

## ***Interactive comment on “Sensitivity of local air quality to the interplay between small- and large-scale circulations: a Large Eddy Simulation study” by Tobias Wolf-Grosse et al.***

**Anonymous Referee #2**

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Local air quality is affected by the emission and interplay between large scale forcing and local topography. This article is presenting an analysis how the local effects can interact with large scale meteorology to produce conditions with a strong stagnation in Bergen, a city located in a coastal valley. The results of the study are applicable only to the study region, and thus of limited interest. However, the usage of large eddy model is novel and shown to be very usable to study such conditions. Thus the study has potential to motivate further utilization of similar models in different locations and hopefully also in city planning. Thus I recommend this article to be published after the following remarks are considered.

1) My main concern is related to periodic boundary conditions used in the simulations.

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There is some discussion how it could affect the results, and suggestion that larger domain should be used. 1000m buffer zone is used with linearly interpolated surface. Is it tested that this 1000m is enough? For example in E-W direction the slope is quite steep, if I understood the method correctly. Later there is discussion on page 11 that the artificially generated outflow at the northern border is affecting the results, but not expected to change the conclusions. This should be tested, maybe using non-periodic boundaries are larger domain.

2) Case 0 is not analyzed. It would help a non-expert reader a lot if there would be 3D figure (similar to figure 1 in Wolf et al. (2014)), where the flows in the valley would be shown schematically in case when there is no sensible heat forcing from the surface. This could be included already in section 3.1. After such a plot figures 4-7 and the changes in local circulation would be easier to understand.

3) Page 5: Lines 30 onward. I agree with Reviewer 1 that this is too detailed and could be removed.

4) Page 6: lines 13-14: Based on Figure 2 it is not so obvious that the Bergen valley is open towards south-west.

5) Figure 2: It would be nice to see the geostrophic wind direction added to figure 2, or maybe figure 4.

6) Eral wind speeds from 410m are used down to 100m. Would the results change if the information from 10m wind speeds would be used to create the initial profiles?

7) Figure 6: The colormap for the tracer concentration is quite hard to interpret. Would it be better to compare against reference simulation and present the difference, or maybe use some other colormap to make plots easier to interpret.

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