[25] Y. Jiang and Q. Chen, Buoyancy-driven single-sided natural ventilation in buildings with large openings, *International Journal of heat and mass transfer.*, vol. 46, no. 6, pp. 973–988, 2003.
[26] T. Sawachi, K. Narita, N. Kiyota, H. Seto, S. Nishizawa, and Y. Ishikawa, Wind pressure and airflow in a full-scale building model under cross ventilation, *The International Journal of Ventilation*, vol. 2, no. 4, pp. 343–358, 2004.
[27] ANSYS, ANSYS FLUENT 12.1 Documentation, ANSYS Inc., PA.

Table 1. Summary of test cases

Case	Scale	Data Compared	References
Wind-driven, single-sided and cross ventilation	Small-scale wind tunnel	Temperature and velocity	Experiment by Jiang et al.[22] , CFD by Allocca [23]
Buoyancy driven, single-sided natural ventilation	Full-scale chamber	Temperature, velocity, and ventilation rate	Experiment by Jiang et al. [25], CFD by Jiang [24]
Cross ventilation through a four-zone building model	Full-scale wind tunnel	Velocity and ventilation rate	Experiment by Sawachi et al. [26]
Building 661	Two story building	Velocity and ventilation rate	CFD

Table 2. Surface temperatures of the laboratory

	Ceiling	Floor	North wall	South wall	East wall	West wall
Surface temperature (^{o}C)	23.11	22.11	23.01	22.90	20.94	22.83

Table 3 Air change rates for single-side natural ventilation

	Experimental measurements	CFD	FFD
Air change rate (ACH)	9.18-12.6	15.2	9.36

Caption of figures

Figure 1. Schematic view of the building model for wind-driven, single-sided, and cross ventilation (Jiang et al.[22])

Figure 2. The positions for the velocity measurement in the streamwise mid-section (Jiang et al. [22])

Figure 3. Comparison of velocity field in the streamwise mid-section computed by FFD and the experiment for (a) single sided, windward ventilation, (b) single sided, leeward ventilation, and (c) cross ventilation

Figure 4. Mean velocity distributions in the streamwise direction for (a) single-sided, windward ventilation, (b) single-sided, leeward ventilation, and (c) cross ventilation

Figure 5. Sketch of (a) the layout of the laboratory and (b) measurement positions

Figure 6. Comparison of airflow patterns simulated by (a) FFD and (b) CFD by Jiang at al.[25]

Figure 7. Comparison of the computed velocity profiles with the experimental data at the five measurement positions

Figure 8. Comparison of the computed temperature profiles with the experimental data at the five measurement positions

Figure 9. Sketch of the four-zone building model

Figure 10. Comparison of airflow patterns (a) observed in experiment by Sawachi et al. [26] and (b) simulated by FFD

Figure 11. Comparison of ventilation rates with different wind angles by FFD and the data from Sawachi et al. [26]

