 4 line 7: “w” is used for window channel in Eq. (3) but later it uses for weighting function.

Page 4 line 9: There are no explanation for L\_cld ( $\nu$ ) in the text. Is it the same as L\_obs ( $\nu$ )?

Section 4: In the approach of CO<sub>2</sub> slicing of this paper, contribution of meteorological clouds seems to be omitted in radiance calculations. If so, it should be mentioned in the text.

Page 6 line 5-6: Add reference for the atmospheric profiles.

Page 6 line 6-7: Add the applied ash model of refractive index for ash optical properties. Is it Pollack andesite model?

Page 6 line 13-14: The values or reference for the noise of the instrument should be added.

Page 8 line 28-29: More explanation for the flagged pixel is required. Do you determine the flagged pixels by yourself? What channel and threshold value are used? If the flagged pixels were given from somewhere, the data source should be added.

Page 8 line 29-30: Add description of surface condition (temperature and emissivity) for the calculations of L\_clr. Did you use the surface emissivity model in RTTOV?

Page 9, Sec 5.1.1: Detailed explanation for the determination of the a priori ash height in the optimal estimation scheme is needed in the text. It is the important point in the

C2

discussion for the results of comparison between OE and your CO<sub>2</sub> slicing.

Figure 2: Label of the ordinate seems wrong. Add values of  $\nu_1$  and  $\nu_2$  in this calculation.

Figure 10-13: There are no discussions for the plots of ash mass (e). Add discussion if these plots are important.

Table 3: What does the number of “step” in table 3 mean? Why step 2 does not exist?

Figure A7: In the caption of Fig. A7, same sentences as those of Fig.6 is not necessary.

---

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-447, 2019.