

0301 – Wind Loads on an Isolated Building

Description

The verification example describes the steady-state flow around an isolated building (scaled model) according to **Figure 1**. The example is given by the Architectural Institute of Japan (AIJ) and it is described in detail in [1]. Chosen results (velocity magnitude) are compared with the measured values. The problem is described by the following table and the inflow velocity profile is introduced in **Figure 2**.

Fluid Properties	Kinematic Viscosity	ν	1.5×10^{-5}	m^2/s
	Density	ρ	1.250	kg/m^3
Geometry	Width	b	0.050	m

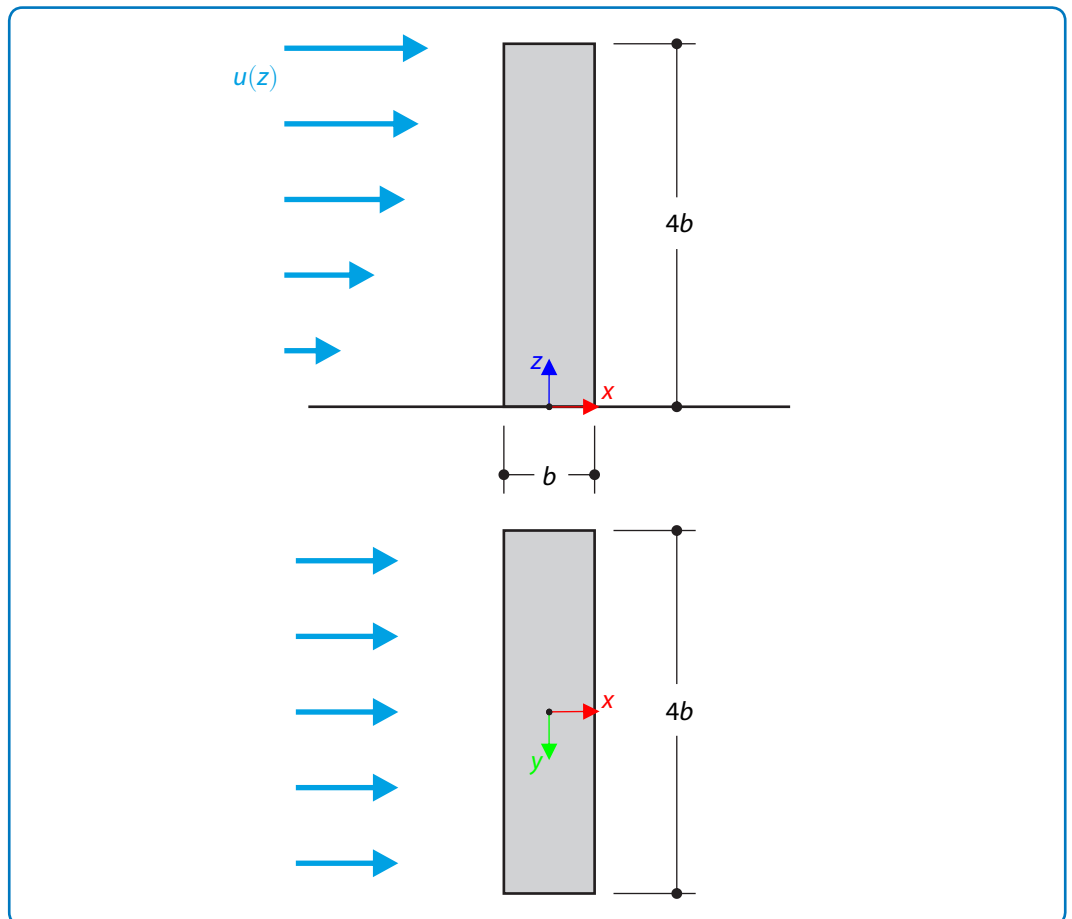


Figure 1: Problem sketch

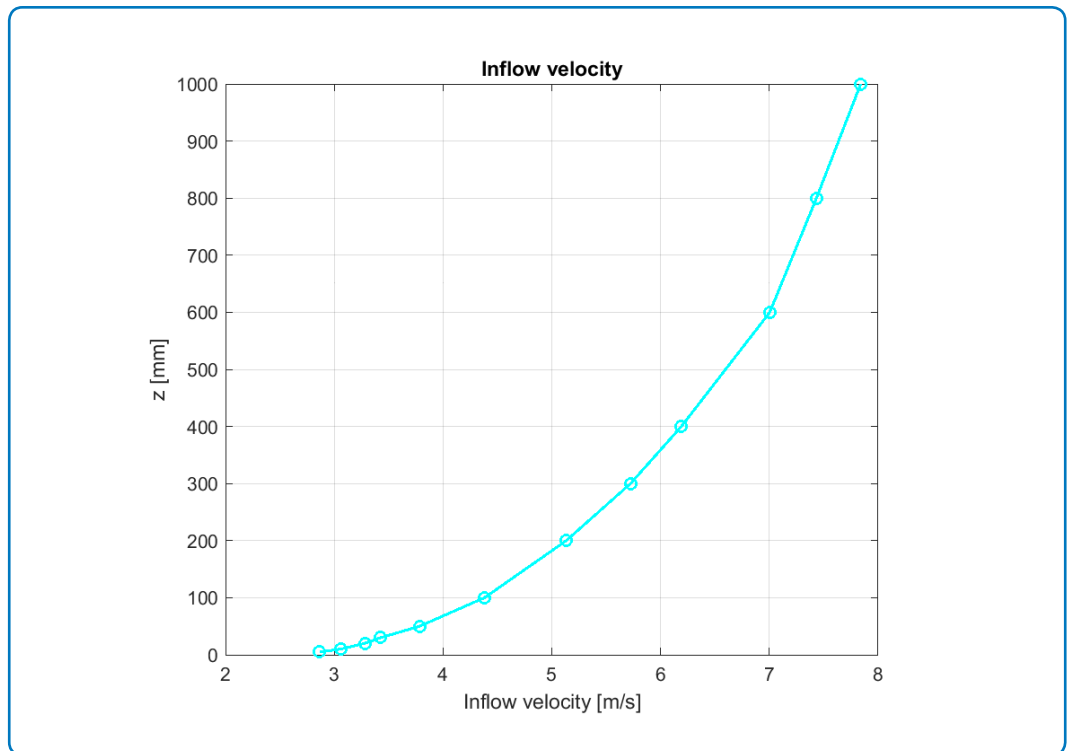


Figure 2: Inflow velocity