Figure 12. Sketch of Building 661 and its surrounding

Figure 13. Comparison of velocity distribution simulated by (a) CFD and (b) FFD

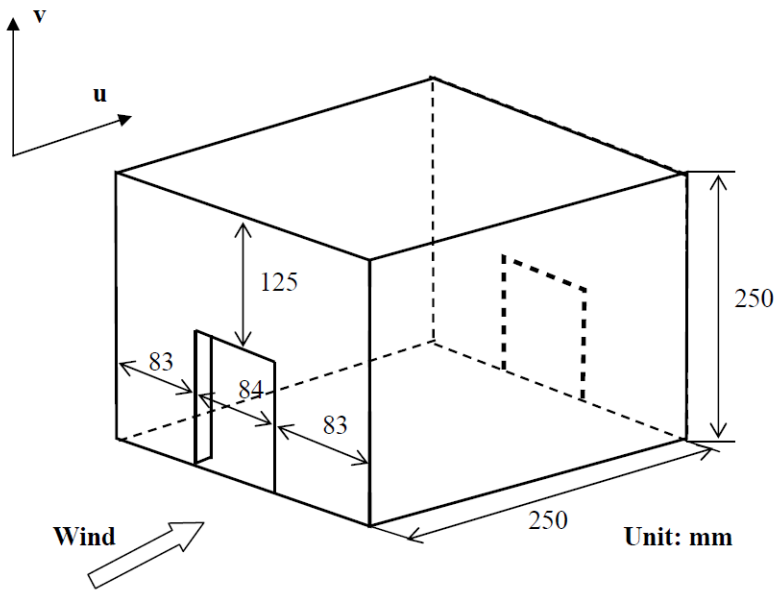


Figure 1

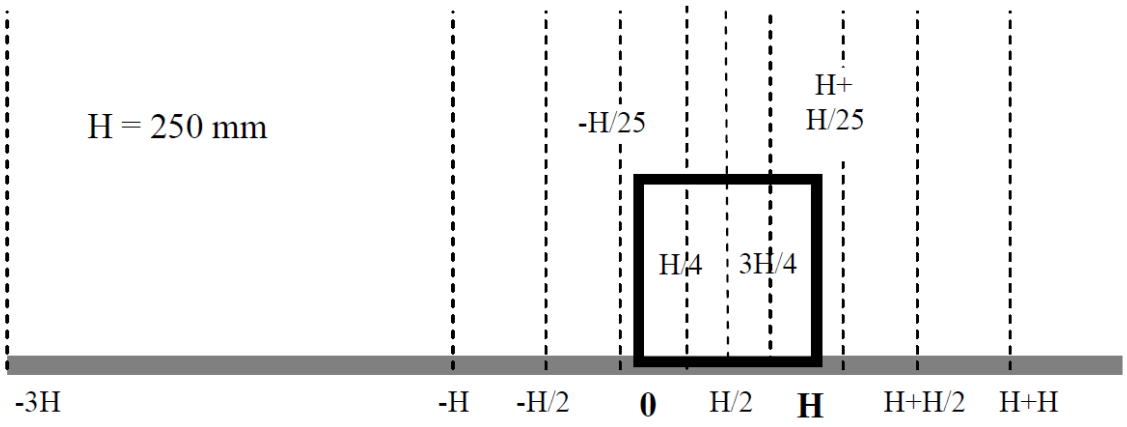
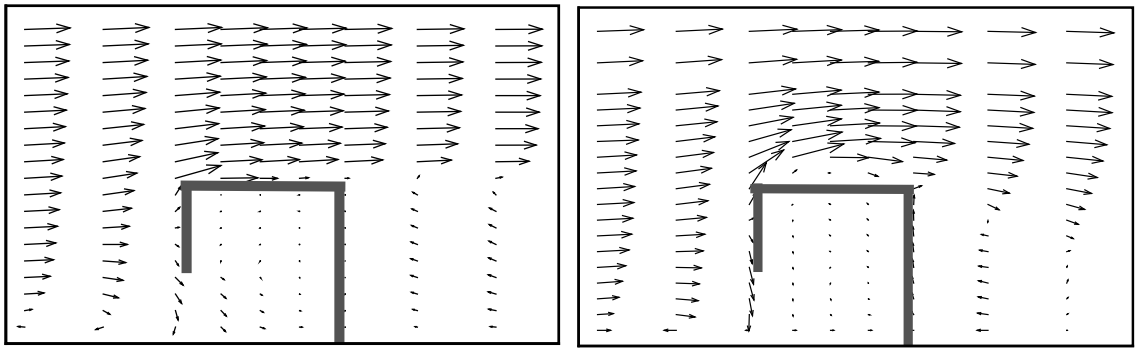
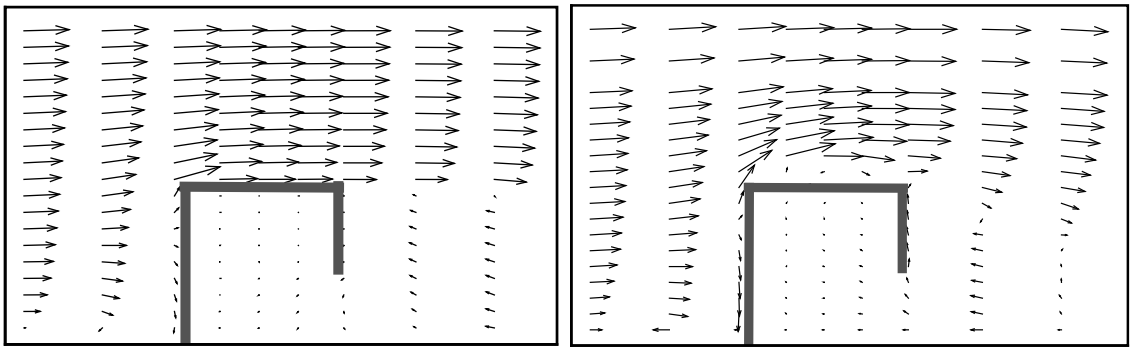


