Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2020-450-AC5, 2021

Atmospheric Measurement Techniques Discussions

Interactive comment on "A Dark Target research aerosol algorithm for MODIS observations over eastern China: Increasing coverage while maintaining accuracy at high aerosol loading" *by* Yingxi R. Shi et al.

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Received and published: 12 March 2021

We thank Dr. Eck to provide detailed analyses on research algorithm selected heavy pollution days. With these analyses, we have a better understanding of the discrepancies between the two datasets. We also included descriptions of these analyses into text. The detailed changes are listed in the end. Among the four categories you defined, there are two scenarios: 1) we do not know whether or not heavy pollution exist due to cloud coverage. 2) There were pollutions existing and research algorithm and AERONET are not agreeing with each other. We agree with all the analyses on

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scenario 2 and make a deeper look into scenario 1. When we categorize these days originally, the standard we used is whether or not heavy pollution exist. We used RGB images as well as DT/DB/MAIAC/VIIRS retrievals to facilitate our decision. We agree that cloud contamination may occur within the granule, but the identification of event is still valid. We also agree that if there is too little data to base on, the event should not be counted. Thus, we changed the number of research algorithm misclassified heavy polluted events from 3 to 5 (36, 41, 45, 49, 61). The description of the table is changed to following:

"It is more difficult to understand how the research algorithm could identify a pollution event on 17 days when all three AERONET stations do not report AOD > 1 at their quality-assured level (level 2). To begin we note that one of the three AERONET stations (Beijing-CAM5) was down for maintenance for more than a month during this time (T. Eck Short Comment in Interactive Discussion). Then, to confirm polluted days that the satellite identified but the operating AERONET stations did not, we visually compared each day using RGB images and MODIS DB and MAIAC AOD retrievals, as well as nearby over ocean AOD retrievals as a reference. Among these 17 days, 12 days have pollution present visually (with retrieval over cloud free/snow free land or ocean). Within these 12 days, analyses show two different scenarios lead to the discrepancies between AERONET and the research AOD. Scenario 1 includes the majority of the 12 days. In these days, AERONET Level 2 (V3) report AOD at 0.55 micron < 1, (0.50 to 0.90). Possible reasons for the differences can be (1) sampling differences, especially when an obvious gradient of AOD exists or (2) the uncertainty within the research product (see Figure 9). Scenario 2 consists of five days. These are days where there was no Level 2 AERONET AOD with AOD550 > 1, however there were L1 data. Eck et al. (2018) found that for the Xianghe site 15% of high AOD days (AOD500 > 1) never made it from L1 to L2. The 5 days identified by the satellite as pollution events but could not be confirmed by visual inspection were overcast with clouds (day 36, 41, 45, 49, and 61). In these five cases we expect cloud effects in the MODIS product that do not appear in the AERONET data are causing the AOD to exceed the AOD = 1.0 threshold.

We note that none of the five days in question have AOD over visually identified snow patches. Overall, we are happy with the ability of using the DT research product to identify pollution events, which can complement sparse ground observations."

The issue you mentioned on reducing data coverage due to cloud masking during summer time is also very interesting, we will continue look into this issue on follow-on study.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-450, 2020.

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