RWIND Simulation Settings

- Modeled in RWIND Simulation 1.25
- Model of turbulence: $k-\epsilon$

Results

Structure Files	Program
0301.01	RWIND Simulation

The velocity magnitudes experimentally obtained are compared in selected points according [1] to the RWIND Simulation results (line probes are used). In this verification example, several vertical sections are chosen to be compared with the experiment, according to **Figure 3**. Corresponding graphs are presented in **Figure 4** to **Figure 13**. Furthermore, velocity vector field can be seen in **Figure 14**.

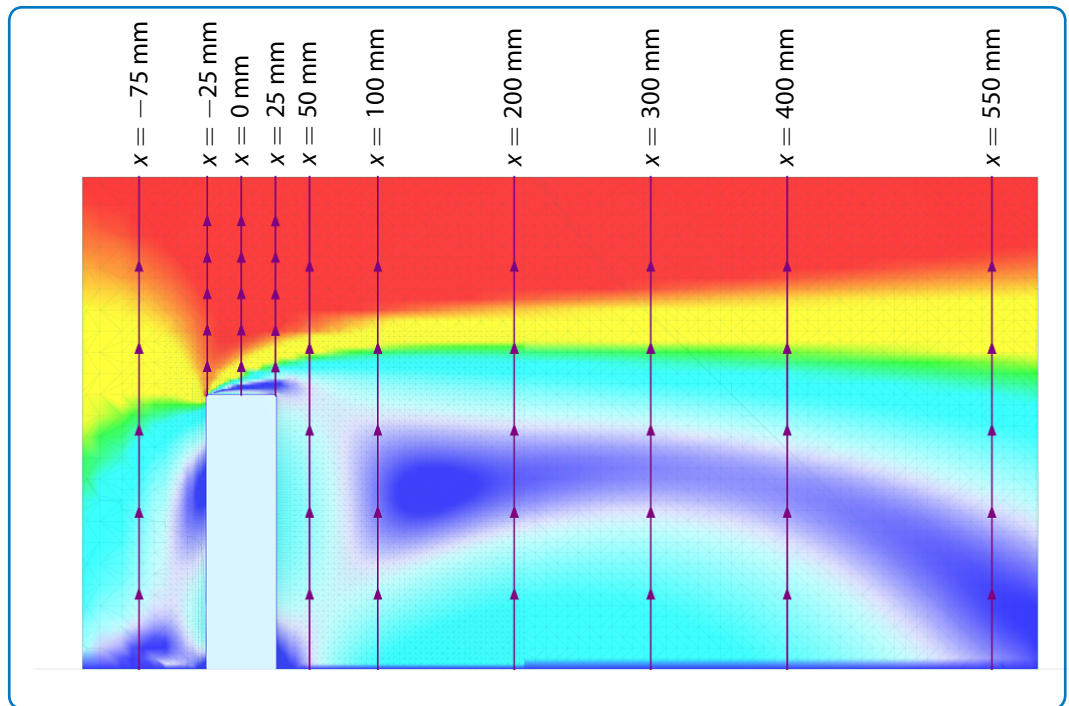


Figure 3: RWIND Simulation – Velocity field in vertical section $y = 0$ mm, line probes placement