Figure 2



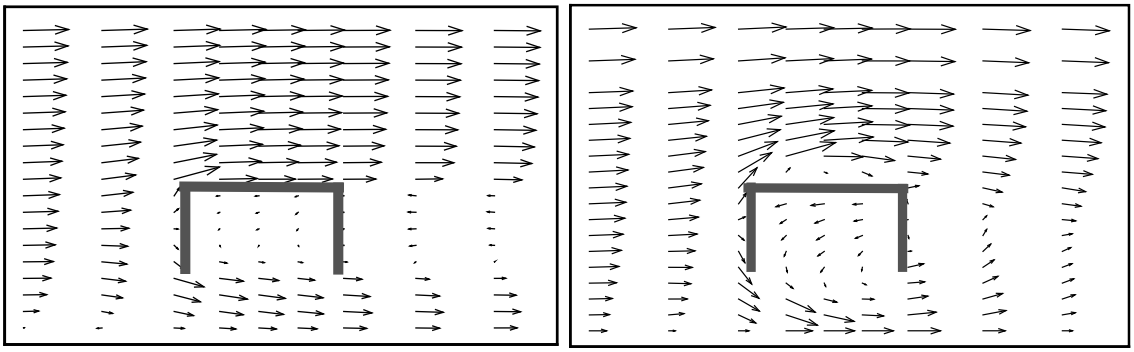
FFD Measurement

(a)



FFD Measurement

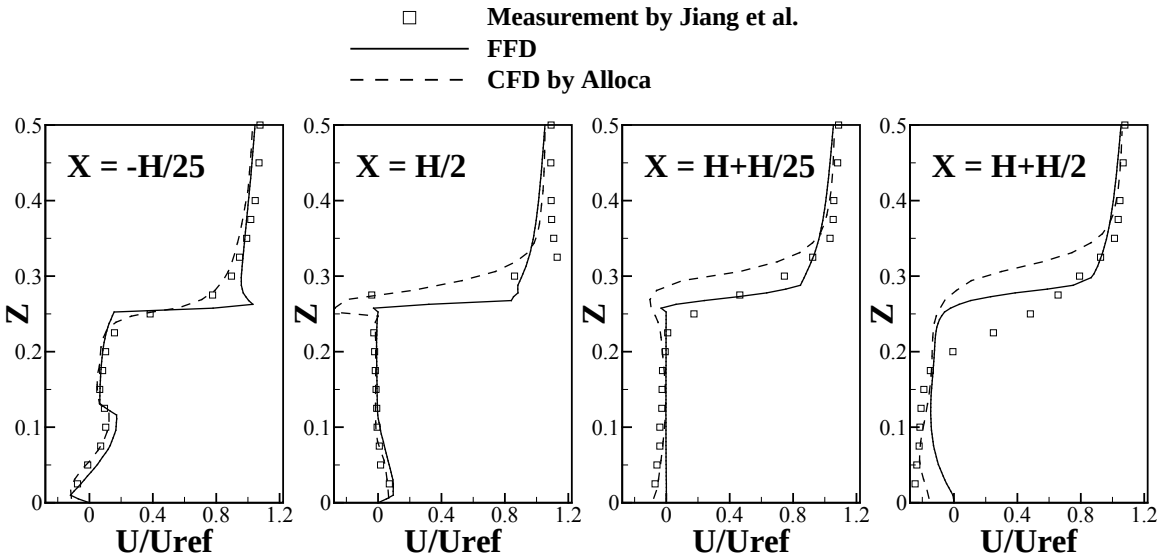
(b)



