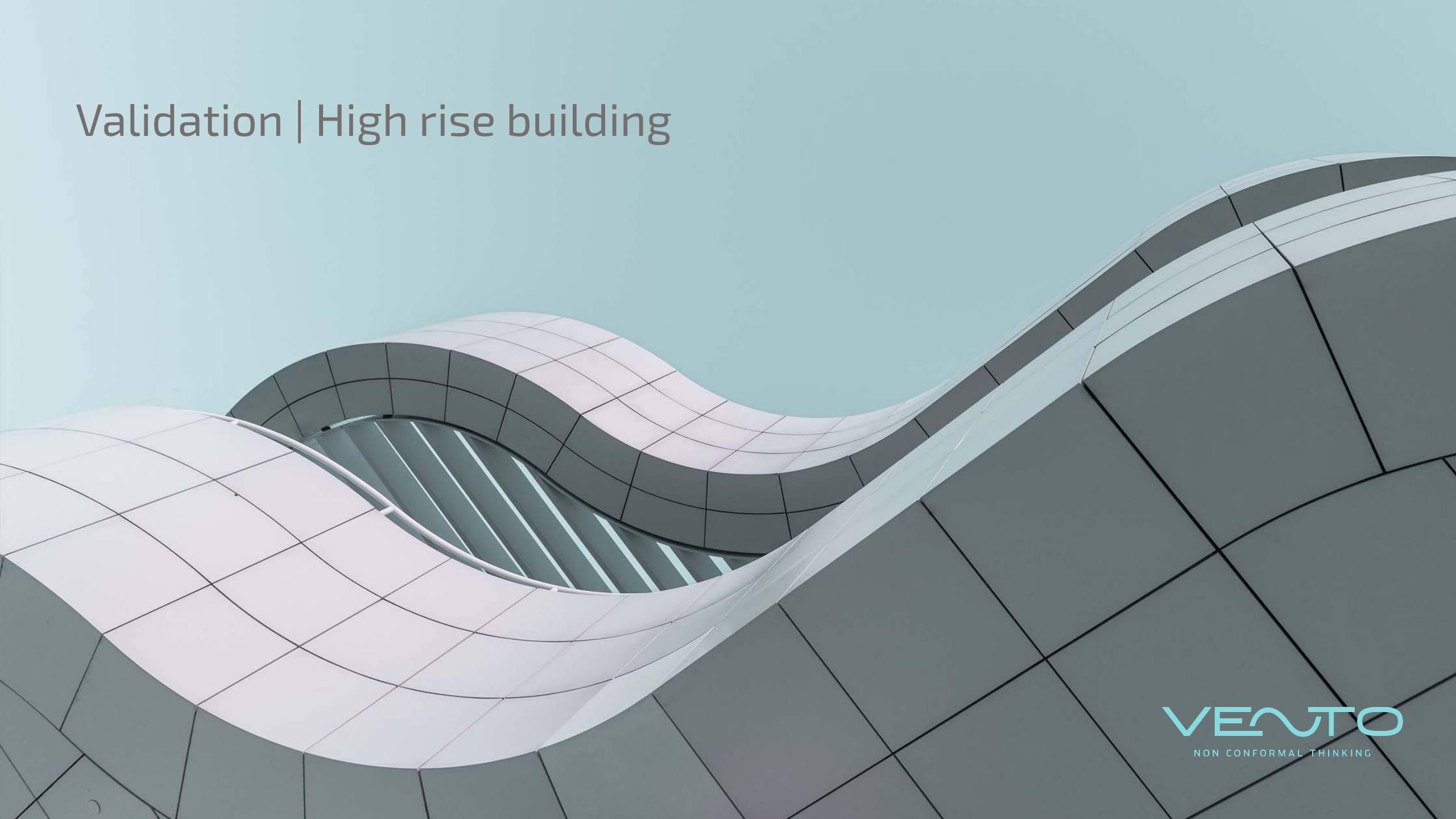
# VENTO

NON CONFORMAL THINKING

Innovative CFD for the built environment

# Validation | High rise building

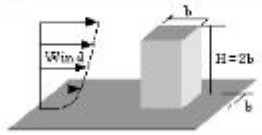


VENTO
NON CONFORMAL THINKING

# Case A: high-rise building

Guidebook for CFD Predictions
of Urban Wind Environment

Architectural Institute of Japan

| | test case | | dataset |
|---|---|---|---|
| A | 1:1:2 shape building model |  | Data file : CaseA(1_1_2).xls |



