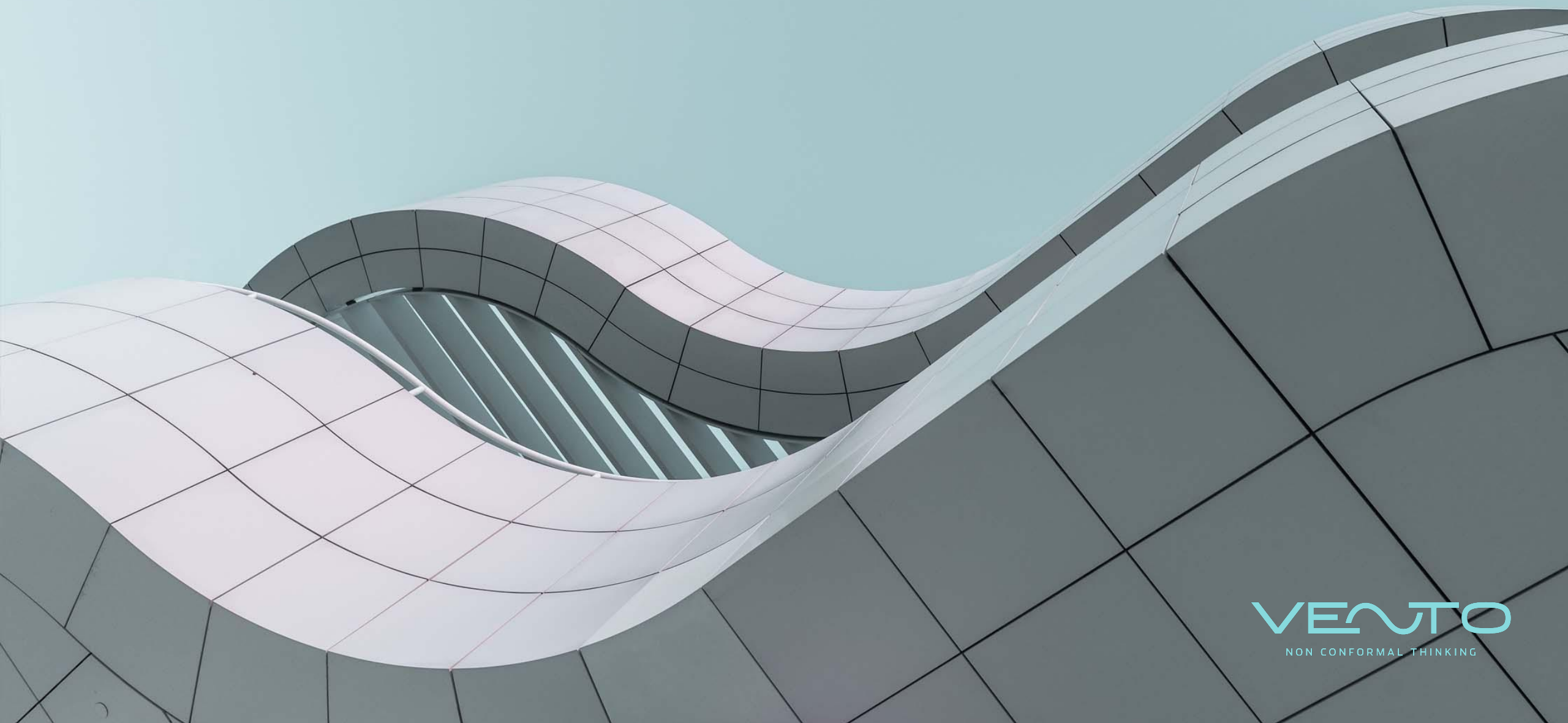
VENTO

NON CONFORMAL THINKING

Innovative CFD for the built environment

Validation | Surface pressure coefficients on a Low-Rise Building with Eaves



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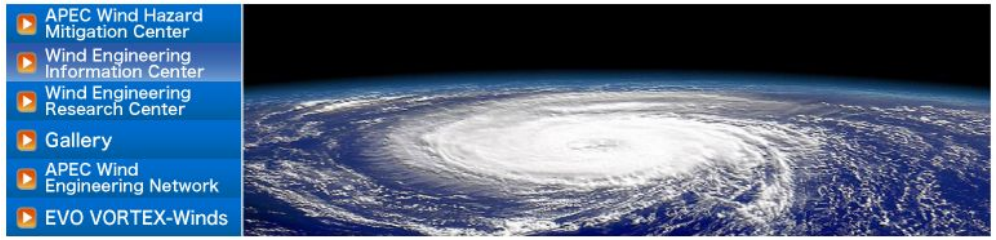
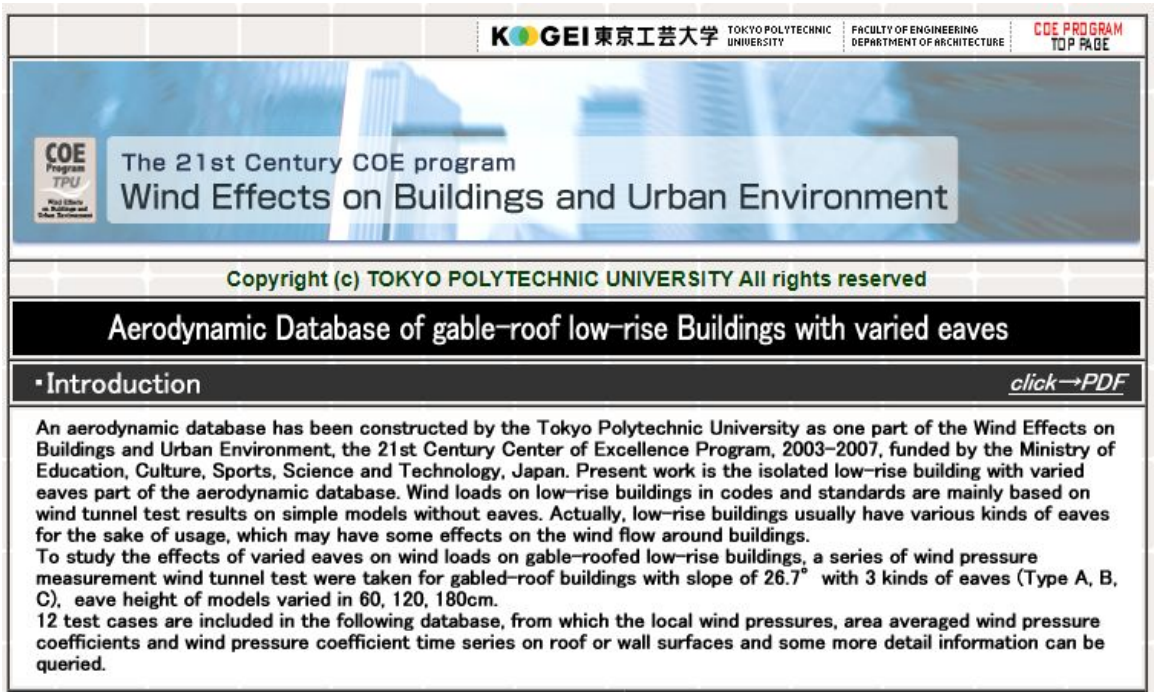
Wind Engineering Information Center

TPU Aerodynamic Database