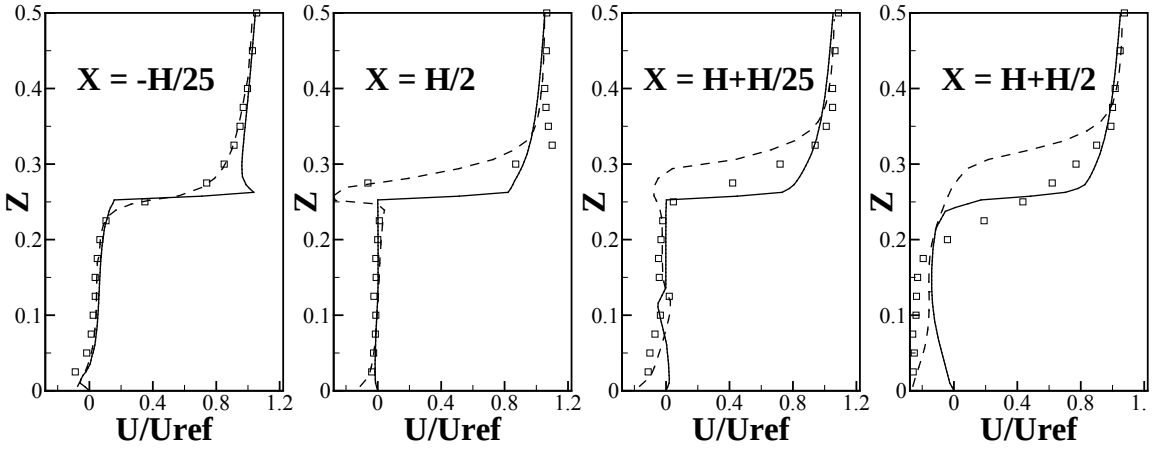
FFD Measurement

(c)

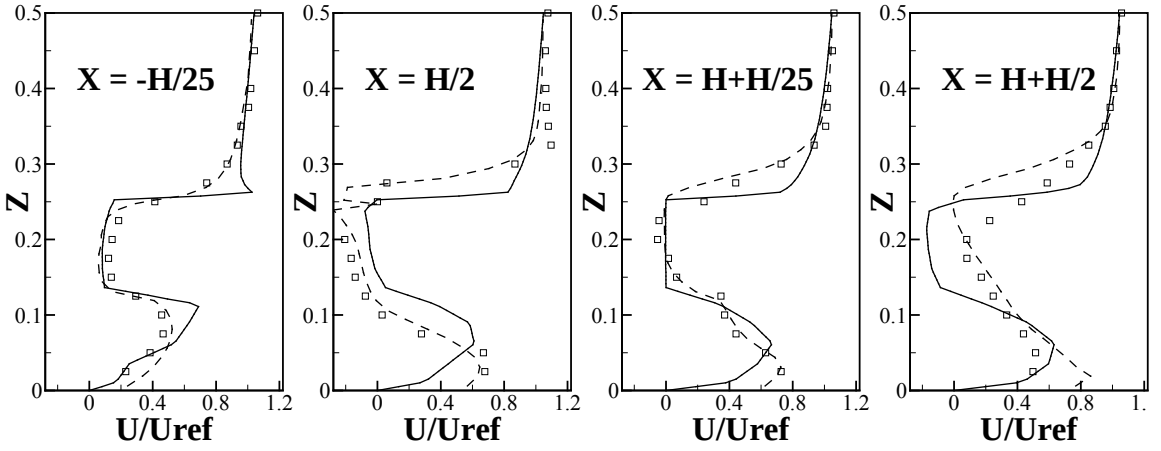
Figure 3


Measurement by Jiang et al.
FFD
CFD by Alloca
X = -H/25
X = H/2
X = H+H/25
X = H+H/2
Z
U/Uref
0
0.1
0.2
0.3
0.4
0.5
0.4
0.8
1.2

(a)

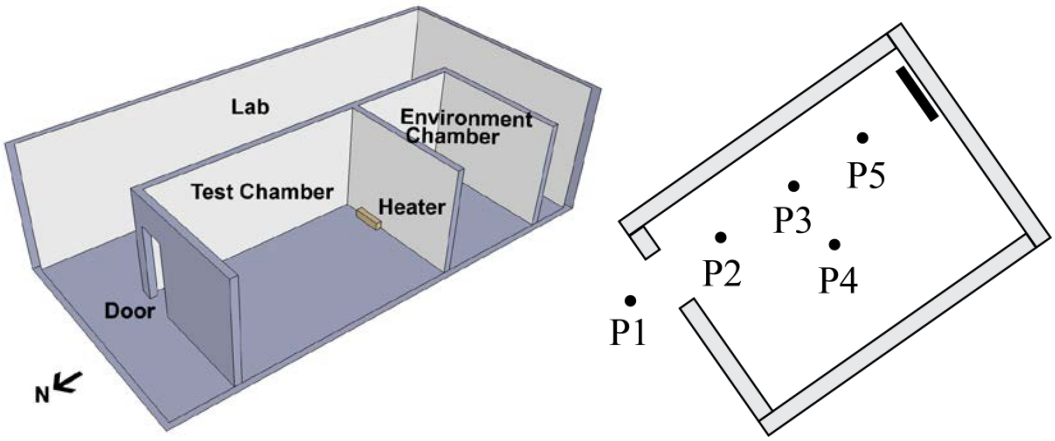

X = -H/25
X = H/2
X = H+H/25
X = H+H/2
Z
U/Uref
0
0.1
0.2
0.3
0.4
0.5
0.4
0.8
1.2

(b)