ELSEVIER

Journal of Wind Engineering
and Industrial Aerodynamics 96 (2008) 1749–1761

JOURNAL OF wind engineering AND industrial aerodynamics

www.elsevier.com/locate/jweia

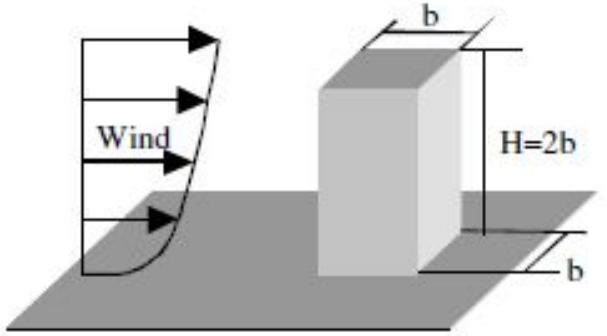
## AIJ guidelines for practical applications of CFD to pedestrian wind environment around buildings

Yoshihide Tominaga[a,*], Akashi Mochida[b], Ryuichiro Yoshie[c], Hiroto Kataoka[d], Tsuyoshi Nozu[e], Masaru Yoshikawa[f], Taichi Shirasawa[c]

[a]*Niigata Institute of Technology, Fujihashi 1719, Kashiwazaki-City, Niigata, Japan*
[b]*Tohoku University, Aoba 06, Aramaki, Aoba-ku, Sendai-City, Miyagi, Japan*
[c]*Tokyo Polytechnic University, Iiyama 1583, Atsugi-City, Kanagawa, Japan*
[d]*Technical Research Institute, Obayashi Corporation, Shimokiyoto 4-640, Kiyose-City, Tokyo, Japan*
[e]*Institute of Technology, Shimizu Corporation, Echujima 3-4-17, Koto-ku, Tokyo, Japan*
[f]*Technology Center, Taisei Corporation, Nasecho 344-1, Totsuka-ku, Yokohama, Japan*

