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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Ship and satellite observations over the ocean for verification of the shortwave cloud radiative effect in climate models" *by* T. Hanschmann et al.

Anonymous Referee #2

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General comments:

The paper compares computed and observed shortwave (SW) cloud radiative effects at the surface. The observations are from ship measurements collected during the Meridional Ocean Radiation Experiment (MORE) and OCEANET campaigns. Cruises during these experiments provided LWP and temperature/humidity profiles from microwave radiometer measurements, and SW radiative fluxes from pyranometer measurements. The calculations use the ECHAM-5 climate model radiative transfer model initialized using different combinations of satellite and surface cloud properties. The satellite retrievals are from SEVIRI cloud data products.

Six closure experiments are performed under different cloud and solar illumination conditions. The main conclusion is that the best results are achieved when a combination of surface and satellite retrievals are used to initialize the radiative transfer model. They find that including satellite-derived cloud effective radius retrievals improves the comparisons compared to the case where effective radius is held constant.

The paper is acceptable subject to minor corrections listed below.

Specific comments:

Abstract: "In this study the accuracy of the radiative transfer scheme of the ECHAM-climate model for reproducing the shortwave cloud radiative effect (SWCRE) at the sea surface has been investigated."

The paper is actually more an evaluation of the different data sources used as input to the radiative transfer scheme than of the radiative transfer scheme itself. For example, the 6 experiments in the closure study differ by whether the calculations are specified using surface observations or satellite observations, and there is a lot of emphasis on the value of including satellite retrieved cloud effective radius in the calculations. There does not appear to be any actual evaluation of the accuracy of the radiative transfer scheme itself. Please clarify.

p.3 (line 28): "Average differences between measured and modeled DSR of 35.7% were found for single layer water clouds using the Rapid Radiative Transfer Model for GCMs. . ."

Does the 35.7% really correspond to bias error or an RMS error? It seems too large to be a bias error. Was the error due to sampling errors in mountainous terrain? Also, are 3 significant digits necessary (why not 36%)?

p. 4 line 7: remove the word "nowadays".

p. 4 lines 7-11: The representation of Cloud radiative effects in GCMs has been evaluated far more often using ERBE or CERES satellite data, not ISCCP.

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Interactive Discussion

Discussion Paper

p. 4 line 13: Start a new paragraph with "The aim of this study…". Also, as noted above (see comment about Abstract), the study doesn't actually evaluate the ECHAM-5 radiative transfer scheme, but rather evaluates the inputs to the radiative transfer scheme in the context of how accurately cloud radiative effects at the surface can be calculated. Please revise.

p. 10 line 1: What does "PS" stand for?

p. 11 lines 3-7: It is not necessary to list this detail in the main text. Please use figure caption for that.

p. 11 line 16: How can a positive SW CRE occur? It implies the cloudy flux at the surface exceeds the clear flux at the surface. Could it be that the clear-sky flux is artificially low due to shadowing by adjacent clouds? Please explain.

p. 12 lines 12-15: These sentences ("From the observed clear sky…error of the measurement devices") repeat what has already been stated in lines 9 and 10. Please revise.

p. 12 line 18: Please define what constitutes "good" and "bad".

p. 12 lines 16-19: "Summarizing…"

This statement is incorrect. See results for Exp PS-RSAT and PS-R10 in Table 3. Differences are positive for all conditions except the clear case.

p. 27 Table 3: It would be helpful to have some sense of the solar zenith angle range. That is, what constitutes "low sun" and "high sun"?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 17743, 2012.

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