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Atmospheric Measurement Techniques Discussions

Interactive comment on "Detection of ground fog in mountainous areas from MODIS day-time data using a statistical approach" *by* H. M. Schulz et al.

H. M. Schulz et al.

schulzm6@staff.uni-marburg.de

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Thank you a lot for your constructive feedback. Please find our replies below.

1. All used MODIS products are from Collection 051 for the simple reason that at the time of our data download (mid 2014) it has been the newest collection covering a time span from 2003 to 2014 (which is the time span for which DOGMA is intended to be used in a future study).

We do believe that the usage of collection 06 is not necessary as PCL pixels are not of special importance for DOGMA (at least not more than for any other cloud related remote sensing algorithm): A lower fog marging pixel ("CBH pixel" in the paper) is normally not a cloud margin pixel.

Also the inclusion of PCL pixels in the Spearman correlations that are calculated by DOGMA could cause some problems. Only the heights (averaged from a high (clearly higher than the 250 m of MODIS) resolution DEM) of the cloudy parts of the pixel should be assigned to the optical thickness of a PCL pixel in the correlation. It is, however, not known which parts of a PCL pixel are cloudy. Also problems could occur in the sharpening process of the optical thickness product as the relationship between channel 1 and the optical thickness that is used in the sharpening process would be different for PCL pixels and nearby cloud pixels. Therefore a regression which is valid for all pixels inside of a moving window would not be possible if PCL pixels are included. Also plane-parallelity can not be assumed for PCL pixels. These problems would most probably not decrease the detection quality of DOGMA too much, but they do certainly outweigh the advantages of including PCL pixels in the analysis (which would be a bigger sample size of the correlation).

Besides the inclusion of PCL pixels the differences between Collection 051 and Collection 6 are quite small for low clouds over Taiwan (cf. Fig. 1).

2. Good point. We will mention this in the conclusion:

"As shown in Sect. 6 the vertical precision of the DOGMA cloud base is highly dependent on the horizontal accuracy of the fog detection. Also fine details in the margin of fog entities that are restricted in their extent by the terrain can be much better captured in the highest MODIS resolution of 250 m than in the 1000 m resolution (cf. Fig. 7 a). For those reasons all inputs necessary for DOGMA needed to be transferred to the 250 m resolution. An inclusion of a 250 m version of the optical cloud thickness product in future MODIS data collections could make such a step superfluous and would be useful for future ground fog detection schemes."

3. We are actually using the 2.1 μm band. This will be mentioned in the final paper in section 3: "The cloud optical thickness is based on the MODIS MOD06 2.1 μm optical thickness product derived from radiative transfer calculations."

We do not think that using any other COT retrieval would have benefits or disadvantages over the 2.1 μm retrieval. The difference between the 1.6 μm, the 2.1 μm and the 3.7 μm are generally quite small as the main information about the COT is coming (in all three retrieval methods) from the 0.6 μm channel. Also the 2.1 μm retrieval does not seem to have any particular problems over Taiwan. The only requirement for any COT product to be used for DOGMA is that the COT correlates well with the cloud thickness. This requirement should be met for any MODIS COT product.

4. You are right, heteroscedasticity is shown in Fig. 4 and could be reduced by a logaritmic transformation. Homoscedacity is, however, not a requirement for Spearman's Rho which is used by DOGMA.

5. As much as we agree on ROC curves being a good way to present validation results: According to our understanding the whole point of ROC curves is to see how the True Positive Rate (=POD) and the False Positive Rate (=POFD) vary with an iteratively altered parameter that defines how "strict" a prediction method is (e.g. a decision threshold applied on a continuous output). In DOGMA as well as in SOFOS we do not have such a parameter. So our validation output corresponds to only one single point of the ROC curve for each fog detection scheme. Therefore the only ROC image we can imagine based on our validation results is an illustration of these single points (cf. Fig. 2). Please tell us if a plot like Fig. 2 is what you are asking for. If so we will gladly put a polished version of Fig. 1 in the paper.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 12155, 2015.