Available online 15 April 2008

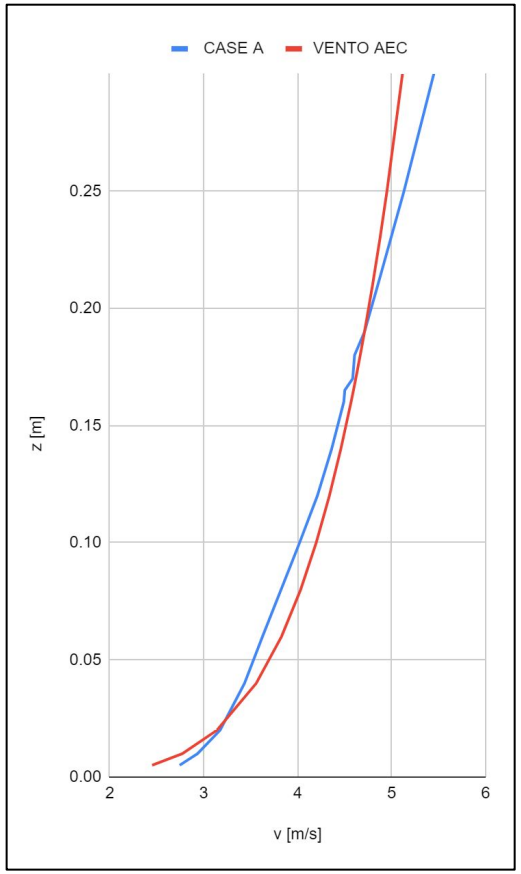
# Case A: high-rise building

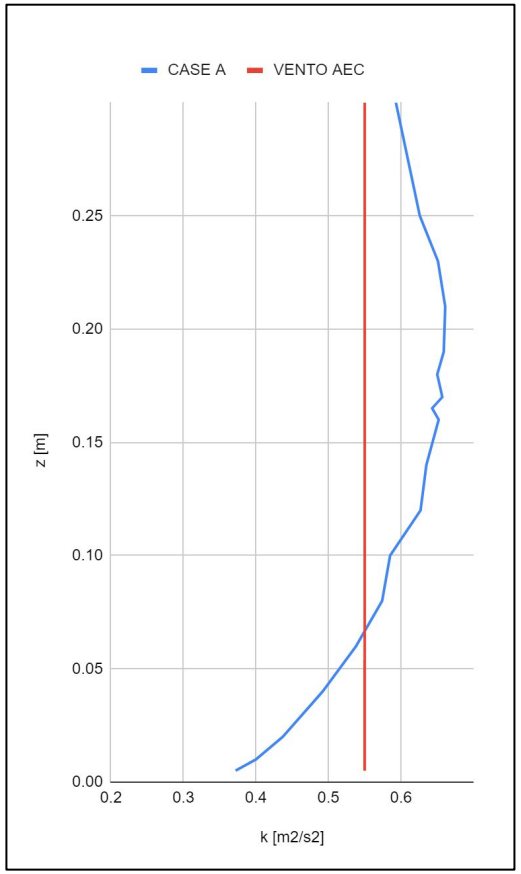



Wind velocities were measured at 66 points distributed across 10 vertical lines intersecting the building symmetrically and parallel to the flow, and at 60 points along two sets of 9 horizontal lines perpendicular to the flow, at two heights z=0.125b and z=1.25b. The length b is equal to 0.08m.

Velocity and turbulence profiles as a function of height are provided. In Vento AEC, a Power law inlet wind profile will be assigned, while the inlet turbulence profile assigned as a constant value, set to 0.55 $m^2/s^2$, corresponding to 12% turbulence intensity.

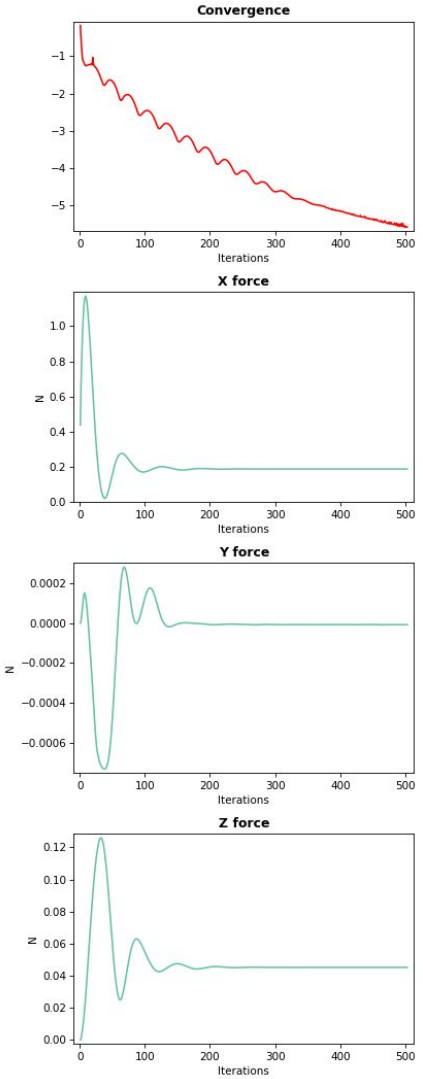
The simulation was performed using the k-epsilon (RANS) turbulence model, following the guidance of the reference paper.