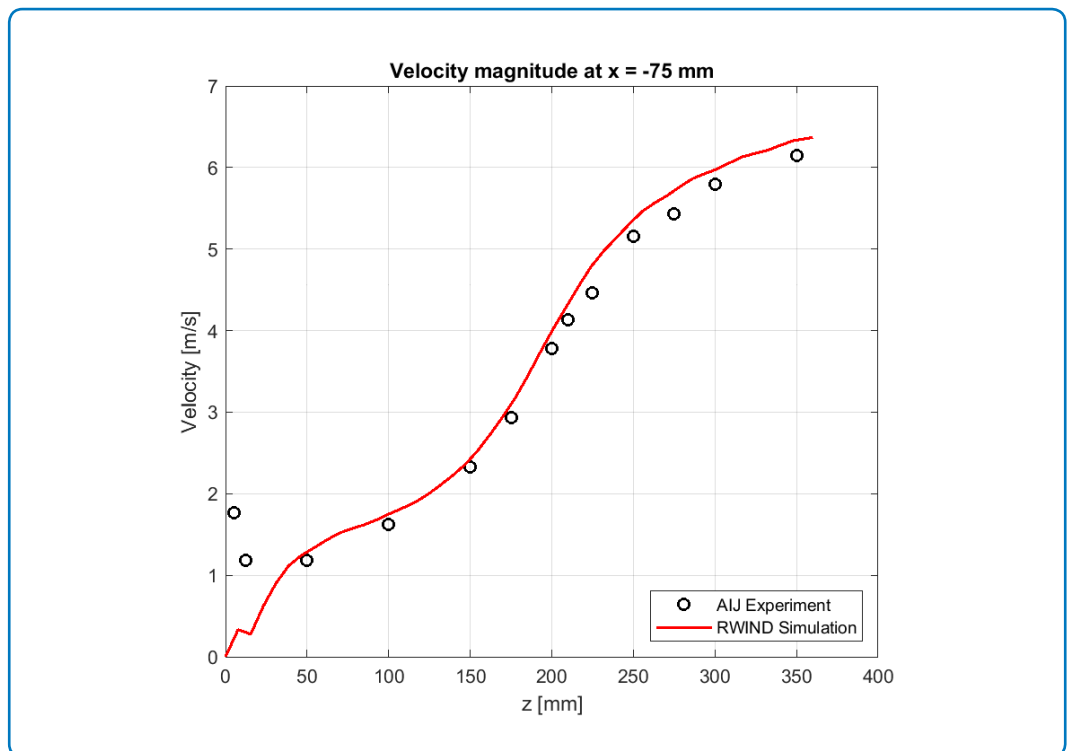


Figure 4: Velocity magnitude comparison at $x = -75$ mm, vertical section

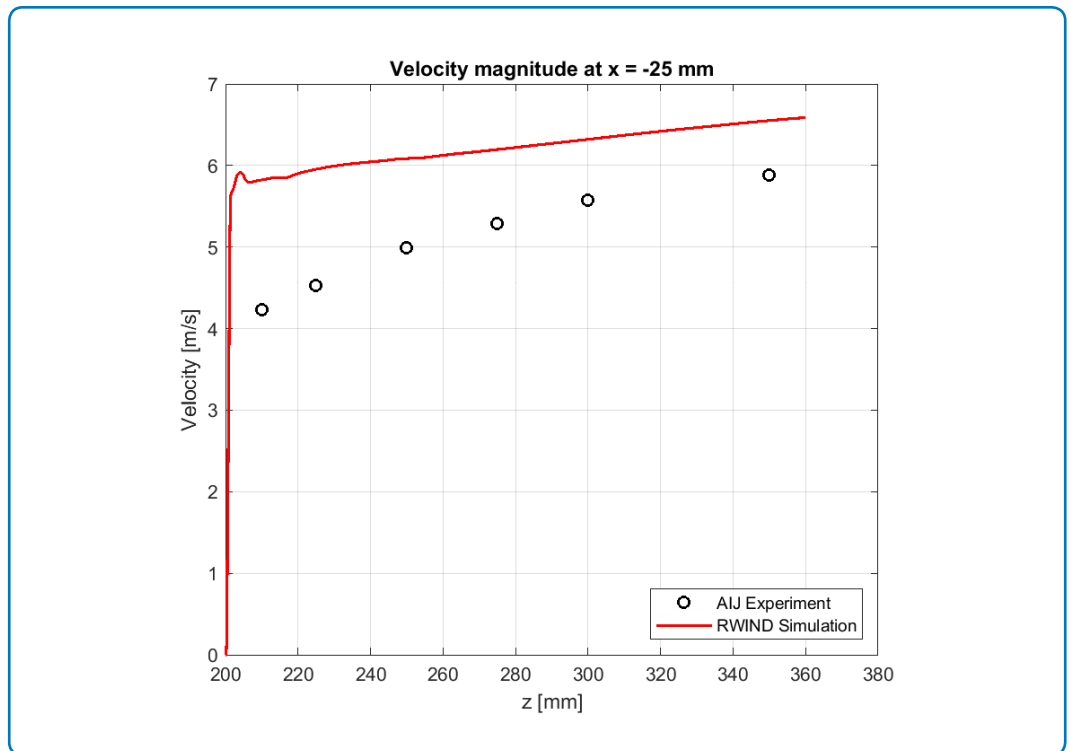


Figure 5: Velocity magnitude comparison at x = -25 mm, vertical section

