Verification Example

Program: RFEM 5, RWIND Simulation

Category: Fluid Mechanics

Verification Example: 0304 – A High-Rise Building in City Blocks

0304 – A High-Rise Building in City Blocks

Description

The verification example describes the steady-state flow around a high-rise building in city blocks (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 3**.

Fluid Properties	Kinematic Viscosity	ν	1.5×10^{-5}	m^2/s
	Density	ρ	1.250	kg/m^3
Geometry	Given by means of CAD model			

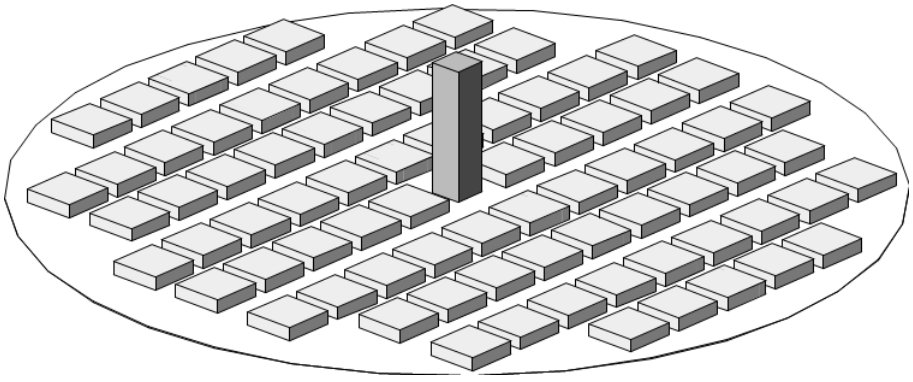

Figure 1: Problem sketch, [1]

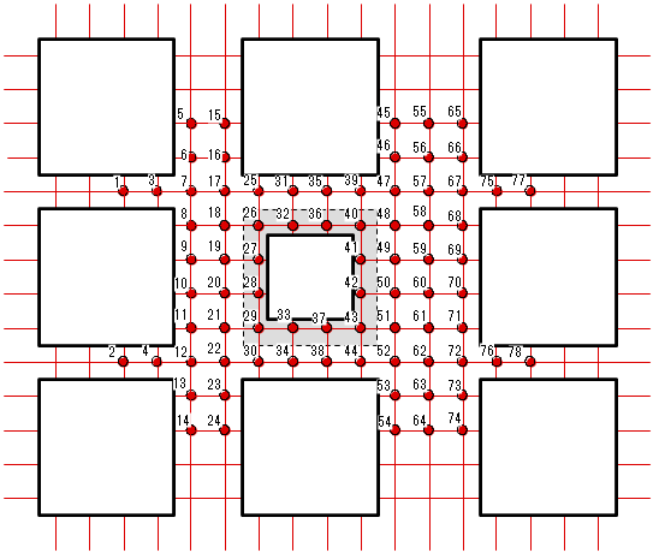

Figure 2: Measuring points, [1]

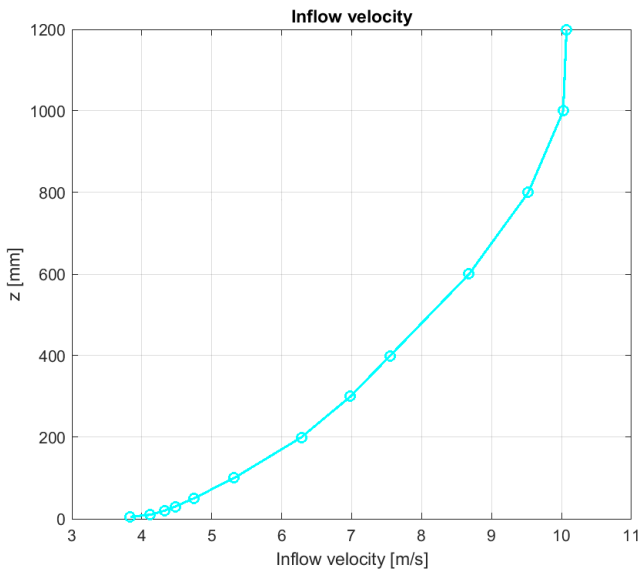

Figure 3: Inflow velocity

RWIND Simulation Settings

- Modeled in RWIND Simulation 1.25
- Model of turbulence: k-ε

Results

Structure Files	Program
0304.01	RWIND Simulation

RWIND Simulation results (red color in graphs) are compared with measured data given by AIJ. The measurement was carried out by means of two types of probes – split fibre probe (black color in graphs) and thermintor anemometer (blue color in graphs). Following graphs present result comparison in selected line probes. All the measured points are located in the horizontal section at height $z = 5$ mm.