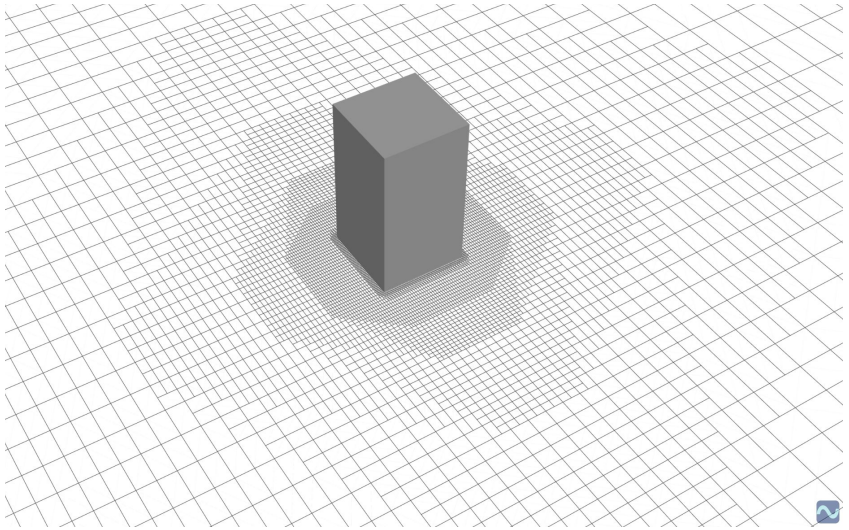
# Case A: high-rise building

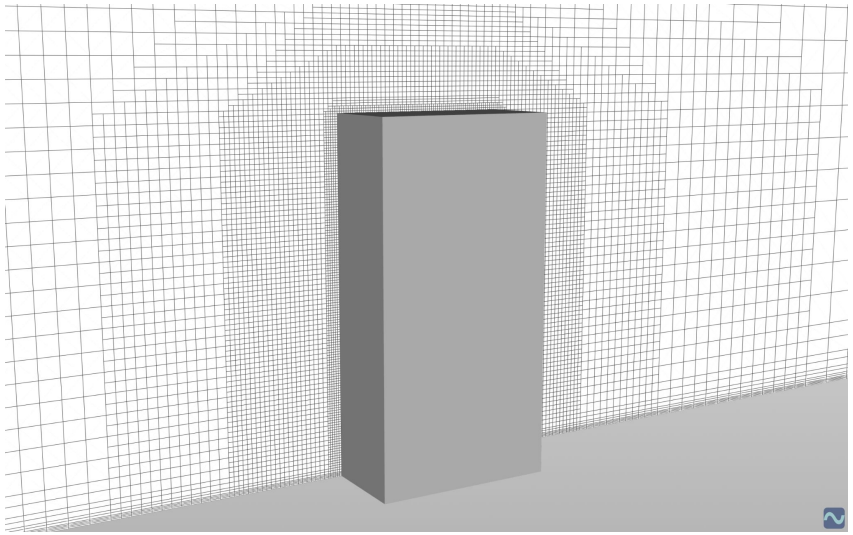
## VENTO AEC CFD simulation




**VENTO AEC**: 570 K cells, K & Epsilon turbulence model.

The convergence level -5 was reached in less than 30 min on a 2-cores desktop with CFL=100. Forces were stable after 15 min.