X = -H/25
X = H/2
X = H+H/25
X = H+H/2
Z
U/Uref
0
0.1
0.2
0.3
0.4
0.5
0.4
0.8
1.2

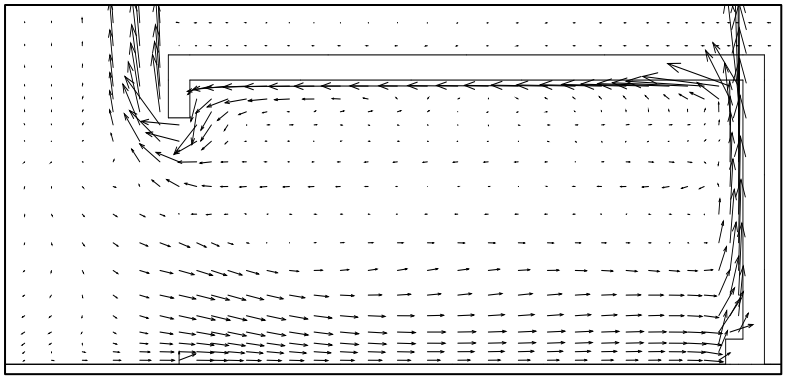
(c)

Figure 4

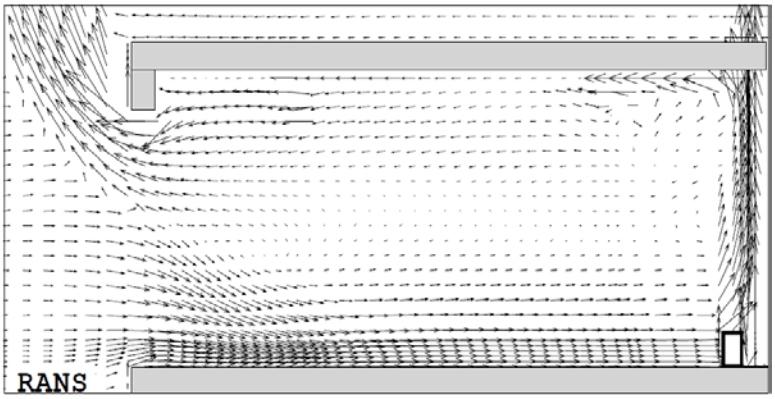

Lab
Environment Chamber
Test Chamber
Heater
Door
N
P1
P2
P3
P4
P5

(a) (b)

Figure 5



(a)



(b)