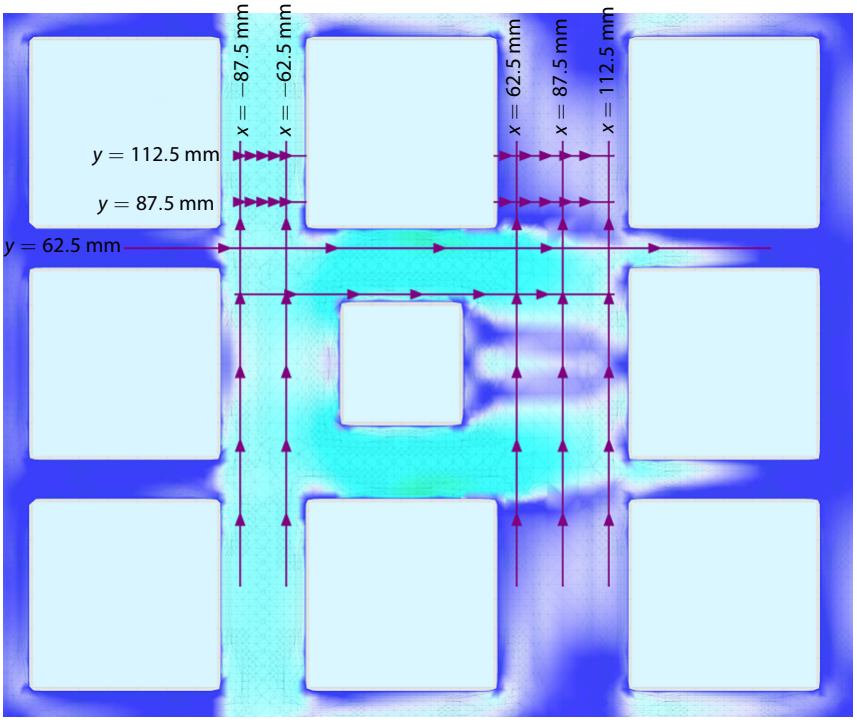

Figure 4: RWIND Simulation – Velocity field in horizontal section $z = 5$ mm, line probes placement