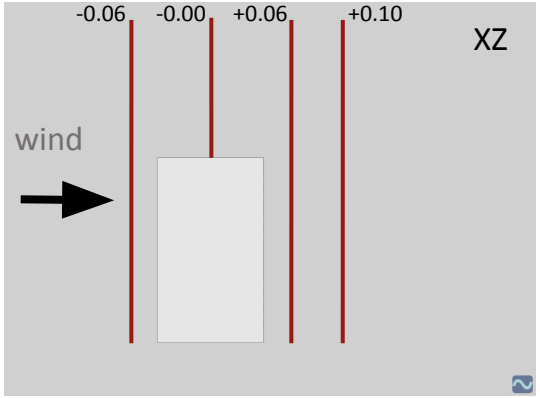




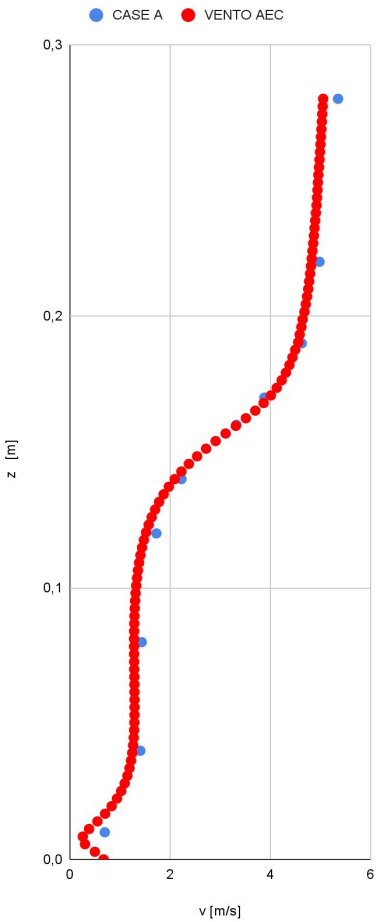
# Case A: high-rise building

## VENTO AEC results vs reference

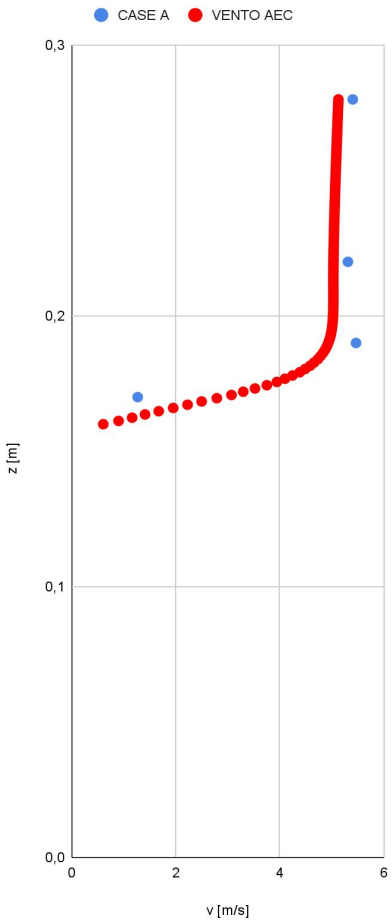
Vertical sections @ y=0



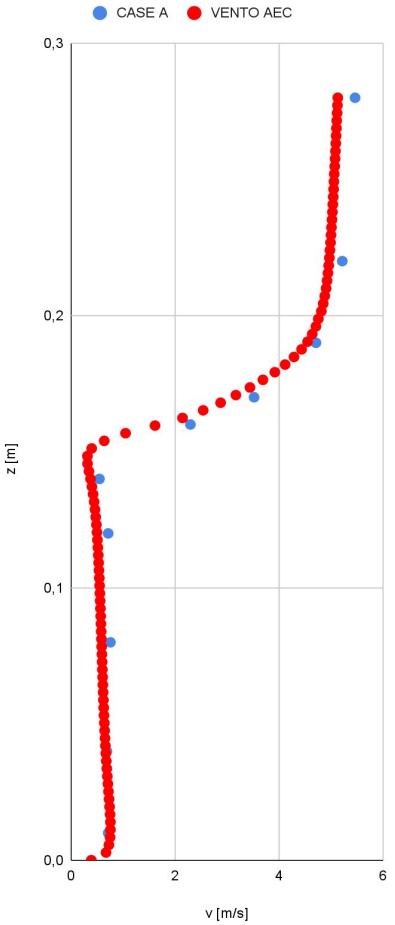

Velocity magnitude distribution on the vertical sections: VENTO AEC (red dots), and wind tunnel (blue dots)



