Geoscientific

Model Development

Discussions

[GMDD]

Interactive

comment

Interactive comment on "Sensitivity analysis of the PALM model system 6.0 in the urban environment" *by* Michal Belda et al.

Anonymous Referee #1

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General comments: This manuscript presents a series of sensitivity simulations of the PALM model in a real urban area in Prague, Czech Republic. The sensitive tests were conducted two-fold by changing the model's physical properties and changing urban morphological characteristics. All the simulations were conducted for a specific hot day over a small block area, and then their results were compared in terms of the influence of UHI and air quality. This study presents a potential capability of using the PALM model as a tool for urban climate research, and it seems that intensive computational works have been done for the sensitivity experiments. However, this study has some significant drawbacks that should be improved. First, it is not clear what this study contributes because its purpose is not clearly presented in a scientific sense. There have been many studies that investigated the sensitivities of the urban climate model's

input parameters and UHI mitigation scenarios. Though the previous studies did not use the PALM model, their contributions might be summarized and compared with this study. Unfortunately, I cannot find something new in this study conducted with the LES model. A clear scientific reason for conducting the sensitivity experiments using a PALM model needs to be presented first. Second, it is not clear why the two types of sensitivity experiments were organized. Besides, what is the reason for selecting the scenarios and model parameters used in the experiment? Before the sensitivity simulations, the reference simulation should be done with an optimized setting that can well simulate the actual (measured) meteorological conditions. In many studies, the sensitivity experiments presented in this study have been performed, and significant results have been presented. Actually, the results of this study are not beyond previous studies. Overall, this manuscript should be further improved by setting up more specific scientific questions and reanalyzing the sensitivity simulation results focusing on the scientific purpose.

Specific comments: L46-47: It should be focused on specific scientific problems. What do the 'systematic' sensitivity studies mean? L76-77: The boundary meteorological conditions might be critical in determining the meteorological conditions over the target domain, so more description of the boundary conditions will be helpful. How to feed the WRF output to the PALM model? What is the feeding time step? L87: Is there any reason to select PM10 for analysis rather than NOx, PM2.5? if vehicular emission is estimated, more relevant species might be NOx and PM2.5 rather than PM10. L90: More specific or technical description might be helpful for the mesoscale and microscale coupling strategy. How frequently is the WRF output provided? L93: Why didn't you use urban parameterization in the WRF simulation? Generally, the use of urban parameterization in WRF can give better simulations than the NoahLSM bulk urban parameterization. Providing realistic meteorological boundary conditions to the PALM model might be critical in the simulation over the target area. L103-105: which parameters were measured? What are the methods to get the parameters from the site? More specific descriptions will be necessary. L112-114: any reference for

Prague 3D model? L121-124: it seems that this spin-up result can influence the analyses of the sensitivity simulation results. L125: does the 'simulation' mean sensitivity or spin-up simulation? L134-135: Despite low vegetation fraction, this study says the vegetation has the most important factor in this area. Are there any studies to evaluate the physical parameterization of vegetation in the PALM model? If so, add the papers as references. L154-155: Please add a reference paper that explains the WRF and PALM coupling strategy. If this were done in this study, more description would be informative and useful. L172: why was the heatwave episode selected? I guess the series of sensitivity simulation results might depend on the case selection. L179: It seems that the PALM model does not cover the LLJ in the vertical direction. L187: Please check the emission unit in Fig. 3. It is difficult to read the emission intensity from the Fig. 3. What are the emission fluxes of NOx, PM2.5, and PM10 used in the simulation? How reliable are the estimated emissions? The primary pollutants emitted from passenger cars are NOx, CO, VOCs, and small particulate matter fractions. For PM10, blown-dust might be a major primary source on roads. L191-192: More explanation will be needed why the sensitivity tests are needed. What should be the base simulation in this study? What do you mean by 'real values'? How did you select the model parameters? L200-201: I think that the necessity does not worth publication. L212: Result section should be significantly revised. Tables 3 and 4 are too busy but show little differences. Many studies have reported similar sensitivity results. Please compare your results with them. Fig. 4: at which level are the variables plotted? Define the surface temperature. Please show how to calculate MRT and PET from the model results. PM concentration field looks unrealistic in magnitude and spatial distribution. Compare also Fig. 3. Is there any comparison against measurements?

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