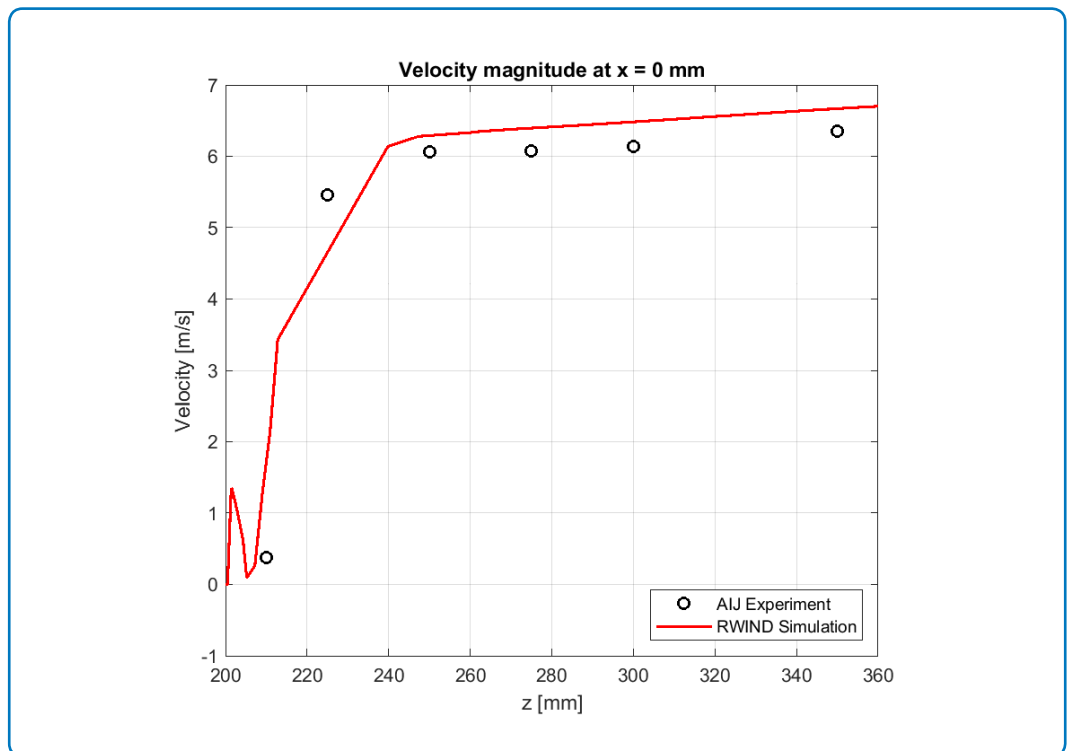


Figure 6: Velocity magnitude comparison at x = 0 mm, vertical section

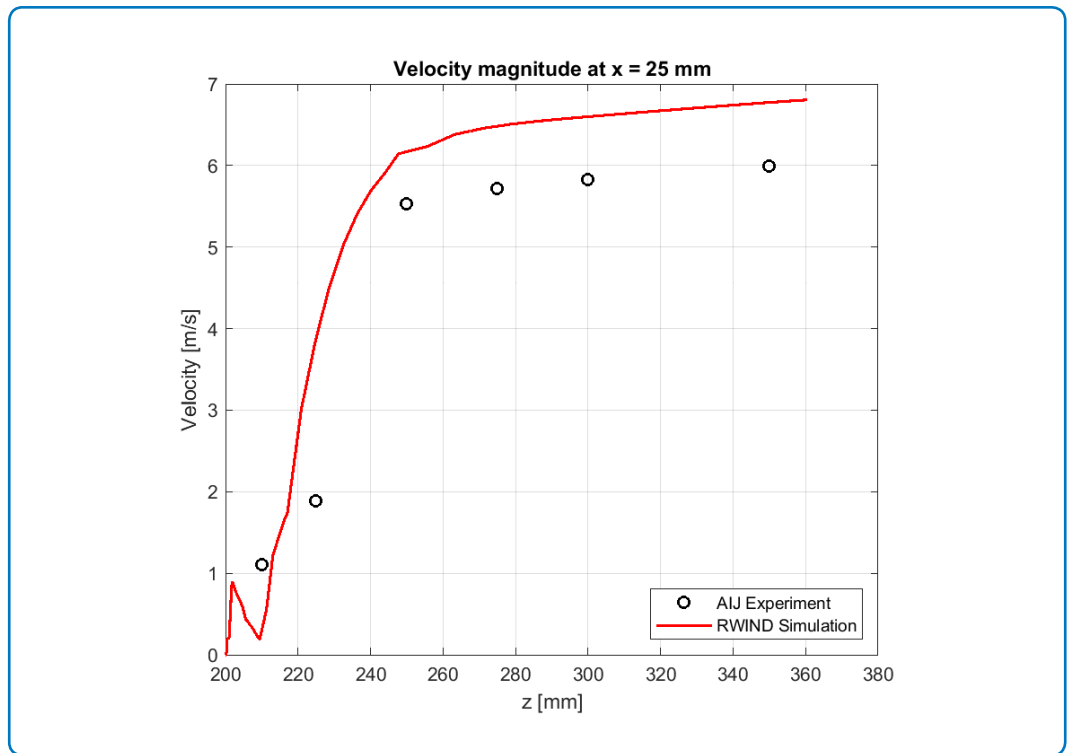


Figure 7: Velocity magnitude comparison at x = 25 mm, vertical section

