Atmospheric
Measurement
Techniques
Discussions

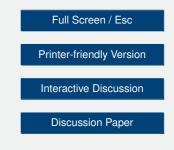Open Access

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 #2

Received and published: 2 September 2014

The authors aim to determine the representativeness of measurements from ground stations for the surrounding area in order to facilitate the evaluation of NWP models. This task is done via the analysis of Meteosat-9 images from one year of data in original temporal resolution, where for each ground station a rectangular field of 300 x 300 km is considered. The representative area is specified via correlation of time-series of surrounding SEVIRI pixels and the center pixel. In the following, the authors analyse the correlation in terms of channels and for different stations across Europe. The representative area (or radius) is higher for IR than for VIS channels and also dependent on the surface' structure. The article is relevant to scientist involved in model evaluation

or the validation of SEVIRI-derived parameter.

Generally: The article analyses satellite measurements that are averaged quantities over the SEVIRI pixel size which is about 4 x 6 km in European region. For theses averaged quantities the correlation is determined. Can you explain how this relates to the cloud observation sites with various different instruments where many of them have fields of view that are much smaller than the SEVIRI pixel size?

The results in terms of different wavelength are valid for SEVIRI and sensors with comparable channels spectral response functions only. Did you also consider other sensors with different spectral responses?

Major remarks:

p3., l.1: "the impact of all cloud types on the net fluxes are still not known" please be more specific, the global net radiative effect is about -21 W/m^2 (Allen, 2011) and measured -13 – 21 W/m^2 as measured by ERBE (NASA). Maybe I misunderstood the phrase.

p.3, ls.7 – 11: Extend this introductory sentence with description and citations on the influence of 3D cloud structure on radiative transfer, the citation you mentioned is not state of the art.

p.4., ls.25 – 29: The comparison of point measurements and SEVIRI pixels is indeed complicated, since the latter covers a certain area, I understood this would be the subject of this study? This refers to the general remark above.

p.4, l.29: "uncertainties due to different resolutions and dimensions are avoided" not completely, the pixel size of a satellite images varies with the viewing angle, in case of SEVIRI this translates to variation with latitude and longitude. Please give an estimate of this for the locations of your study.

p.5, l. 10: Citation for Meteosat and SEVIRI is missing as well as a short description of the measurement principle.

p.5, l. 21: Please describe the cloud net classification and what is calculated there and if the result represents an area or a compilation of point measurements. This would help to motivate the study. Why are particularly the cloud net stations analysed? I assume due to their constant measurement program?

p.6, l. 11: Describe the algorithm that is used to produce the cloud mask. How accurate is it and how are the results validated?

p.6, l. 18-20: How are the cloud free pixels excluded? Do you exclude complete scenes or just the pixel themselves? If singles pixels are excluded from the scenes, this changes the time-series per pixel for the correlation. How do you treat gaps that are not useful for a correlation analysis and which (approximate) influence does this have on the study? Also this approach to exclude cloud-free pixel will very likely falsify the results since the considered scenes are not realistic any more. In this respect the provided correlation length refers to fully cloud covered or partly covered pixel over the complete area of interest. This has to be discussed.

p.7, l.13: For sake of clarity please state once more that the cloud mask is used for filtering the channel information.

p.8, l.8-9: Not necessarily only variation in COT and effective radius, also the 3D macroscopic inhomogeneity causes variations even if there are no clear gaps, which probably exceeds the microphysical effects.

No specific place: Did you distinguish between ice and water clouds? If so, did this have an effect on the correlation length.

p.9, l.25: Why does the likelihood of different cloud layers with different heights increase for partly cloudy scenes compared to fully cloudy?

p.10, l.7.: I agree, but do you have an explanation why the decrease in 6.2 mum is more linear than in the other two channels? Please refer to the absorption bands of water vapour. The peak for this channel in figure 6 is quite remarkable.

p.11, l.1: Any idea why the ozone channel does not show a peak for a in Mace Head?

p.11, l.14: I would add that a larger database would be needed too if the study would be carried out with respect to cloud type. This would be quite interesting.

p.12: I think there is a problem with this study. Did you compile the daily means in the same manner as a model would do? That means taking into account only one slot every 3 hours and not the full 15 minutes resolution? If not this will strongly depreciate the results because the influence of sampling will introduce additional inhomogeneity in case the coarse resolution is considered. Averages based on high temporally resolved data are smoother.

p.20: Please add a graph as in figure 3 but for the Alpine region. More spatial variations could be expected there which would be interesting to see.

Minor remarks:

p. 2, l.3: Which observations? Please give an example.

p.2, l.17: Delete "like they are".

p.3, l.1: "(Kie)": the year is missing.

p.3, l. 4: Extent instead of extend, the same in line 23.

p.4, l. 23: Remove additionally.

p.5, l.1: What are clear-sky coordinates?

p.5, l.5: Agreed, but I think you mean diameter instead of area?

p.5, l.13: Meteosat-8 was moved to 9,5° E.

p.6, l.20: Replace eliminate by diminish.

p.10, l.21: "... is missing", add "in case of full cloud cover".

Citation:

Allan, R.: Meteorol. Appl. 18: Combining satellite data and models to estimate cloud radiative effect at the surface and in the atmosphere,324–333 (2011).

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