

## ***Interactive comment on “CO<sub>2</sub>-flux measurements above the Baltic Sea at two heights: flux gradients in the surface layer” by A. Lammert and F. Ament***

**Anonymous Referee #1**

Received and published: 22 July 2015

General comment

The study ‘CO<sub>2</sub>-flux measurements above the Baltic Sea at two heights: flux gradients in the surface layer’ by Andrea Lammert and Felix Ament investigates whether the assumption of a constant flux layer is appropriate for describing the atmospheric turbulent CO<sub>2</sub> flux (and also heat and momentum fluxes) in the Baltic region. The investigation based on data, which were observed in two different heights at the FINO2 platform in the Baltic sea over 1  $\frac{1}{2}$  year. The assumption of a constant flux layer was evaluated on the basis of high frequency CO<sub>2</sub>, sensible and latent heat flux measurements, as well as measurements of the turbulent momentum flux. Due to the fact that there still exists only scanty data of long term CO<sub>2</sub> flux measurements over the sea, and -to my knowledge- hardly any data measured in two heights, this data are new and worth pub-

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lishing. They are also very useful for future research, e.g. they are of high value for the scientific community which investigate air-sea-flux exchange processes. Moreover, there is still controversy, how the CO<sub>2</sub> flux can be described and parameterized in the maritime boundary layer. Therefore, this evaluation of the CO<sub>2</sub> constant flux layer is a very interesting and important study. The data and topic of the manuscript fits well for publication in Earth System Science Data (ESSD). The manuscript is well written and the logic is clear, and the figures are of good quality (except for one of the main figures, Figure 4, which shows no data in the online version, but in the reviewers version the data is included, so I guess that this is a minor technical error). The data set contains useful additional parameters and the description of the atmospheric parameters which are given in the data table is plausible and clear. I see no noticeable errors in the data set. The data set is presented in the commonly used netcdf format.

I recommend accepting this work for publication after minor changes and clarifications, which I suggest in two scientific comments and some minor comments.

Main scientific comments

1. It would be good to include in Section 4 or in the conclusion a sentence or two, whether the authors have investigated the 35 % cases, where significant CO<sub>2</sub> flux gradients were seen, in more detail. For example: do the gradients occurred during certain wind direction/speed, season, atmospheric stability etc. (or not?). This would be relatively easy to investigate, because wind parameters and stability are also measured and included in the 1.5 year data set. 2. I recommend that the authors should include in the conclusion a sentence or two whether the Baltic Sea can be assumed as a typical ocean site.

Figures: Figure 4: Figure 4, shows no data in the online pdf-file (although in the reviewers manuscript version is does have data points).

Minor comments and technical corrections

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Abstract Page 1, Line 6-7: I suggest changing 'due to this assumption' to something like 'to investigate this assumption' or 'to verify/validated/test this assumption'.

1 Introduction Page 1, Line 21: I suggest changing 'were and are' into 'have been'.  
Page 2, Line 25: I suggest replacing 'is characterized' by 'is approximated', because the goal of this paper is to test whether this assumption/approximation of the constant flux layer is valid over the ocean for different flux data.

2 Fino2 – site and instrumentation Page 2, Line 47: should be 'gas' not 'gar' analysers.  
Page 3, Line 58-59: I suggest changing the word order, because you want to say that the fluxes of both heights are compared to each other.

3 Time series Page 3, Line 66: Please add a plural 's' in order to get 'winter months' or delete month so it is consistent with the following expression 'summer'.

4 Turbulent fluxes and flux gradients Page 4, Line 112: I suggest skipping this sentence, or replace 'surprisingly' with something like 'the correlation is clearly smaller'. Page 4, line 116 (and on other pages and lines in the manuscript): The use (or not use) of the hyphen before the word 'flux' is not consistent within the text and title. Please change this to be consistent.

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