

## ***Interactive comment on “Estimates of the aerosol indirect effect over the Baltic Sea region derived from twelve years of MODIS observations” by Giulia Saponaro et al.***

**Anonymous Referee #1**

Received and published: 3 November 2016

The manuscript by Saponaro et al. presents a regional satellite study on aerosol-cloud interactions over and around the Baltic Sea. This type of regional study has not been performed in this region before and the study provides new insights into aerosol-cloud interactions here. The aerosol-cloud interactions are thoroughly investigated in several different manners which highlights that different results regarding the interactions can be found depending on how the data is investigated. I suggest the manuscript is published in ACP after some minor corrections, see below.

General comments:

1. The results in the paper are somewhat inconsistent. In Fig 3 and 7 the aerosols can be seen to affect the COT and LWP while in Fig 6 no effects from aerosols are

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found on these parameters. No effect on CF by the aerosols are found in Fig 3 while in Fig 6 and 7 CF is found to vary with aerosol loading. I believe the paper would benefit from a more structured discussion with regards to why the aerosol effects for different parameters appear in some of the figures while not in others.

2. Figure 3 b and d. The values of AE and COT are very high over the North western Norway. Could snow cover possibly affect the retrievals leading to high biases?

3. Figure 7: This figure is very nice and informative. Could you please change the colorbar for the COT? The colorbar goes up to 40 but the highest value in the figure is around 20. If you changed this it would be easier to see the trends in the COT.

Technical corrections:

Page 2, line 16: 'in situ' should be changed to 'in-situ'.

Page 3, line 39: There is no figure 2 b and c.

Page 4, line 14: The sentence is somewhat awkward. Please rewrite.

Page 4, line 20-24: It seems to me that these sentences presents results and perhaps should be moved to section 4.

Page 4, line 43 – Page 5 line 1. The end of this sentence is confusing since there are no high AOD values over the Atlantic coast of Norway in figure 3a.

Page 5, line 9: "rather unlikely to be correct" awkward, please rephrase.

Page 5, line 16-17: The acronym AIE has not been defined. Also the start of the sentence is confusing, the AIE does not say that CER appears to be better correlated with the AOD.

Page 5, line 19: 'which makes these particles very effeicient' please add CCN and change the spelling to efficient.

Page 6, line 4: 'turbulences' change to 'turbulence'.

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Page 6, line 10: There may be other parameters than LTS and aerosol that affects the clouds. I therefore recommend rewriting the first part of this sentence.

Page 6, line 14: To me it looks like also the CER is affected by the LTS.

Page 6, line 21-25: This part is confusing to me. There are no results on CF in figure 5 and the structures of the sentences are confusing. Could you please rewrite these sentences to clarify the reasoning with regards to CF results.

Page 7, line 7: Should ACI be AIE?

Page 7, the conclusion contains quite a bit of discussion of the results. Maybe this section should be renamed Discussion and Conclusion.

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Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-678, 2016.