Wednesday 6th September 2023

Dagmar Zádrapová
Studini oddéleni Ke Karlovu 2027/3
121 16 Praha 2
the Czech Republic
dagmar.zadrapova@maffyz.cuni.cz

Dr Matteo Carpentieri
Associate Professor in
Environmental Fluid Mechanics
School of Mechanical Engineering Sciences
Guildford, Surrey GU2 7XH

T **+44 (0)1483 686370**
E **m.carpentieri@surrey.ac.uk**

Dear Sir/Madam

Ref: "Flow dynamics and pollutant transport in street canyons of different roof heights and geometries: a wind tunnel and LES modelling", by Ms. Zuzana Kluková

I reviewed the doctoral thesis "Flow dynamics and pollutant transport in street canyons of different roof heights and geometries: a wind tunnel and LES modelling" by Zuzana Kluková. The thesis reports on a series of wind tunnel experiments designed to study and analyse flow and dispersion in complex urban arrays. The author followed up previous experiments on similar configurations by performing particle image velocimetry (PIV) measurements. in a wind tunnel. Previous experiments only included point measuments (LDA and FFID concentration measurements) and further flat-roof models were added to the range of studied configurations. Theoretical aspects of the research, including context, background, methods of analysis are introduced very well in Chapter 1. As mentioned in the introduction, one of the novel aspects explored by the author is the application of the oscillation pattern decomposition (OPD) method to analyse the data, which is relatively new and unexplored in the community, and so it comes with its challenges.

After introducing and justifying the models studied in Chapter 2 and describing previous results on some of them in Chapter 3, the author presented her PIV results in Chapter 4. The methodology is sound and well described. Results are presented in the form of mean velocity and TKE, quadrant analysis, POD and OPD. The author compared them with previous results with different methodologies, mostly confirming their validity. The analysis is rigorous and does the most of the available data. As the focus and main motivation for this research was assessing pollutant concentrations in urban areas, the author reverted to analysing LES numerical data in Chapter 5, as simultaneous concentration measurements on a large spatial domain in the wind tunnel are not available and would be very challenging to set up (if possible at all). The author did not perform the simulations herself but she performed the analysis, which is deep and very well reported. Validation was reported (with generally good agreement) and results were presented in the form of 3D flow analysis, pollutant transport (vertical and lateral fluxes) and flux balance. Air exchange rates are also presented. The analysis in this chapter is a nice complement to the experimental results in chapter 4 and gives a more complete picture of the investigated topic, even though the LES data could have been further explored in more depth. The final conclusions are well writte and report very well the main findings of the doctoral project and their significance in the field.

Wednesday 6th September 2023

Dagmar Zádrapová
Studini oddéleni Ke Karlovu 2027/3
121 16 Praha 2
the Czech Republic
dagmar.zadrapova@maffyz.cuni.cz

Dr Matteo Carpentieri
Associate Professor in
Environmental Fluid Mechanics
School of Mechanical Engineering Sciences
Guildford, Surrey GU2 7XH

T **+44 (0)1483 686370**
E **m.carpentieri@surrey.ac.uk**

The form and presentation of the thesis are of the required doctoral standard. The English language used in the thesis is generally good, with some minor areas worth of improvement (except the introductory section which is entirely well written). Overall a very good theis with a clear scientific objective that, while certainly not revolutionary, builds really well on previous research in the same laboratory and complements it nicely. The only minor weakness, as mentioned above, was the lack of a deeper analysis of the LES data that could have strengthened the conclusions of the thesis.

Overall, I believe that the submitted thesis proves very well the author's ability for creative scientific work and is above the required level for a doctoral degree.

Yours sincerely,

Matteo Carpentieri