Figure 6

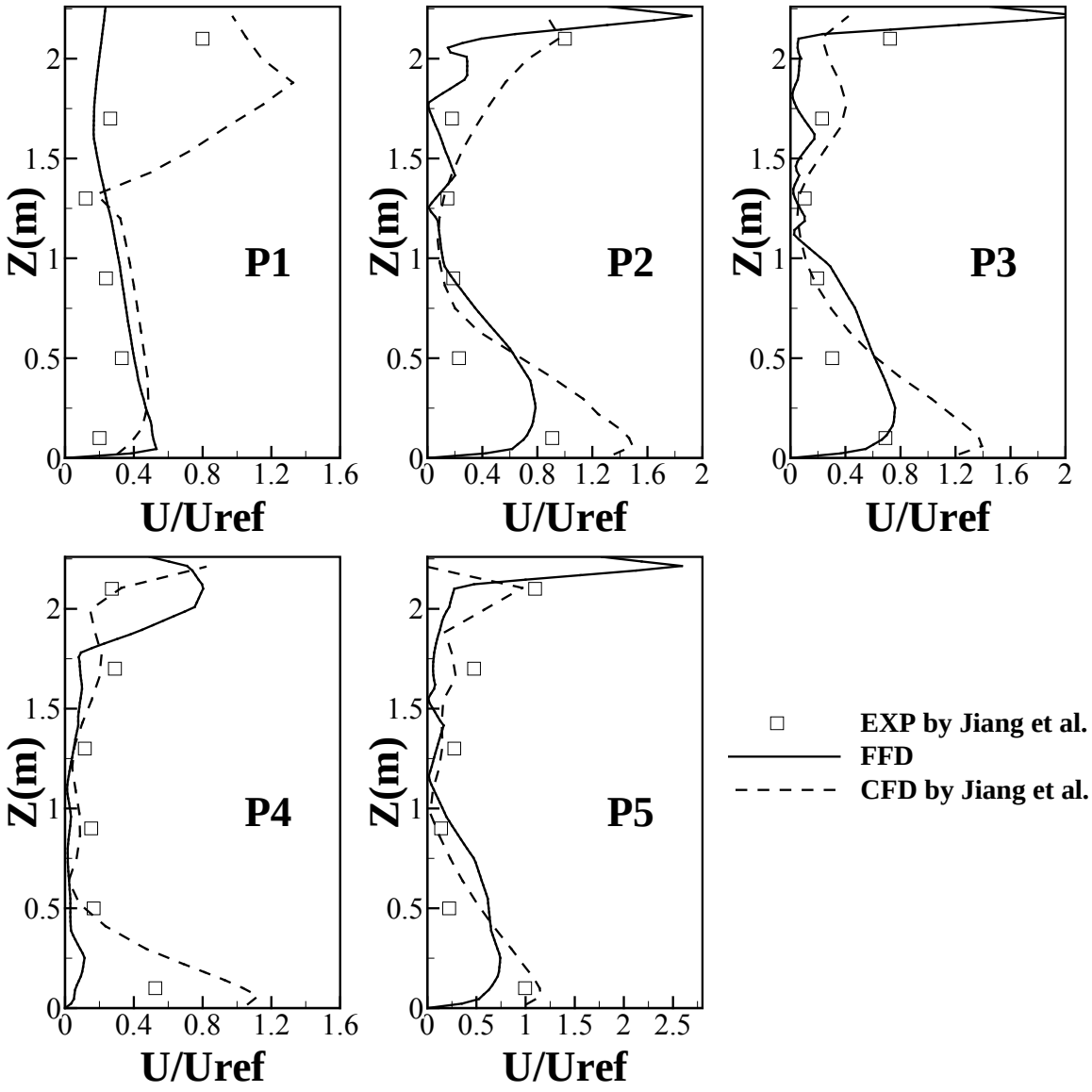


Figure 7

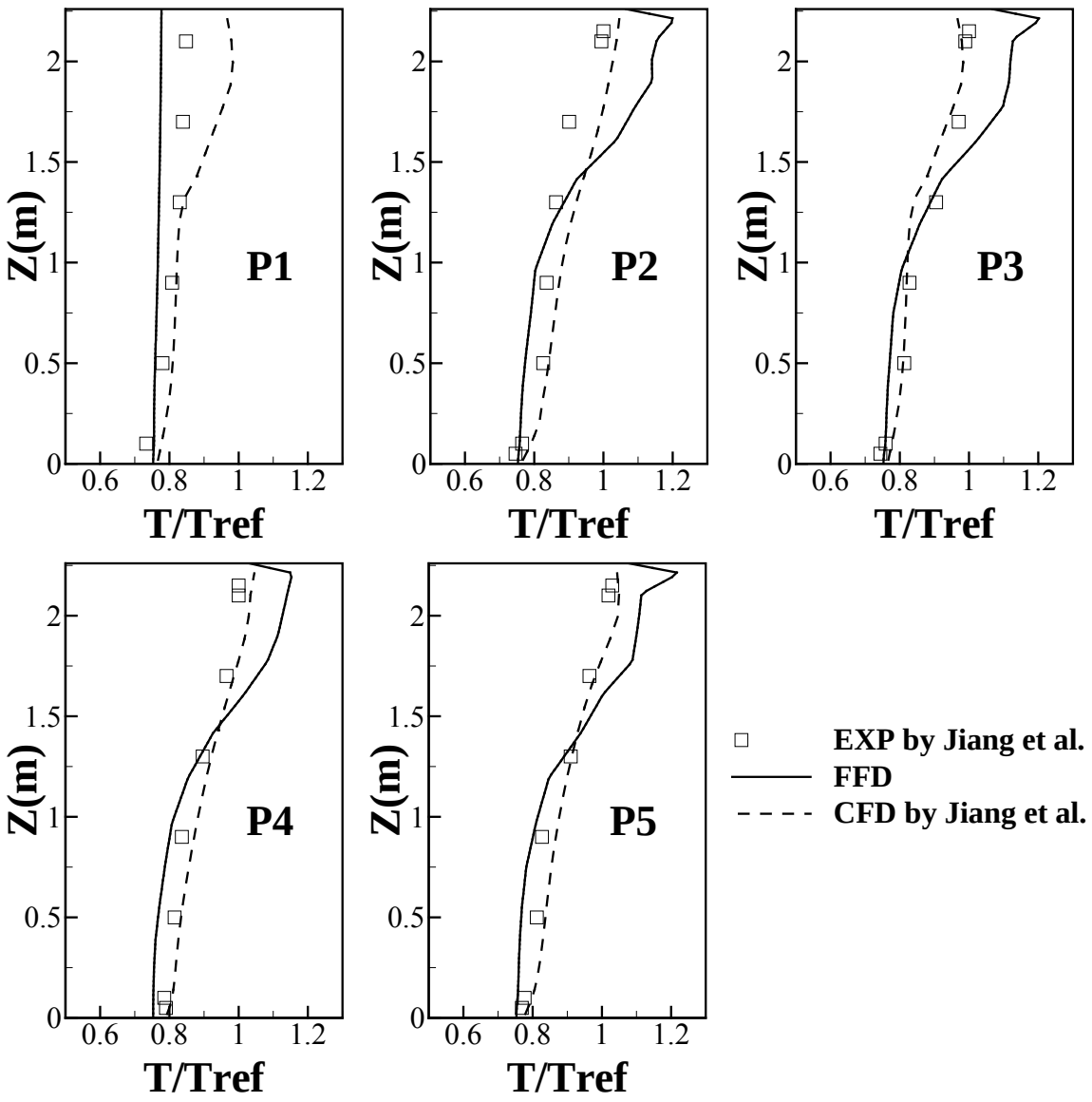

P1
P2
P3
P4
P5
Z(m)
T/Tref
0
0.5
1
1.5
2
0.6
0.8
1
1.2
EXP by Jiang et al.