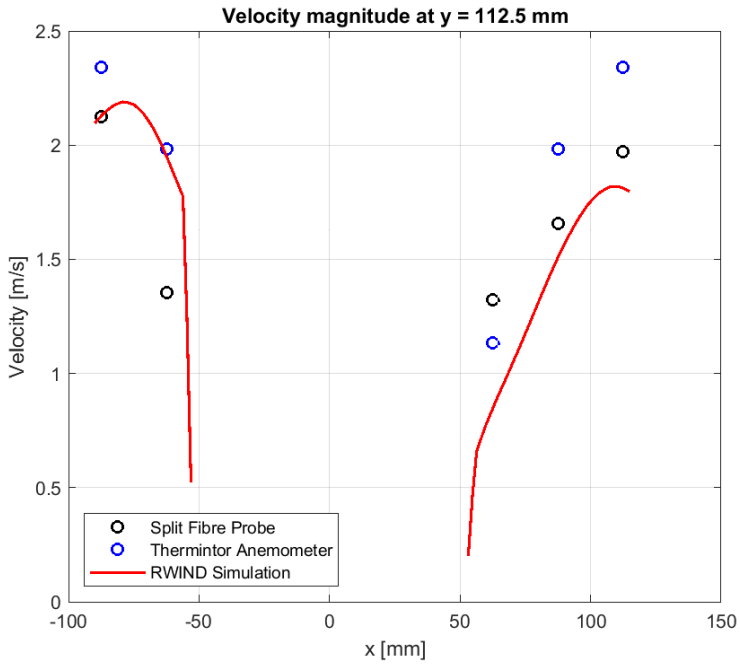

Figure 5: Velocity magnitude comparison at y = 112.5 mm, horizontal section

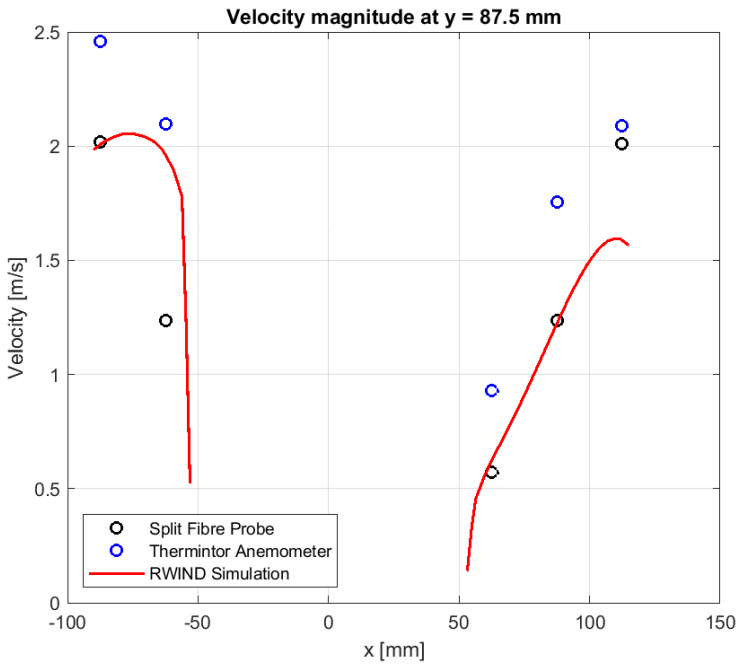

Figure 6: Velocity magnitude comparison at y = 87.5 mm, horizontal section

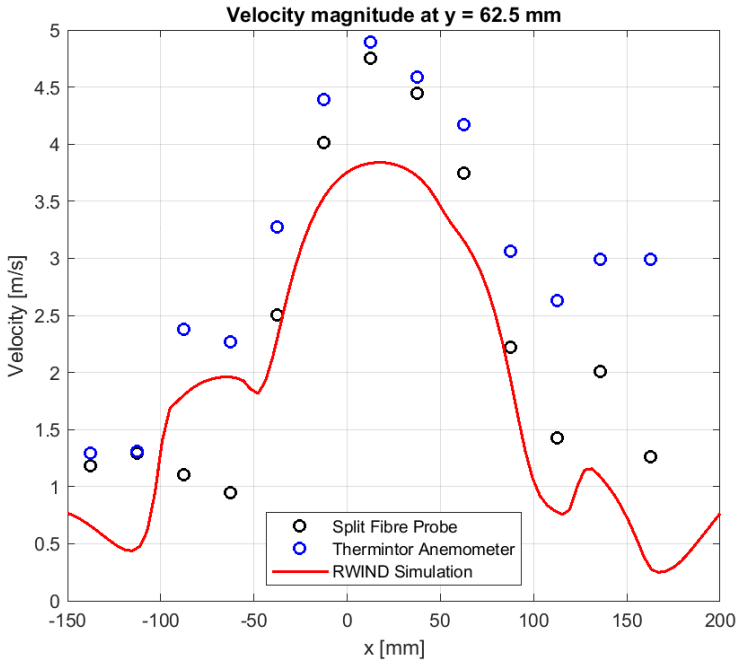

Figure 7: Velocity magnitude comparison at y = 62.5 mm, horizontal section

