

Review

Title: Challenges of high-fidelity air quality modeling in urban environments – PALM sensitivity study during stable conditions

In this paper, challenges related to the PALM, especially for air-quality modeling under stable conditions is discussed. Several sensitivity tests (e.g., initial and boundary condition and PALM processes) were performed to investigate the reason for the overestimation of the PALM's air pollutants concentration within urban canyon, which is caused by the underestimation of the estimate of the ventilation. The authors conclude with some suggestions for future model development. The topic is important, and the manuscript is generally well-written and streamlined. The introduction provides a complete (theoretical) background to the study. The scientific merit of the study deserves publication. Yet, I recommend minor revision of the manuscript before its acceptance. This recommendation is based on the comments and remarks listed below:

- 1) The word 'to' in line 3 should be changed to "on".
- 2) The word 'unrealistically' in line 4 should be changed to "unrealistic".
- 3) In line 6, the phrase "... changes of meteorological..." should be changed to "... changes on meteorological..."
- 4) Comma is missing in line 20 after the word "radiation" in the phrase "... radiation wind field ..."
- 5) In line 21, change "... a prerequisite for ..." to "... the tools needed for ...".
- 6) In line 28, change the phrase "physical bases" to "parameterizations".
The sentence "*However, high-precision and turbulence-resolving methods in the models alone are not sufficient for them to be considered fully reliable for urban atmosphere research, especially in the realm of air quality in the cities.*" is not clear. It should be rewritten.
- 7) The comma in line 56 after "different scenarios" should be change to full stop.
- 8) In figure 1, what is the height in which the concentration time series is computed from?
- 9) Move the flow statistics of the observation and PALM simulations to figure 1 from the Supplements. This will show readers that ventilation in the street canyon is underestimated.