Database of Isolated Low-Rise Building With Eaves:
A collection of data on aerodynamic pressures acting on low-rising building with eaves.



Isolated Low-Rise Building with Eaves

Contours of local wind pressure coefficients were measured for all the surfaces of a low-rise building with gable eaves and side eaves (Type C). The test model case used has:

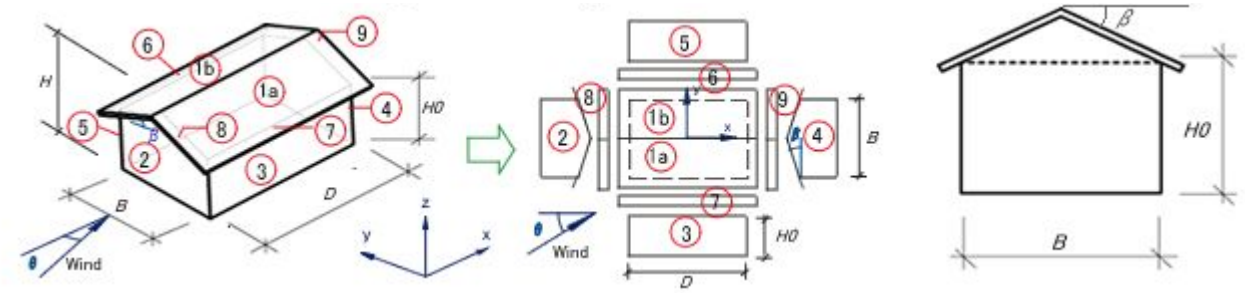
Breadth/Depth/H0=(160/240/120)mm and β=26.7°