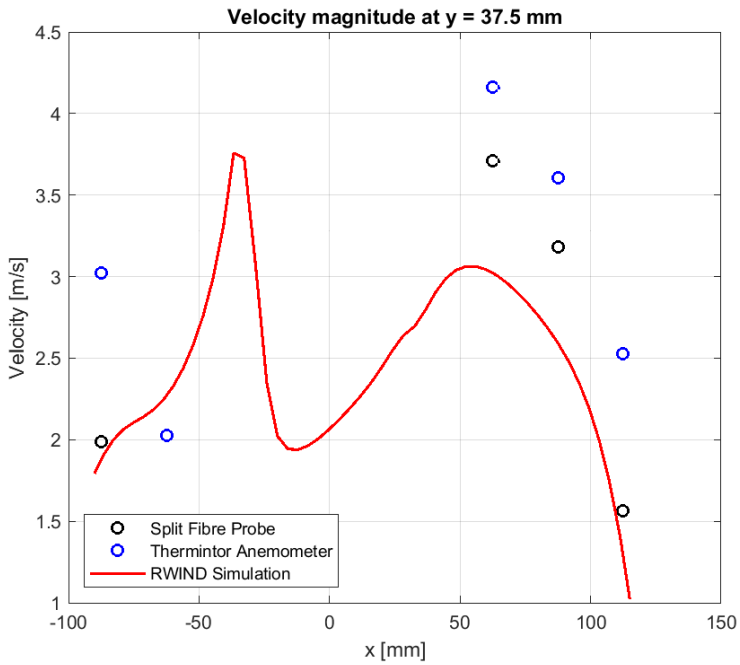

Figure 8: Velocity magnitude comparison at y = 37.5 mm, horizontal section

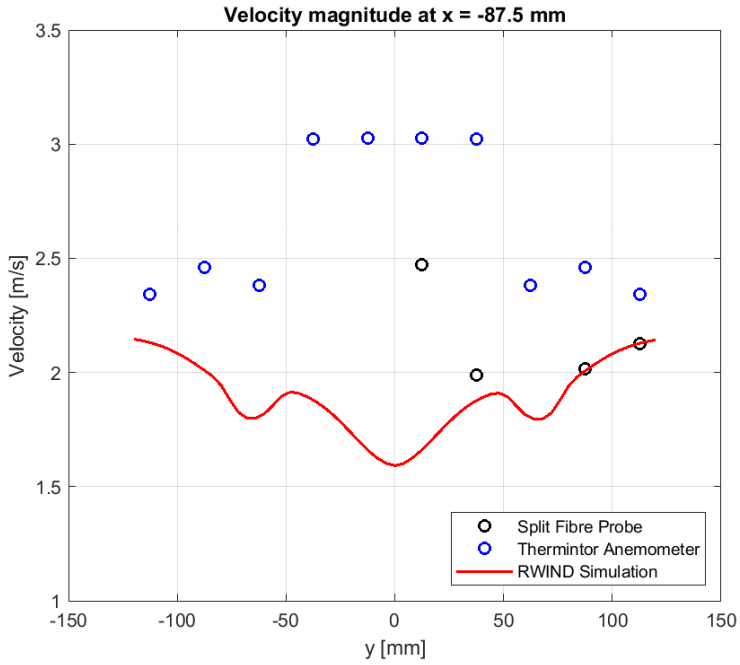

Figure 9: Velocity magnitude comparison at x = -87.5 mm, horizontal section

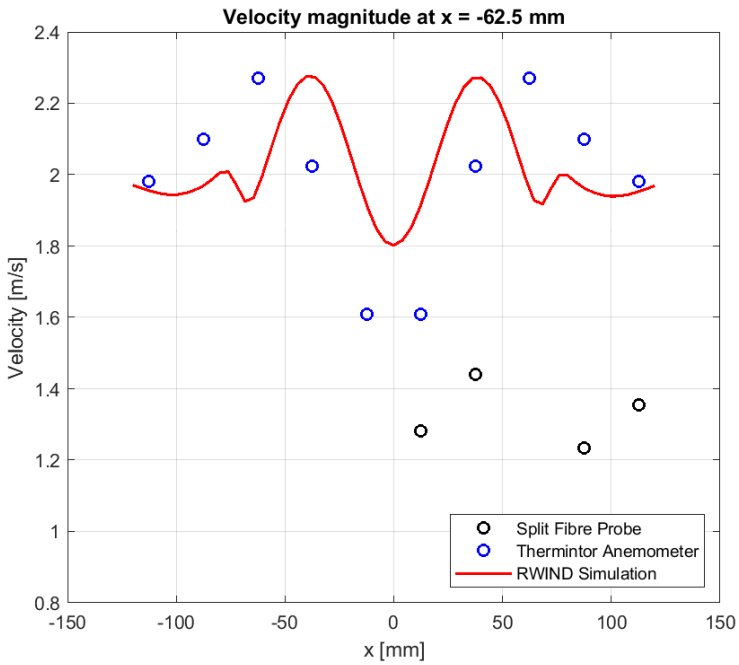

Figure 10: Velocity magnitude comparison at x = -62.5 mm, horizontal section

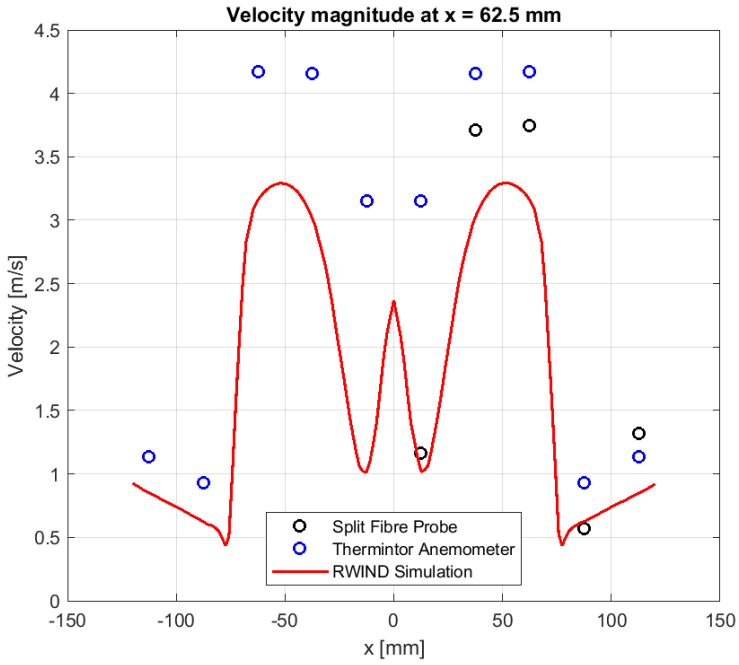

