

Interactive comment on “FRESCO-B: A fast cloud retrieval algorithm using oxygen B-band measurements from GOME-2” by Marine Desmons et al.

Anonymous Referee #2

Received and published: 7 January 2019

This paper presents a new FRESCO-B algorithm that was built up on the FRESCO algorithm but uses spectral measurements in the O₂ B-band, whereas FRESCO algorithm uses the O₂ A-band measurements. Both FRESCO-B and FRESCO algorithms retrieve cloud effective fraction and cloud top pressure from three 1-nm wide bands around the corresponding O₂ absorption bands. The development of FRESCO-B algorithm is motivated for its valuable application over vegetation surface that has much lower surface albedo in the O₂ B-band. This work demonstrated the promising retrievals using the FRESCO-B algorithm with both the synthetic data and the GOME-2 measured data. The study is well designed and matches the scope of AMT. The manuscript is well written. I only have a few minor comments as below.

- (1) For the algorithm, why select only three 1-nm wide windows instead of performing spectral fitting at all wavelengths of GOME-2 measurements around O2 A- and B-band? Is it supposed to have more information if more wavelengths are used?
- (2) Can authors include the definition for “effective cloud fraction” and explain why cloud effective fraction can exceed 1 (Figure 5)?
- (3) Figure 5 and 6. Need to label the left and right panels with (a) and (b), as these are indicated in the figure caption.
- (4) Page 7 line 15: “Figure 4b” -> “Figure 5b”.
- (5) Table 2&3: As shown in the simulated retrievals in section 4, cloud effective fraction is larger from O2-B retrievals. Why the differences are negative for Land and Vegetation cases of GOME-2 retrievals? Ok, I found this is discussed on page 10.
- (6) Figure 7a is not discussed in the text.
- (7) It seems to me Figure 7b shows substantial land areas with negative cloud pressure difference. However, global average of this difference over Land is positive in Table 4, which may not consistent with Figure 7b. Please double check.
- (8) In Figure 7, it appears some correlation may exist between the differences in effective cloud fraction and the differences in cloud top pressure. For instance, areas over land with negative cloud pressure difference tend to have negative cloud fraction difference. It seems a low bias in cloud fraction may lead to low bias in cloud pressure?
- (9) Figure 9: Need to add label “(b) Multi-layer clouds”

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-420, 2018.

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