FFD
CFD by Jiang et al.

Figure 8

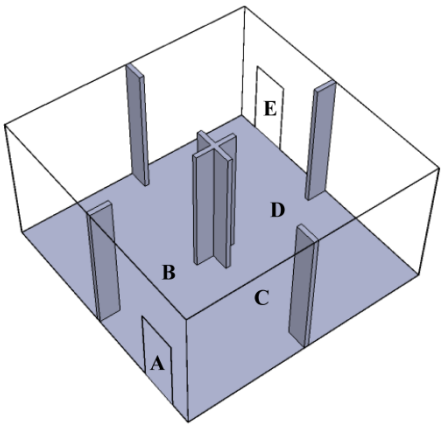
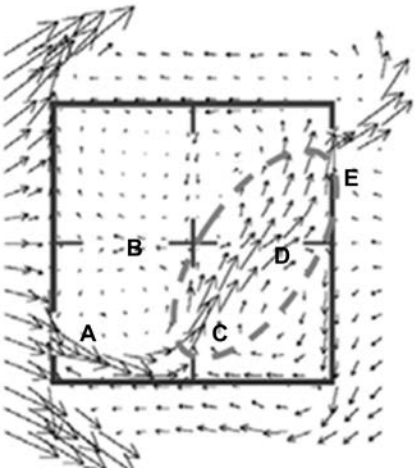
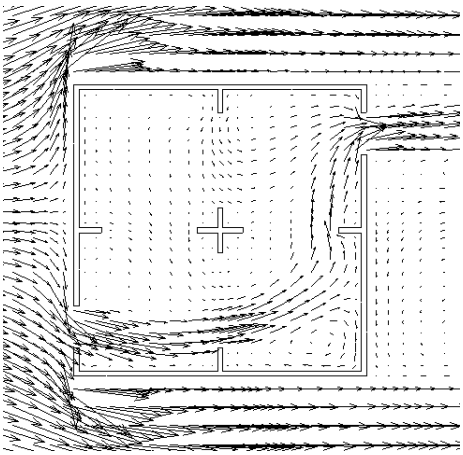


Figure 9



(a)



(b)