Figure 11: Velocity magnitude comparison at x = 62.5 mm, horizontal section

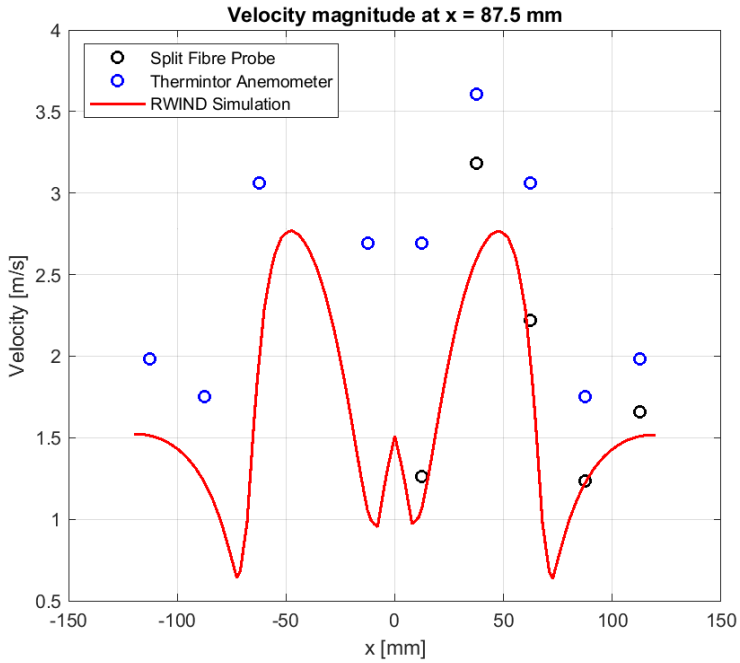

Figure 12: Velocity magnitude comparison at x = 87.5 mm, horizontal section

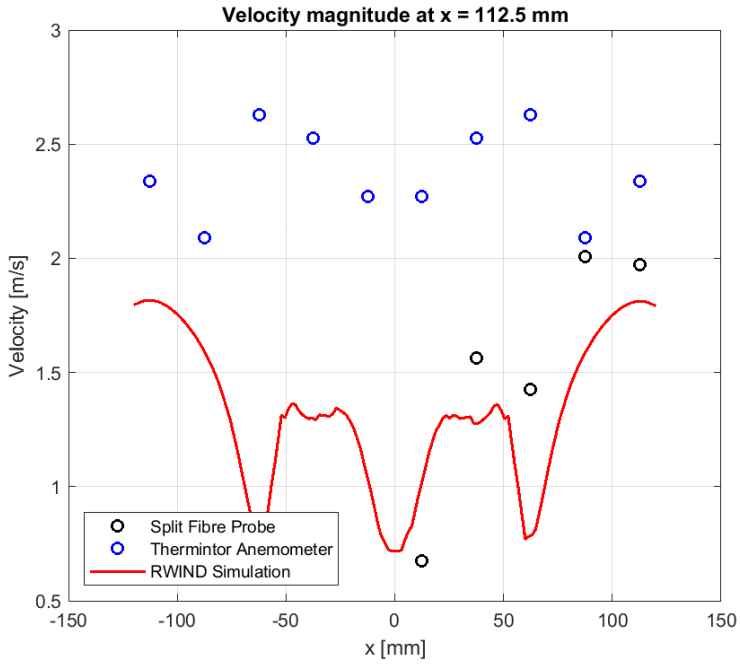

Figure 13: Velocity magnitude comparison at x = 112.5 mm, horizontal section

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*