

Review of the paper “Detecting layer height of smoke aerosols over vegetated land and water surfaces via oxygen absorption bands: Hourly results from EPIC/DSCOVR satellite in deep space” (amt_2018_414) by Xu et al.

General comments

This paper demonstrates nicely that aerosol layer height information can be retrieved from EPIC/DSCOVR data. This is especially of interest since hourly information can be retrieved – a unique contribution indeed.

The paper should be published following minor revisions which are mostly due to suggested minor phrasing corrections.

Specific Comments

Page 7, lines 20-23. These two sentences are awkward. The sentence “Besides, cloud mask thresholds” leaves the reader in a state of uncertainty. The phrase “might need..” is inconclusive. It is suggested to delete the sentence “Besides, cloud mask thresholds”. Perhaps one can replace this sentence with “This is a topic of further investigation.”

Page 10, lines 10-15. The sentence “To compensate for this bias,..” is not clear. I am having difficulty in accepting the methodology used to account for undetected aerosol. How can one impose an exponentially-decaying background aerosol amount to an undetected aerosol layer if you don’t know if the undetected aerosol is there or not? To assume that undetected aerosol is everywhere is problematic. The amount of undetected aerosol likely varies from place to place. Furthermore, the summertime Arctic aerosols do not correspond to conditions elsewhere.

I think it would be best to estimate the bias in ALH_{CALIOP} due to the undetected aerosol for a number of observations, state the uncertainty in the paper, and then calculate ALH_{CALIOP} without adding undetected AOD amounts anywhere.

Page 11, lines 28-29. What are typical ALH uncertainties due to MODIS surface products uncertainties and GOME-2 LER uncertainties?

Technical corrections

Page 1, line 3: change to “from the EPIC/DSCOVR”

Page 1, line 38: change to “temperature, influence the measured aerosol extinction profiles”

Page 3, line 4: change to “aerosol extinction profiles measured”

Page 3, line 20: change to “ALH utilizing the O_2 ”

Page 6, line 2: change to “where $C(\lambda)$ is the EPIC”

Page 6, line 29: change to “from analyzing USGS (United States Geological Survey)”

Page 7, line 30: change to “constructed with the UNL-VRTM model.”

Page 8, line 1: change to “It also incorporates HITRAN spectroscopic gaseous absorption with up to 22 trace gases”

Page 8, line 27: change to “satellite instrument, separate over-land”

Page 10, line 6: change to “(2013), the CALIOP day time aerosol extinction threshold is $0.01 - 0.03 \text{ km}^{-1}$ for 80-km horizontal resolution and up to 0.07 km^{-1} for 5-km horizontal resolution.”

Page 10, line 19: change to “65% of the ALH retrievals are within an uncertainty envelope of”

Page 10, line 22: change to “The collocation method follows Ichoku et al. (2002), but was”

Page 10, line 33: change to “smoke by using the UV aerosol”

Page 11, line 9: change to “satellite, since both perform hyperspectral measurements from the UV to the NIR and both cover the O₂ A and B bands”

Page 11, line 21: change to “dust ALH from the EPIC experiment (Xu”

Page 11, line 28: change to “information. Surface reflectance values are specified using MODIS”

Page 12, line 5: change to “The three years of data recorded”

Page 12, line 18: change to “group at the University of Iowa”

Page 12, line 20: change to “acknowledge the AERONET program”

Page 20, line 6: change to “includes all ten EPIC bands,”

Page 21, line 8: change to “resulting in less absorption by O₂ and “

Page 22, line 4: change to “and surface reflectance (A_s) values”.