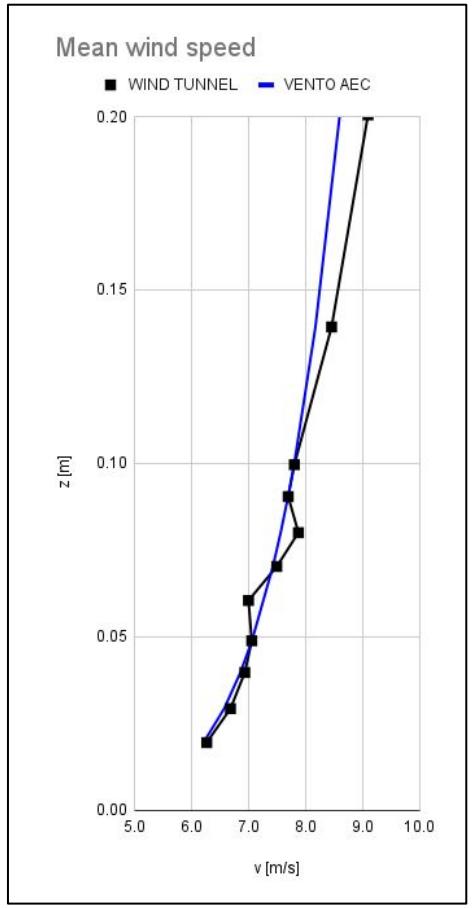
Two wind directions are considered: θ=0° and 68°.

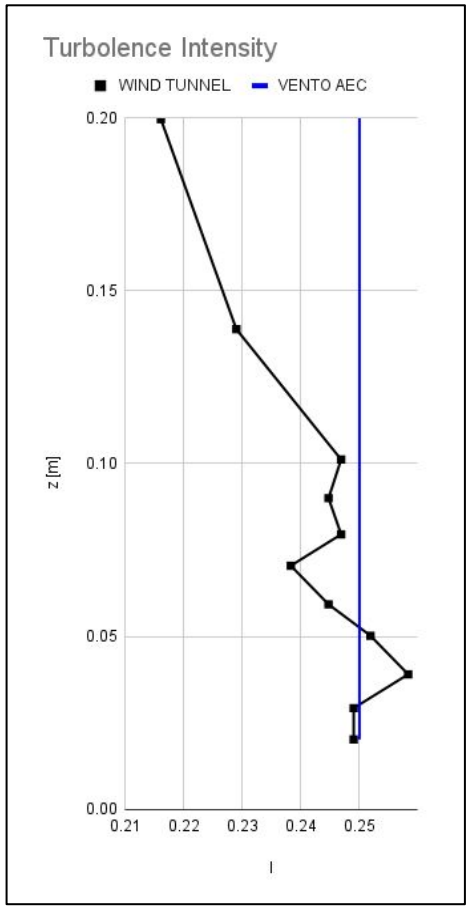
Velocity and turbulence density (intensity) profiles as a function of height are provided. In Vento AEC, a Power law inlet wind profile was assigned, while the inlet turbulence intensity was set constant to 25%.

The simulation was performed using the k-epsilon (RANS) turbulence model.

Note: Some information from the TPU aerodynamic database is not entirely clear, for instance the reference speed for non-dimensionalization and the scales used to report the pressure coefficients (Cp). For this reason, specific choices were made in the conducted simulations.