Figure 10

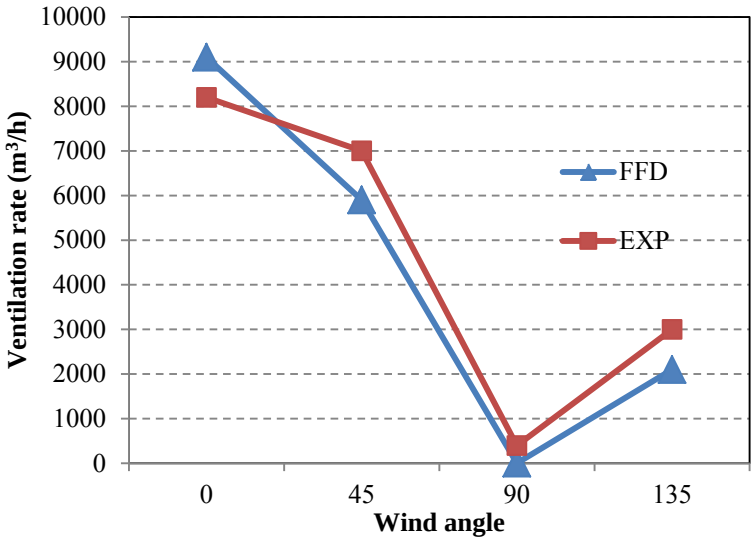

10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Ventilation rate (m³/h)
0
45
90
135
Wind angle
FFD
EXP

Figure 11

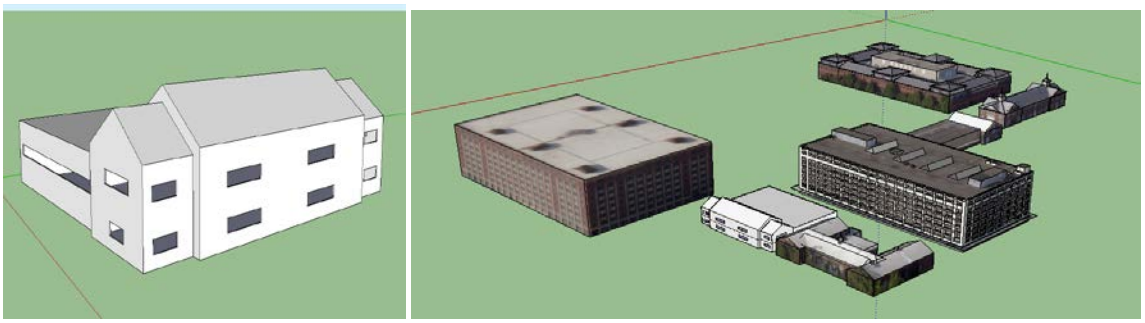
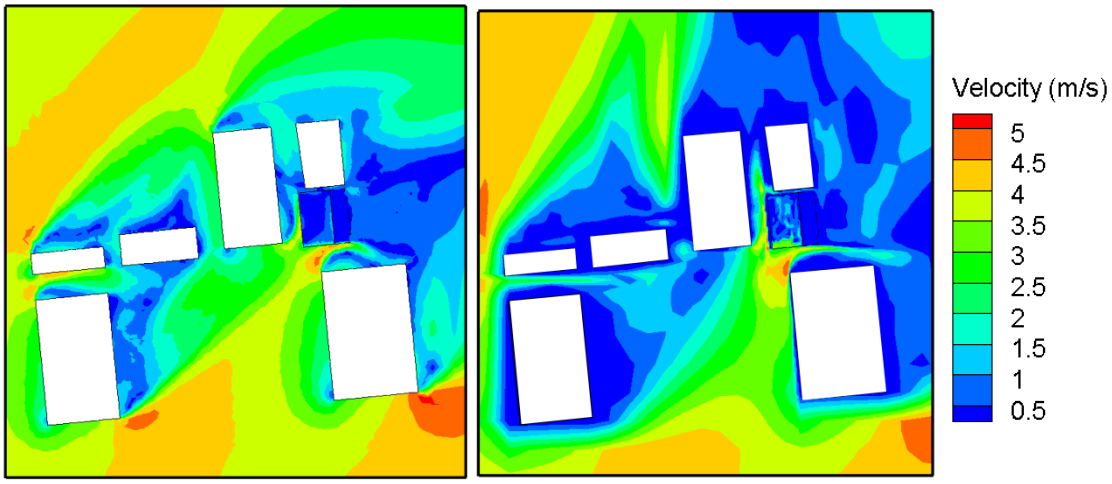


Figure 12



(a) (b)

Figure 13