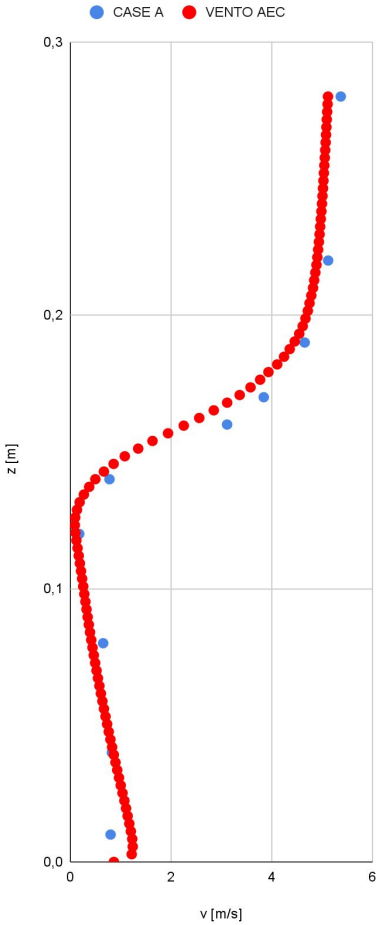

Ver. Sect. x=-0.06m




Ver. Sect. x= 0.00m




Ver. Sect. x= 0.06m

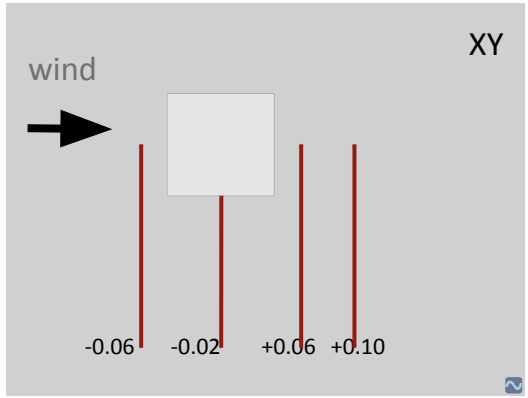



Ver. Sect. x= 0.10m

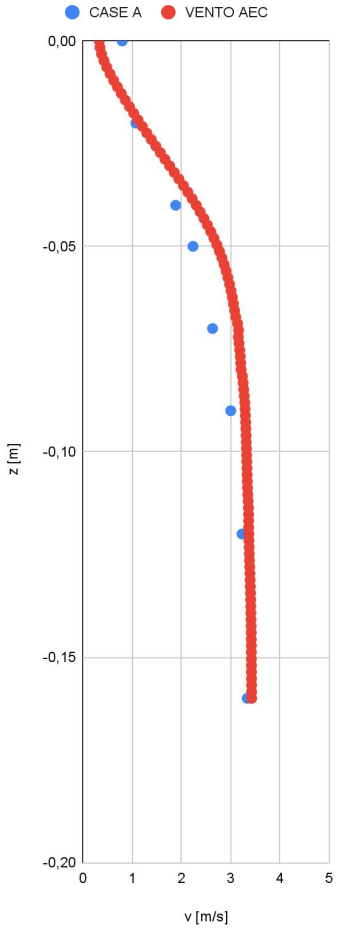
# Case A: high-rise building

## VENTO AEC results vs reference

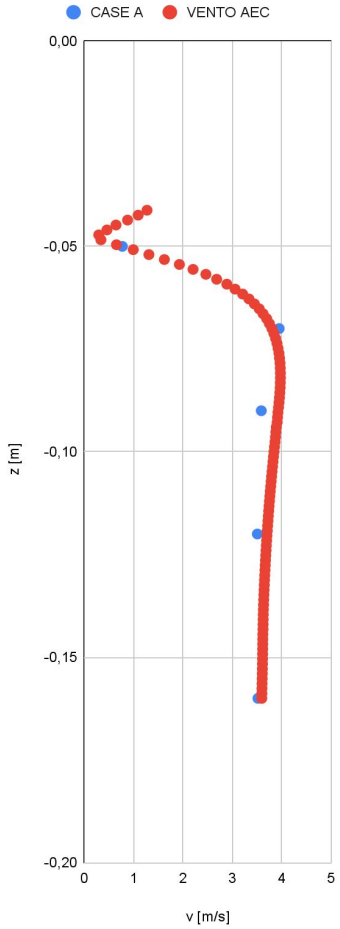
Horizontal sections z=0.01m



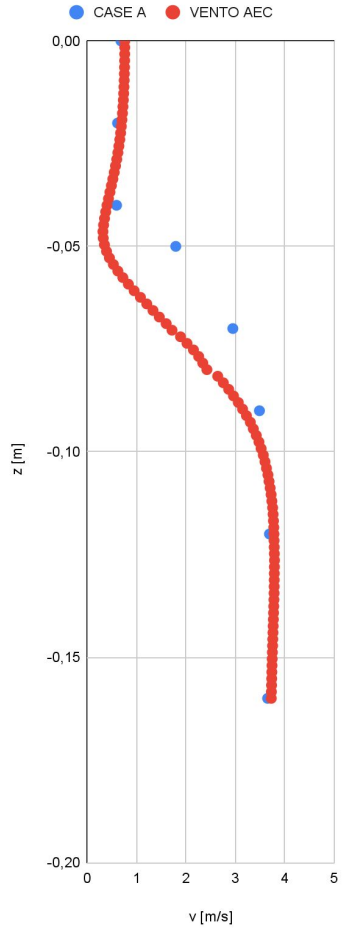

Velocity magnitude distribution on the horizontal sections at z=0.01m: VENTO AEC (red dots), and wind tunnel (blue dots)



