Anonymous Referee #1

Dear Referee #1,

Thank you very much for your effort and your work on our manuscript! Your helpful comments and useful suggestions contribute to the scientific quality of the publication.

General comments: In this paper ship borne radiation measurements are analyzed

which respect to cloud radiative effects over the Atlantic. The paper is clearly written

and the main ideas and outputs are comprehensible. The results are not new and not

surprising but valuable because only few comparable studies over ocean have been

made in the past. The paper should be published after minor changes.

Page 2012,line 17: "…the solar contribution is large for cirrus clouds and small for stratus clouds".

And what about cirrus stratus? Do you mean:…the solar contribution is large for high

level clouds and small for medium and low level clouds?

Reply: *Our statement refers to the calculated net radiative fluxes given in Tab. 2. For the presence of cirrus (cloud type 2) the largest mean SW budget and for stratus (type 6) the lowest mean SW budget was reached.*

Cirrostratus is included in cloud type 2and no further differentiation was done between cirrus and cirrostratus.

It would be wrong to say that the solar contribution is small for low level clouds in general (because cumulus and stratocumulus belong to low level clouds and show an intermediate contribution).

Page 2016, line 11: The equation is not homogeny with respect to the dimensions.

Please rewrite.

Reply: *The dimensions are correct, see Zillman (1972). This formula is an empirical one, that means the dimension of the output does not have to arise logically from the input.*

Page 2018, line 3: What do you mean by surface air temperature? Which height?

Reply: *I used the air temperature measured operationally by POLARSTERN in about 35m height.*

I changed the sentence to: " With the air temperature T in K measured operationally in a height of 35m and…"

Page 2018, line 23: To my understanding man made synoptic observations are a good

source (may be even a better source as a full sky imager) to analyze cloud effects since

they are not limit to day time values and frequently available.

***Reply**: Synoptic observations are a good source, no doubt.*

Synoptic cloud observations are not limited to daytime? Well, in my opinion synoptic cloud observations at night time are very dubious and are very often not performed.

Anyway, as I mentioned in the paper synoptic observations are not reproducible, which is a big disadvantage. And they are performed every 3 hours.

But both, the synoptic observations and the sky imager, have advantages and disadvantages.

Page 2020, line 7+: Using the water temperature 5 m below the surface to estimate

LWU is questionable. Data from the water surface could be obtained much better using

radiation thermometer. At least a error estimation should be added.

***Reply:** We are aware that a radiation thermometer for the detection of the skin temperature would reduce errors. But it has not been used, because precisely radiation thermometers are expensive (>10k€) and sea spray and salt on the lens may cause much bigger uncertainties than using the SST. As already mentioned on page 2020, line 11 Schluessel et al. (1990) estimated the difference between skin temperature and SST with 0.1K to 0.2K. At a SST of 20°C this leads to an error of +0.5 to +1.1W/m².*

For the cloud radiative effect this error cancels out (see Eq. 6).

For the budget calculation an error estimation can be added. But due to the fact, that the focus of our paper lies in the cloud radiative effect, this is of questionable sense.

Page 2020, line 25+: Two sentences starting with "Furthermore". Please change.

***Reply:** Thank you! Changed.*

Page 2022, line 6: A diurnal a well as a meridional LW CRE dependency should be

expected. Please explain why these dependencies do not show up. Is it a matter of

averaging?

***Reply**: Note that the diurnal cycle of the air and water temperature is low for offshore conditions.*

I agree that there must be a meridional dependency for the LW BUDGET. But for the LW CRE I am not sure. For the LW CRE the influence of the SST cancels out (see Eq. 6) so that the LW CRE results from DLR minus DLR_clearsky. In polar regions both, the cloud bottom temperature (that affects the DLR) and the temperature of the whole clear atmosphere is lower – and the difference of both might be as big as for tropic conditions…

Page 2022, line 16: Please avoid an inconsistent expression like "clear sky CRE".

***Reply:** Thanks. Changed to: "The CREs for the cloud type class 4 (clear sky) are…"*

Page 2023, line 21: A linear regression should be used. The data show no indication

to use a quadratic regression. (A lower explained variance is no argument.)

Reply: *Thank you. I have removed the quadratic regression and used a linear regression function. The Fig. 4 is changed accordingly.*

Page 2024, formula 9: Please explain why this function was used.

Reply: *This function was used for pure numerical reasons. The choice was not physically motivated. From a large number of different mathematical functions this is the one with the highest explained variance.*

Page 2025, line 14: Please delete ": : : and radio sounding profiles"

Reply: *Thank you! Deleted.*

References: Please cite the relevant "Expedition programs" and used datasets, see:

(http://www.pangaea.de/PHP/CruiseReports.php?b=Polarstern)

Reply: *I have checked the PANGAEA-archive.*

PANGAEA gives the meteorological datasets in 10-min-means only. But I have used the high resolution datasets (1-min) taken from the POLARSTERN-servers. In this case a citation of PANGAEA would not be correct.

Furthermore PANGAEA always shows as a reference not the "Expedition program", but the "Reports on Polar and Marine Research". For me this makes more sense, because the "Programs" were published before the cruises, the "Reports" after and therefore are more detailed.

I have already cited the corresponding "Reports on Polar and Marine Research" inTable 1.