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Atmospheric Measurement Techniques Discussions

Interactive comment on "Multichannel analysis of correlation length of SEVIRI images around ground-based cloud observatories to determine their representativeness" *by* J. Slobodda et al.

Anonymous Referee #1

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Multichannel analysis of correlation length of SEVIRI images around ground-based cloud observatories to determine their representativeness

J. Slobodda, A. Hueerbein, R. Lindstrot, R. Preusker, K. Ebell, and J. Fischer

This study aims to study how representative cloud observations at single ground sites are for their surrounding area. This work is of relevance to evaluation of clouds in models, or SEVIRI retrievals against ground station data.

The authors perform the study by considering temporal correlation among instantaneous SEVIRI cloudy radiances in an area of $\sim$ 300 by 300km. They show that 1)

visual and near IR radiances are correlated over much shorter distances than IR radiances (1km vs 20km) and argue this has consequences for the sort of evaluation that is possible (cloud optical thickness and effective particle size for visual and near-IR or cloud top height for IR). They also show that daily averages increases these correlations and allows evaluation of regional models (grid resolutions up to 70km).

General comments

The purpose and context of the paper would become clearer if the authors are more specific about strategies for evaluating models against observations. Their paper seems to advocate correlating individual model values and observations. Given the statistical description of clouds in many models, a comparison of the statistical properties (monthly mean and standard deviation of optical thickness, particle size and cloud top height) might be sufficient. Such a comparison does not require the rather strict demands on proximity that their study reveals.

I assume that the authors decided to use radiances instead of retrieved properties in their analysis due to errors in the latter that might further reduce correlations? It would be good if they could discuss this briefly.

Specific comments

p. 5770, l. 6: Please remove "the one of".

p. 5770, l. 8: Maybe replace "the characteristic" by "a characteristic"? No radius has been defined yet.

p 5570, Asbtract: nowhere do the authors mention what property is actually studied. Presumably this is channel radiance.

p. 5770, l. 11: Visual channels contain mostly information on COT. I would not call COT a microphysical property; it refers to the full extent of a cloud and is a function of not only individual droplet properties (e.g. size) but also total number.

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p. 5770, l. 17: Consider rephrasing "The results show good comparability between regional forecast modelsi...". The authors have not done any comparison with models. I suggest "Our results suggest it should be possible to compare instantaneous cloud observations from ground sites to regional forecast models".

p 5772, l 6-13: Schutgens & Roebeling JAOT 2009 studied the impact of cloud inhomogeneity on SEVIRI evaluation with ground-based microwave radiometers. They were able to make error estimates for various sources (parallax effect, time integration, sub-pixel inhomogeneity, etc) and suggested optimal averaging times for comparison. I think this paper should be mentioned in this or the following paragraph.

p. 5772, Introduction: Since the authors propose to study correlations among SEVIRI pixesl to understand better the usefulness of surface measurements for model evaluation, it would be good if they listed typical FOVs (field of view) of various instruments

p 5772, Introduction: in GCMs, cloud at the sub-pixel level are represented in a statistical fashion, using a cloud fraction. These clouds do not need to correlate with ground sites to be considered ok, they only need to have sufficiently similar statistics (on various time scales, daily, weekly seasonally).

p. 5774, l.9: The choice of either 0.4 or 0.9 is fairly arbitrary. Is there not some way to objectivly specify a correlation below which comparison becomes useless? What are typical correlations of model vs observations, when observations are close to the center of the gridbox?

p. 5775, l. 26: Presumably these time series have different timesteps. Although SEVIRI observes every 15 min, not all pixels will be cloudy/clear at the same time. How have you dealt with this and what is its impact?

p. 5776, l. 1: why not use rho = 1 - (dist/a)ˆb ? This makes the interpretation of a very easy.

p. 5776, l 15: global models that include aerosol and gas species are often run at even

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coarser resolution (100-200 km)

p. 5776, l. 19: because models may treat clouds in a statistical fashion, correlations over the size of a gridbox may not be useful to determine uncertainties. Rather you want the statistics of the clouds over the meaurement site and those of the model clouds in the gridbox to be similar. It is possible to find good mean and standard deviation of e.g. cloud fraction, LWP, and CTOP while correlation is actually very low.

p. 5776, l. 23: optical depth is not a microphysical property. But really the conclusion that COT or Reff changes more than CTP i(p. 5777, l. 10) is a bit optimistic. Rather I suggest that different radiative transfer aspect cause the differences in correlations. E.g. For very similar COT and Reff, variations in cloud top height will cause shadowing and brightening which will affect the correlations. These variations in cloud top height need not be very dramatic and can be missed in IR channels.

p. 5778, l. 19: Possibly "total cloud cover" should be replaced by "larger areas"?

p. 5778, l. 24: What "anomaly" are the authors referring to?

p. 5780, l. 20: "Comparisons between ...especially for cloud top temperatures". This sentence suggests that the authors have actually made such a comparison. I suggest replacing "are reasonable" with "should be possible".

p. 5780, l. 26: again, an objectively determined minimum correlation would be helpfull at this stage.

p. 5781, l. 6: The authors are not really considering larger timesteps (which would indicate sub-sampling of the original 15-min time series to e.g. 12 hours) but aggregates over time, in this case daily averages. The statement that models only give output every few hours appears meaningless in this context. Also, many models allow temporal means (e.g. daily or monthly) to be written to file. In this particular paragraph, I am not sure what sort of model comparison the authors are proposing: daily means from both model and observations or daily means from observations against hourly model

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ouput?

p. 5781, l 12: "possibilities of origins" should be replaced by "possible cases".

p. 5781, l. 25: "blurred out" shoud be "smoothed out", also please remove "for the mean values".

p. 5781, l. 27: Please replace "for the single stations" by "between the single stations".

p. 5782, Conclusions: Please rephrase the first sentence. It is too long and confusing.

p. 5787, caption: these measurement stations are not analysed at all.

p. 5788, caption: I propose rephrasing: "Histogram of mean cloud cover from day-time SEVIRI images of the area surrounding each ground station."

p. 5792, caption: I propose rephrasing: "Comparison of coefficients a (upper panel) and b (middle panel) as well as dist0.9 (lower panel) for two different cloud covers (left side: half covered scenes; right side: fully covered scenes) fnd or all channels (x axes) and locations (different colours, see legend).".

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 5769, 2014.