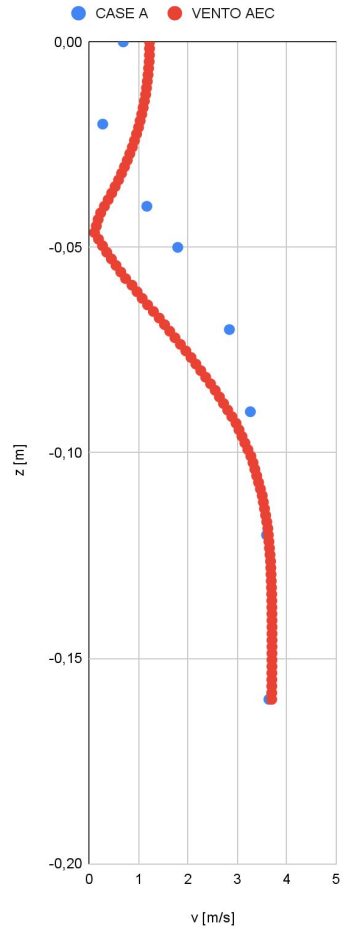

Ver. Sect. x=-0.06m




Ver. Sect. x= -0.02m




Ver. Sect. x= 0.06m

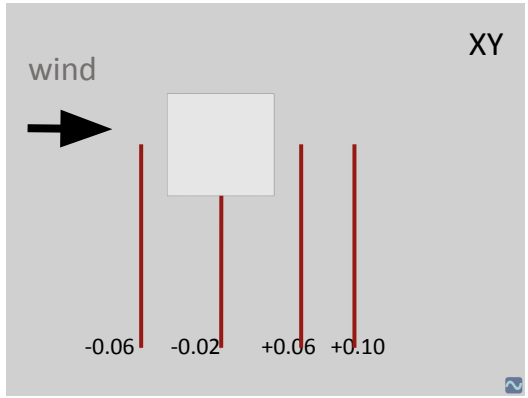



Ver. Sect. x= 0.10m

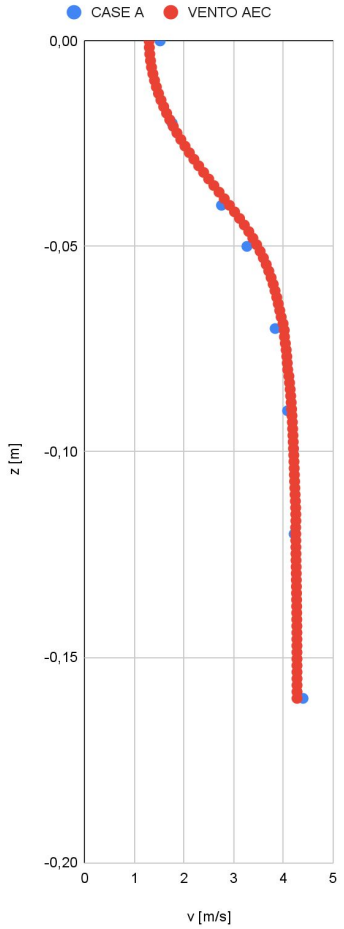
# Case A: high-rise building

## VENTO AEC results vs reference

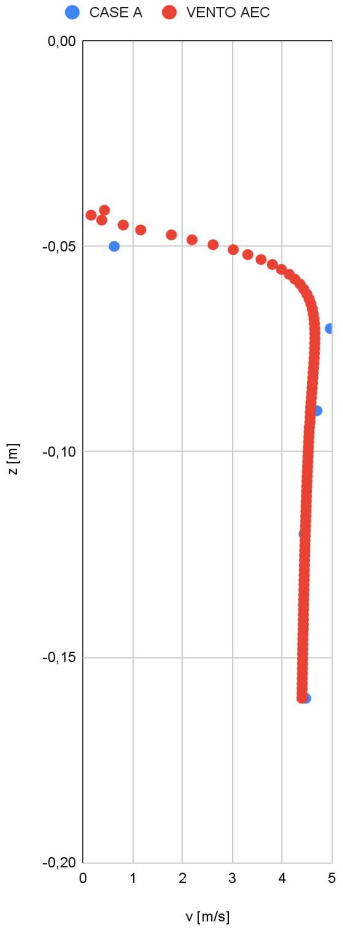
Horizontal sections z=0.09m