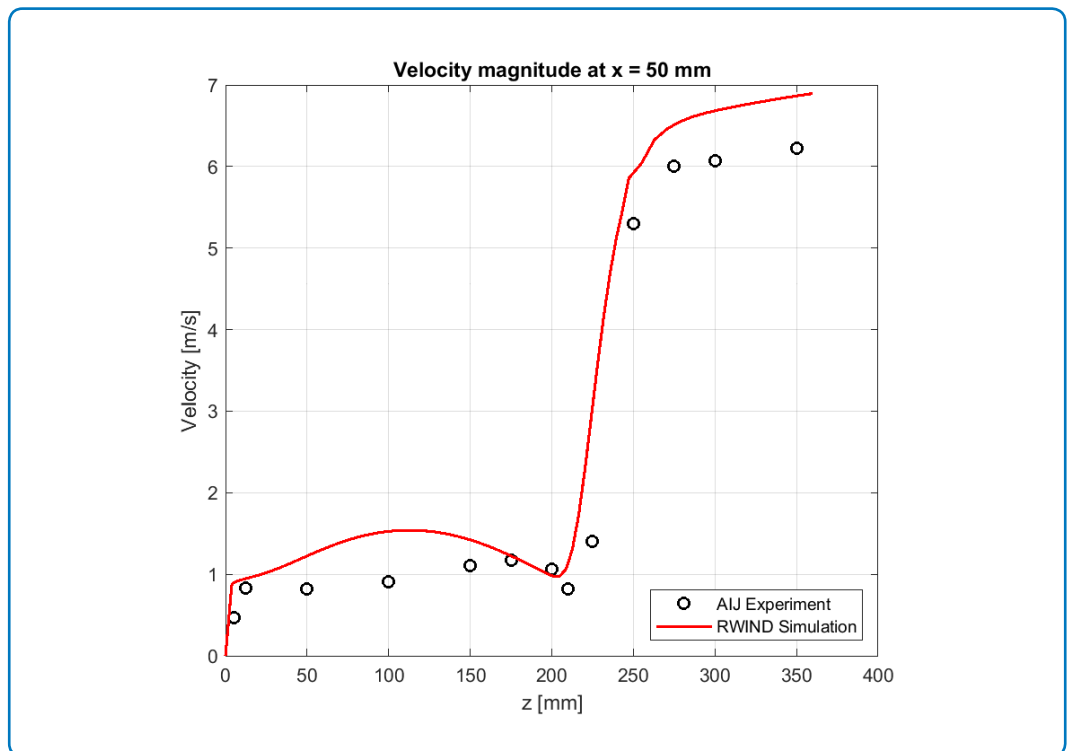


Figure 8: Velocity magnitude comparison at x = 50 mm, vertical section

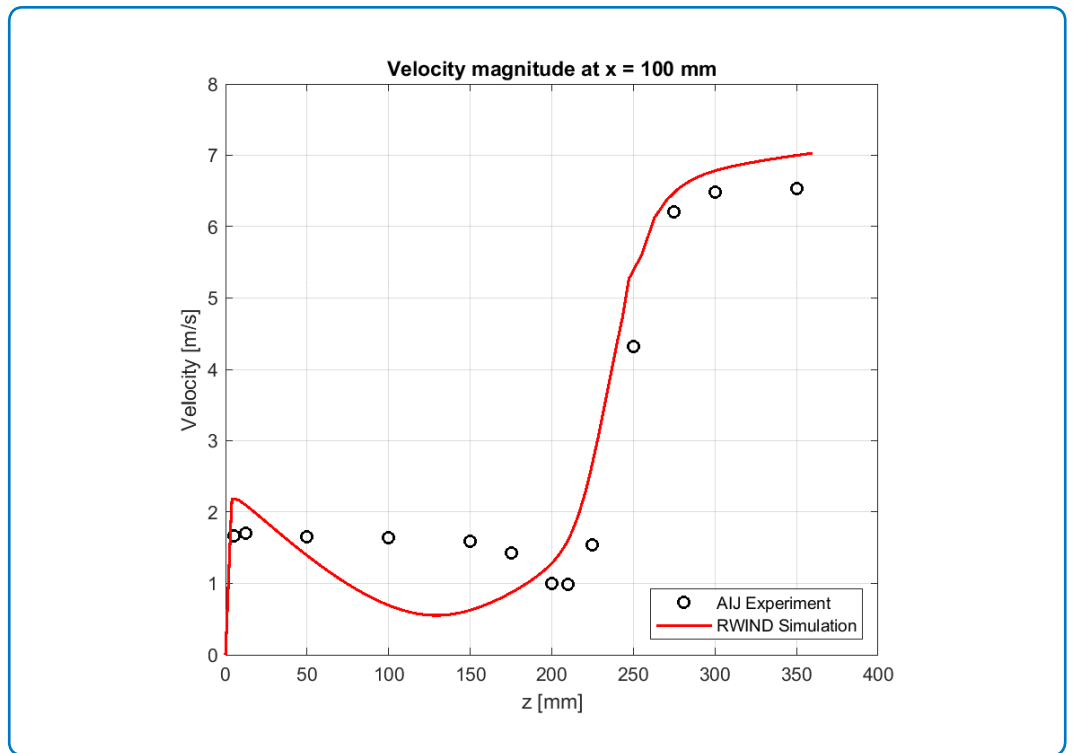


Figure 9: Velocity magnitude comparison at x = 100 mm, vertical section

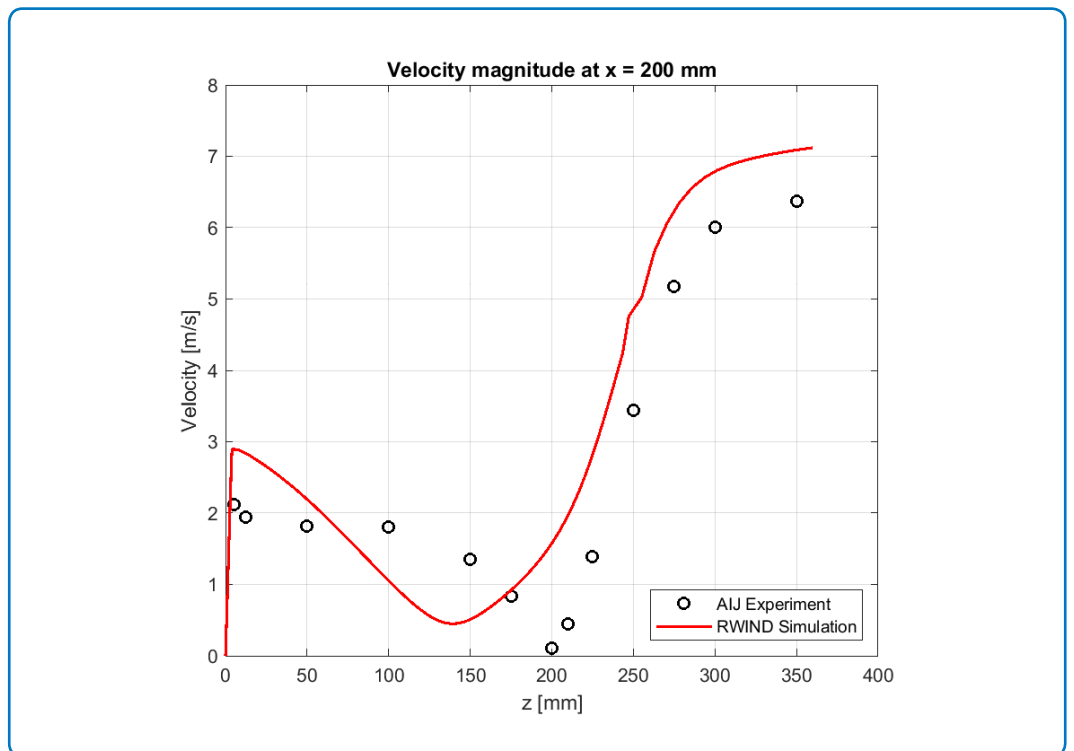