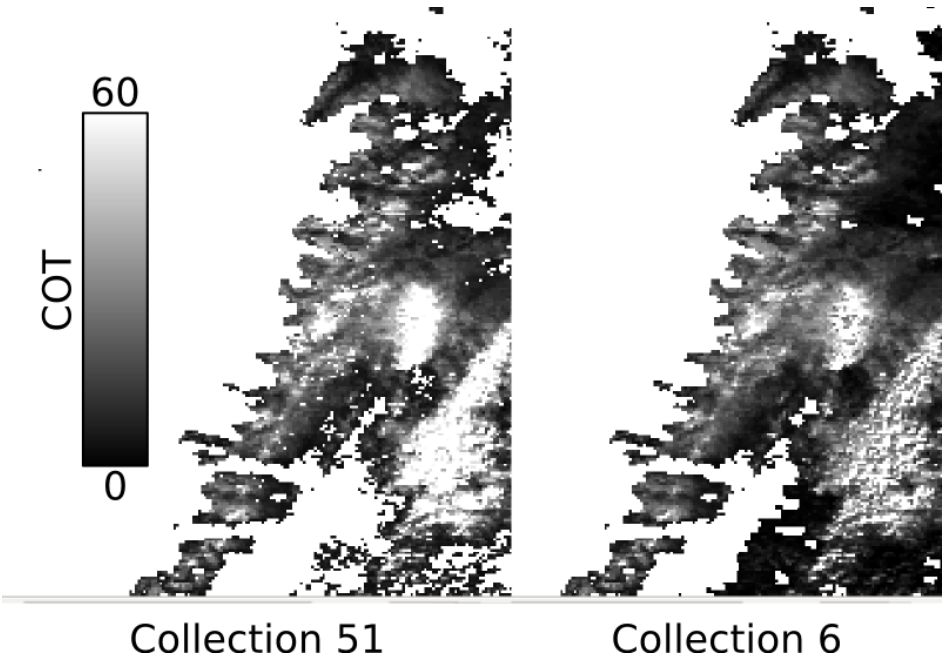

Fig. 1. optical thickness taken from Collection 051 and Collection 6

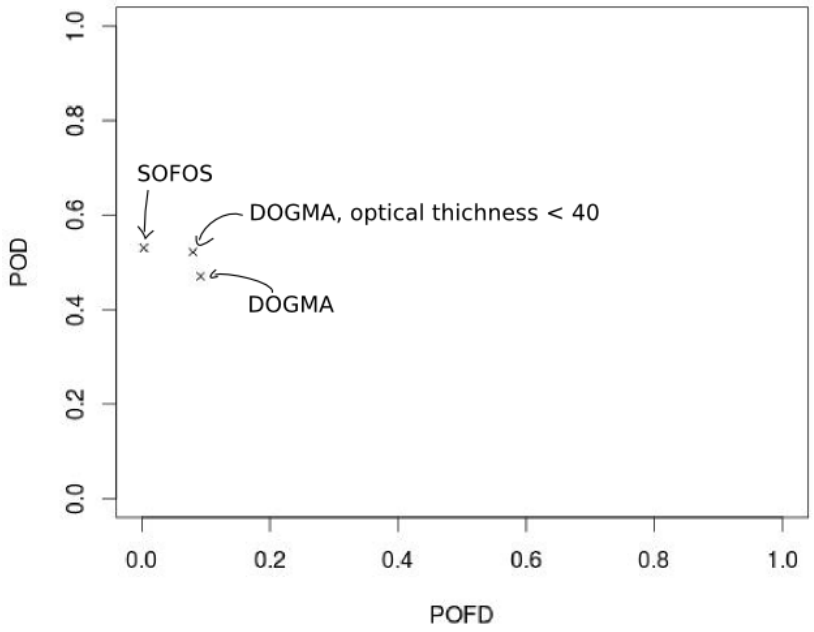

Fig. 2. validation results as ROC