Atmospheric
Measurement
Techniques

Discussions

Interactive comment on "First fully-diurnal fog and low cloud satellite detection reveals life cycle in the Namib" *by* Hendrik Andersen and Jan Cermak

Anonymous Referee #2

Received and published: 7 August 2018

My review and comments will focus on four area: general overview, methodology, validation, and product impact. The paper is well written and presents an interesting approach to a challenging problem. Overview The authors present an interesting approach and methodology to create a fog and low cloud product. The application of interest stated by the authors is fog detection that is hazardous to traffic and the potential for economic impact, and the need to understand the formation and dissipation processes over the region. Does the algorithm differentiate between fog and low clouds (low clouds may not reduce visibility to the same extent as the fog)? What portion of cases can be isolated or identified as fog versus low clouds? Does the FogNet stations help to isolate and identify and differentiate fog from low clouds? The goal to develop a common algorithm that works well particularly during the transition from night to day

in order to monitor fog development and dissipation with solar insolation is admirable. The authors point to other studies that utilize different approaches during the night and day, but do not show any failure of these approaches to properly detect the life cycle of the fog. Are the authors aware of more recent work to produce a stable and fully diurnal approach for the detection of fog and low clouds with the 24 hour Red-Green-Blue (RGB) microphysics products (developed and applied to SEVIRI and GOES ABI data) using only the 8, 11, and 12 micrometer channels on these instruments? https://weather.msfc.nasa.gov/sport/training/quickGuides/rgb/QuickGuide_24hrMicroRGB_N https://www.eumetsat.int/website/home/Data/Training/TrainingLibrary/DAT_2044069.html Or NOAA's low cloud and fog product? https://www.goes-r.gov/products/opt2-low-cloud-fog.html Recognizing this work or acknowledging these other approaches should be done. Methodology This is an interesting 2 step approach which eliminates high clouds and then identifies fog and low cloud regions. The temporally varying compositing approach to represent cloud-free scenes over land as a reference is good and has been successfully demonstrated for other cloud detection approaches. The SSIM approach to identify regions that are significantly different from the cloud-free composite is interesting although limits application to ocean coastal regions where sea surface temperature structure is limit. It would be interesting to know how the threshold (0.4) and the window size were determined. The assignment of pixels as "difficult" on the edge of fog and low cloud regions in the contextual plausibility control step seems a bit subjective. While the approach is meant to address sub-pixel issues, other issues could be coming into play (marginal thermal structure in composite, complete pixel coverage if thin or dissipating fog, etc.). Eliminating these regions makes the regions identified as fog and low cloud more limited. These "difficult" pixels also seem to be eliminate from the validation section improving statistical performance of the algorithm. Additional justification is necessary for this approach. Reason for iteration of plausibility control is not clear. Can you elaborate? Validation Only night-time results are presented. A proposed strength of the algorithm is its day and night performance (?) to monitor dissipation of the fog with solar insolation. How do the day-time results

compare to these? Labeling pixels on edges of clouds as "difficult" helps the validation statics. What to the results look like if you add in results from the "difficult points" What percentage of fog pixels to difficult ones? Is there performance variability by year or by season? This would add confidence to the use of the product for climate studies. Good discussion of the potential source of errors.

Product impact on science Interesting and useful inference of spatial and diurnal variation in occurrence of FLC. Could you use a monthly varying composite to increase FLC frequency over the region?

Other things I cant locate the grey line in Figure 2a. Figure 3b it is not obvious that the dot corresponds to the values from GK. Please explain this and the error bars in the figure. The label "BC" should be BS in Figure 3b.

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