Figure 10: Velocity magnitude comparison at x= 200 mm, vertical section

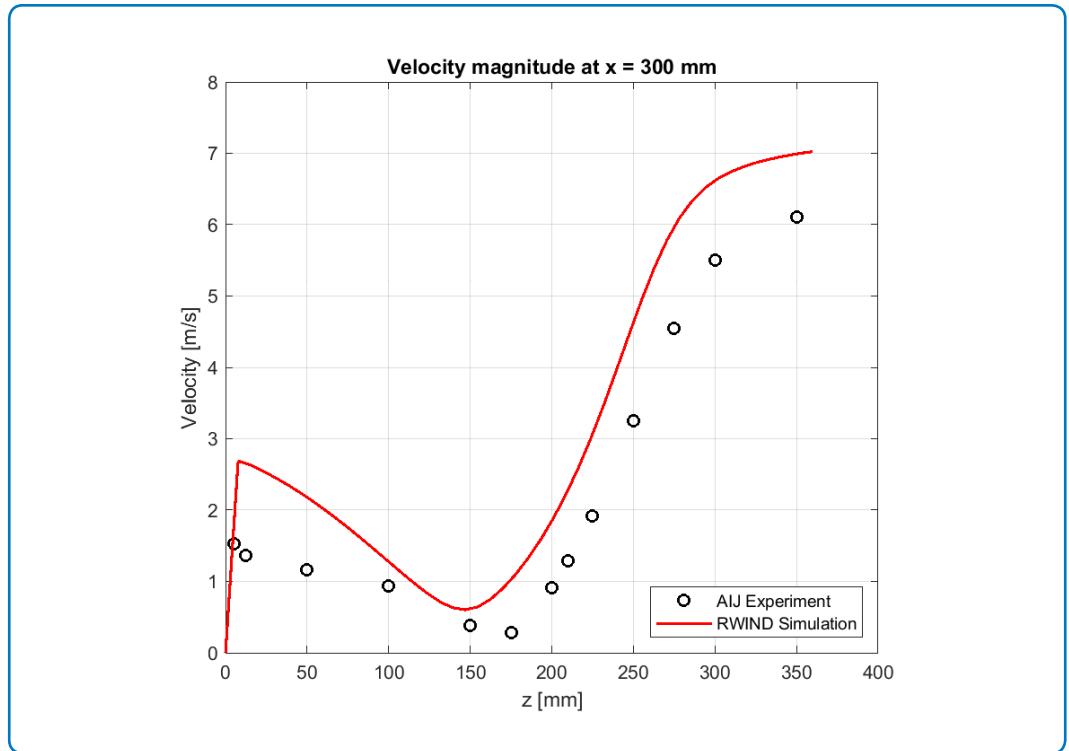


Figure 11: Velocity magnitude comparison at x = 300 mm, vertical section

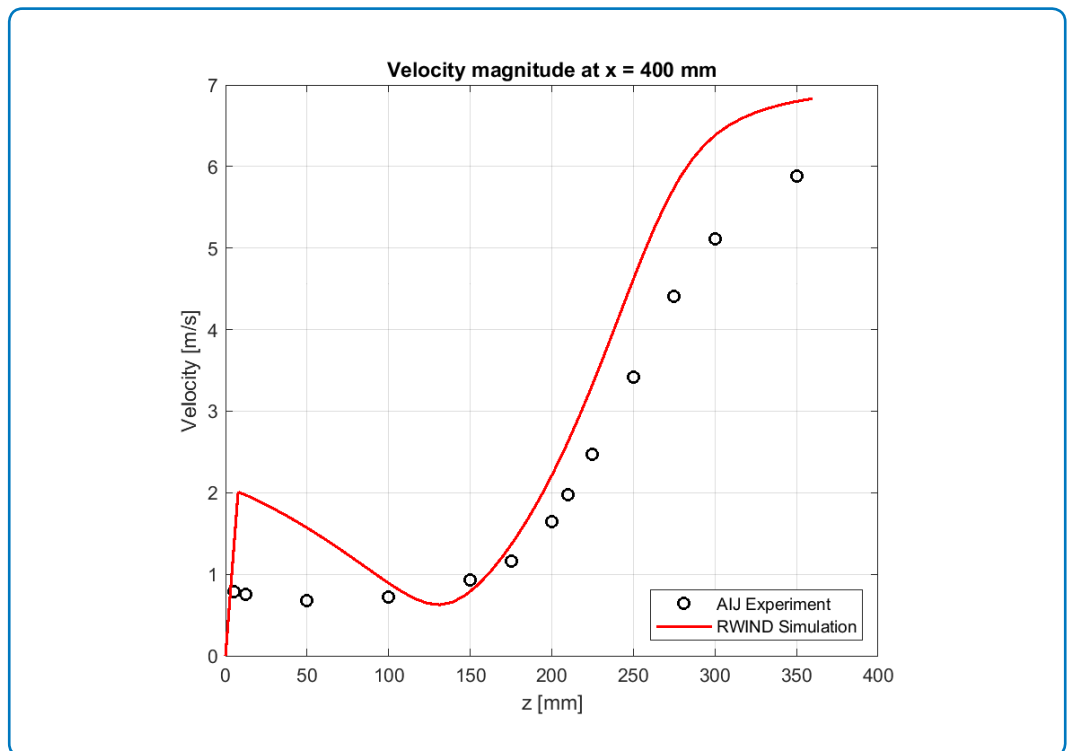