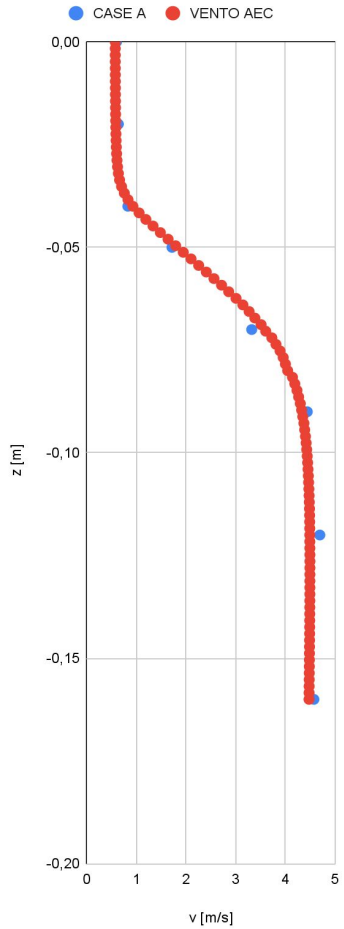

Velocity magnitude distribution on the horizontal sections at z=0.09m: VENTO AEC (red dots), and wind tunnel (blue dots)



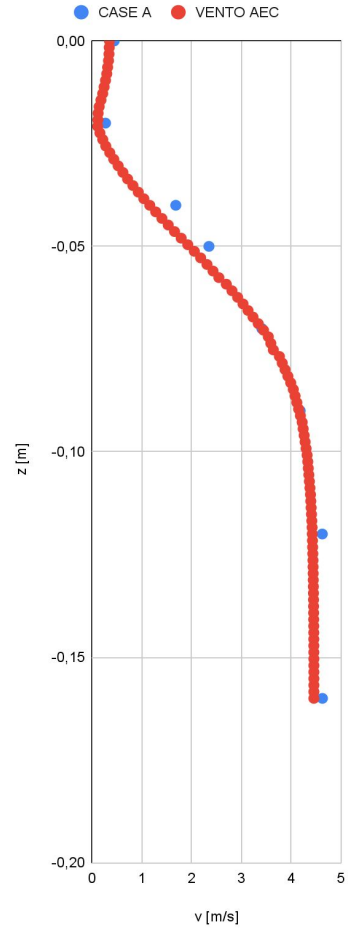

Ver. Sect. x=-0.06m




Ver. Sect. x= -0.02m




Ver. Sect. x= 0.06m




Ver. Sect. x= 0.10m

VENTO
NON CONFORMAL THINKING