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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A very high-resolution assessment and modelling of urban air quality" *by* Tobias Wolf et al.

Anonymous Referee #1

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General Comments

Within the manuscript, an example/template urban air quality assessment is presented for the city of Bergen, Norway. The air quality assessment is conducted by means of large-eddy simulations (LES) utilizing the LES model PALM. The presented work analyses NO^2 and PM2.5 concentrations emitted from different sources which are ships, cars and domestic fireplaces withn the city and harbour of Bergen and the close surroundings. The work is aimed to give a first idea how such air-quality assessments can provide more detailed information about the impact of pollutant emissions on the urban air quality. The fact that the different pollutant sources are treated independently also allows for a better identification of the main source of pollution. This, in turn, helps decission-making authorities to better plan mittigation measures in order to ef-

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Discussion paper

fectively reduce pollution within the city. Results of this study are already used by the local harbour authority for reducing pollution caused by ships. The presentation of the possibility for such high-resolution air-quality assessments and their value to the local authorities and citizens, is of great value to the scientific community. Open research questions and missing input information for such applications are presented. Follow-up studies can benefit from these results and work on further improvements of air-quality assessments. I, therefore, suggest the manuscript for publication after the following recommended changes are implemented into the manuscript.

Specific Comments

Within the description of the data sets, it is mentioned that only supply vessels for the offshore oil industry are considered in the pollution emission of ships (p.5, l.9). This raises the question why not all ships are considered. There is no information given if these type of ships are the main pollutant emitter or if they contribute only by little to the total ship emissions. As the analysis of the contribution of ship emissions to the total air pollution is one of the major points of the manuscript, this question must clearly be answered within the text.

During the presentation of the results in Sect. 4, the different used scenarios are mentioned at various points. Although, in Sect. 3.2.1, all considered meteorological conditions are mentioned and listed in Table 2, a list is missing which shows the actually conducted simulations with the used combinations of parameters. Such a table is also referenced on page 11, line 29 but is not part of the manuscript. Also, the naming of the scenarios is not explained in the text. An explanation is given below Table 2, but the explanation is incorrect and needs to updated.

In the discussion section, it is mentioned, that a resolution of at least 100m should be used to correctly resolve the diffusion processes of air pollutants within the Bergen region (p.12, l.26). I am missing a justification for this statement. Why can I also use 100m for such a study? Is there a gird-sensitity study conducted which suggested a

resolution of 100m or finer? A quotation is needed at this point. Otherwise, this has to be corrected to 10m resolution as this is the resolution used for this study.

Typos and other Technical Corrections

On page 10, line 26, it is mentioned that areas with higher density of fireplaces can easily be identified using Fig. 6 and Fig. 1. In my opinion, it is very hard to compare Fig. 1 and Fig. 6 because I cannot identify the coastlines in Fig. 6 (and also in Figs. 5-12). As I am not familiar with the area around Bergen, I need some help to navigate within the figures and the coastlines would drastically help. My suggestion is, either try to draw the coastlines into Figs. 5-12 or remove the white colour from the colour shading.

- p.4, l.9: Should be '2.5km **spacial** resolution'. - p.5, l.22: Remove comma between 'atmospheric model' and 'which is'. - p.6, l.18: The sentence 'This nudging is enabled only above the first local grid level over the surface' sounds a bit complicated. I suggest to write: 'This nudging is enabled starting from the second grid level above the local surface.' - p.8, l.14: Missing space between 'N_i' and the following word. - p.8, l.28: What is meant by '... at the level of the third-fourth floors'? Do you mean '...at heights between the third and fourth floor'? - p.9, l.19: '...junctions at DP and around (the sub-area 4)', better: '...junctions at DP (around sub-area 4)'. - p.11, l.10: Replace the semi-colons by comma and remove 'the' from the list. - p.11, l.11: 'Figure 8 shows that **the fireplaces**...' - p.14, l.20: This sentence is hard to understand. Please rephrase it. - Table 1: Entries are hard to read. Reduce the space between lines which belong to the same entry within the table to enhance readibility. - Table 2: The explanation below is wrong. Scenarios are not named as 'boh_...'. - Figure 3: Why is the figure caption written in italic? - Figure 5 and 7: The unit of the concentration does not use superscript for cubic-metres within the figure caption. - p.38, l.5: author names are written in capitals while all other entries are not.

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