Figure 12: Velocity magnitude comparison at x = 400 mm, vertical section

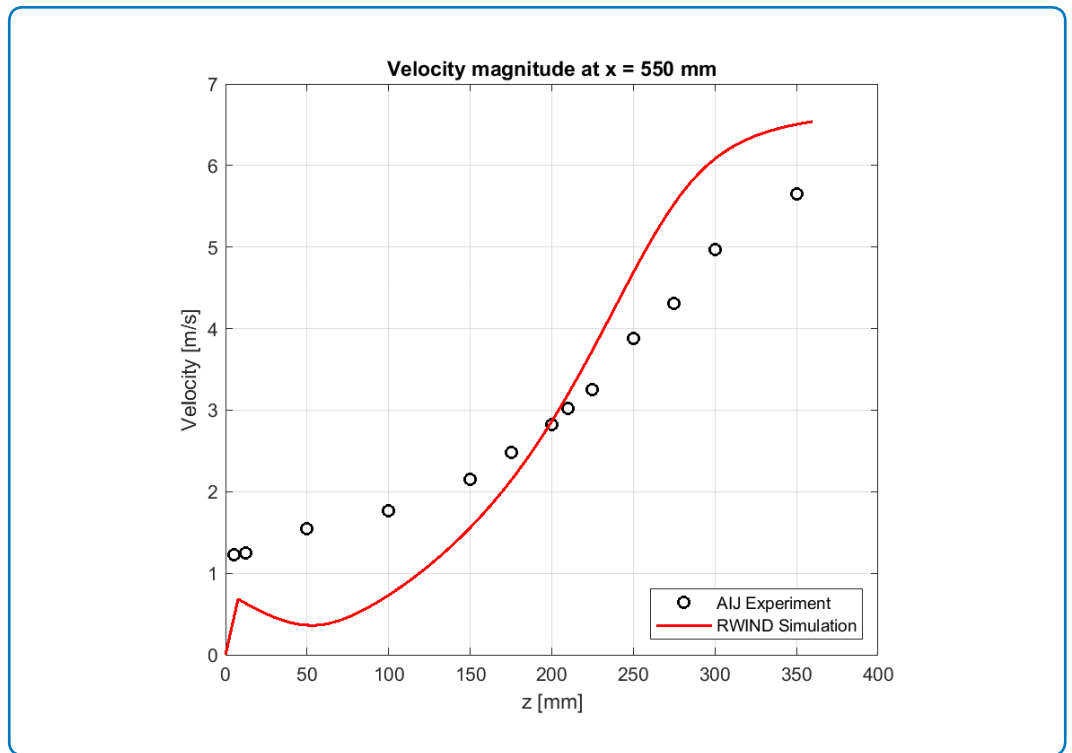


Figure 13: Velocity magnitude comparison at x = 550 mm, vertical section

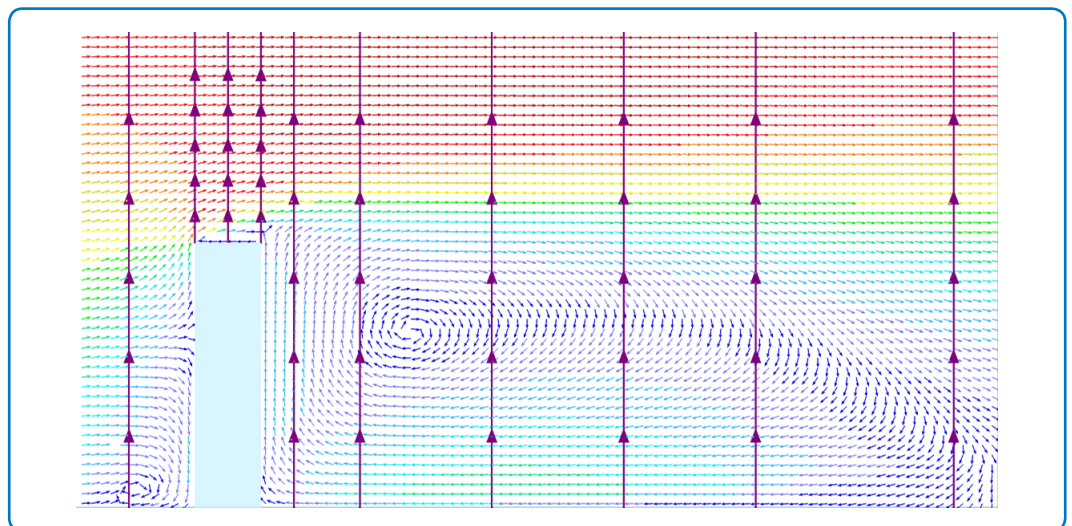


Figure 14: RWIND Simulation – Velocity vector field, line probes placement

References

- [1] https://www.aij.or.jp/jpn/publish/cfdguide/index_e.htm, *Guidebook for practical applications of cfd to pedestrian wind environment around buildings*