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Atmospheric Measurement Techniques Discussions

Interactive comment on "Radiative budget and cloud radiative effect over the Atlantic from ship based observations" *by* J. Kalisch and A. Macke

Anonymous Referee #2

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The paper is in general well written and addresses an quite important topic. However, there are major items to be resolved, which affects conclusions and value of the paper significantly.

Please find attached my comments (all major)

- page 2014, line 3 : This sounds as bit strange as nowadays satellites provide cloud information in a high tempo-spatial resolution. However, the statement might be true as a stand-alone message but does not motivate why satellite data is not used. Either the micro-scale effects cancels out for spatial averages (e.g. satellite pixel size) then there effect on the climate should be expected to be minor, or they do not cancel out, then it could be expected that the effect is somehow observable by satellites (simply as

a result of the law of energy conservation). More over, the in-situ measurements are used for the validation of ECHAM which has a much coarser temporal resolution than satellite data, e.g. from MSG. Especially for the validation of climate model output in-situ data have the great disadvantage that they measure pointwise, whereas satellite data can be averaged to the climate model grid, which makes the data much more comparable. I think it should be discussed in more detail why satellite data are not used for these study or the sentence should by simply deleted. However, the disadvantages of point measurements (e.g. lack of spatial coverage) for climate studies should be discussed in more detail in any case.

- page 2016: The approach for the clear sky radiation is a bit outdated and quite limited. The effect of variations in aerosols on the transmission is not considered by the model as a fixed amount of aerosols is assumed everywhere (only variation in H20 are considered). This is a significant drawback and corrupts the reliability of the estimated quantities of clout radiative forcing/effect which is the core of the whole study. The differences in the clear sky irradiance induced by variation in aerosol optical depths exceeds 100 W/m**2 along the ship tracks for AM2 (as it e.g. passes regions affected by desert storms and biomass burning). As these variations are not considered by the simple clear sky model conclusions on the resulting estimates for CRE might be quite misleading. As several easy to handle & free available clear models are available which performs much better, the motivation for the application of this limited model is quite unclear and unnecessary. Unfortunately, the use of this model is a quite essential limitation. In my opinion, the manuscript can only be accepted for publication if the effect of aerosols is taken into account appropriately in a revised version of the paper. This can be done by the application of a sophisticated model, or perhaps, by the use of the observed clear sky irradiance (or both).

- p 2016, line 14-20: In general, comparison at one station is not enough to provide reliable validation of a model. The statement (line 17) concerning the performance of the model are not proofed by validation and quite misleading. More over, the "mean"

aerosol state at Sylt is quite different to that occuring along the ship tracks, hence, the comparison performed at Sylt are by no means representative for the current study.

- Table4 and other places: CRE is not measured but calculated, partly based on measurements, yet also affected by simple clear sky model approach. The term measured is therefore wrong and should not be used.

- p2026, line 6: The results seems not to provide a clear evidence for the conclusion that "climate model is in general not able to ... due to broken clouds". Would it be possible that the climate model fails to model clouds (hence CRE) appropriately in general.

- Conclusions: no meridional dependency, wrong result/conclusion due to the missing consideration of variations in aerosol contents along the tracks ?

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 2011, 2012.