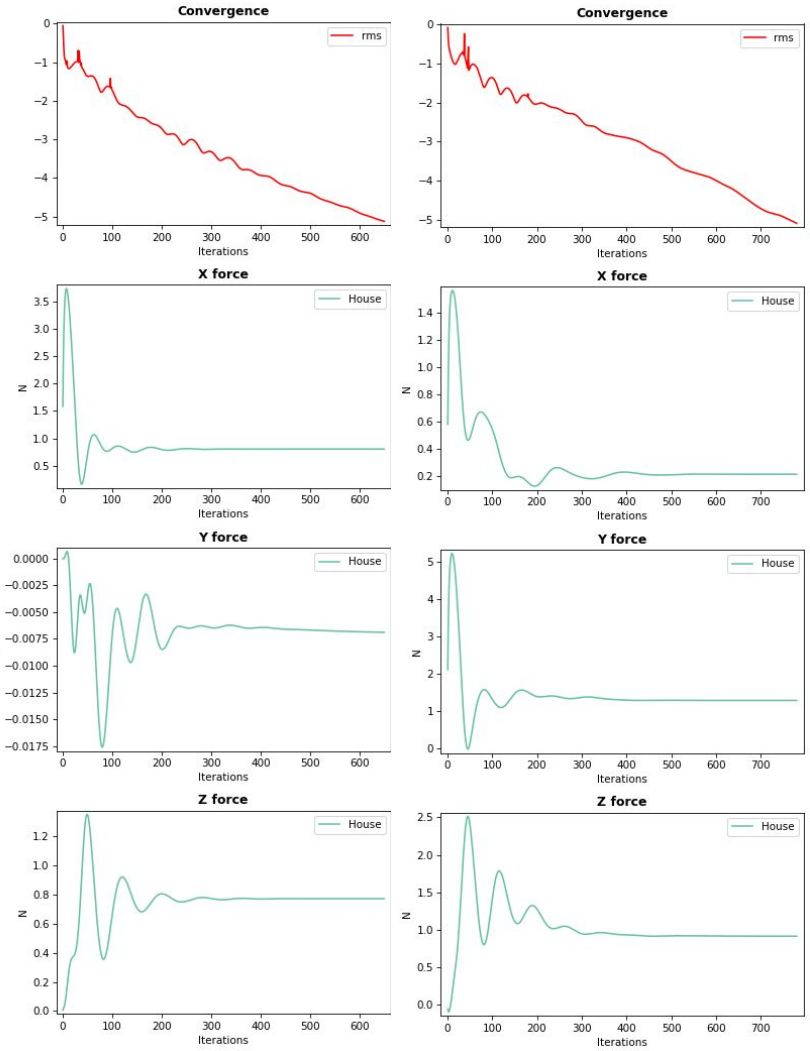




Isolated Low-Rise Building with Eaves

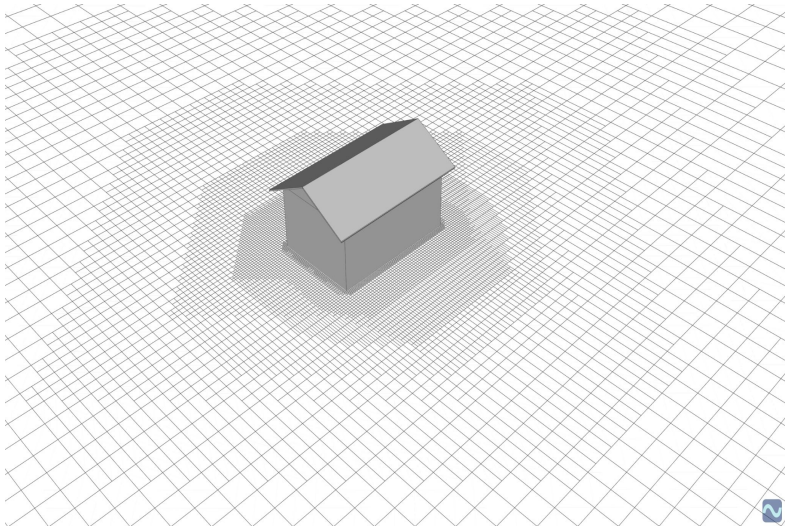
VENTO AEC CFD simulation

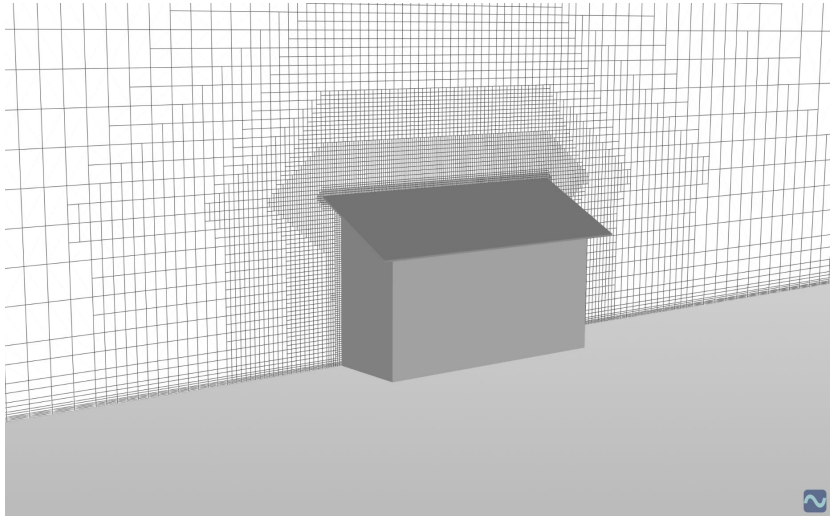
Wind direction θ=0° | **Wind direction θ=68°**



VENTO AEC: 800 K cells, K & Epsilon turbulence model.

The convergence level -5 was reached in less than 30 min on a 4-cores desktop with CFL=50. Forces were stable after 15 min.

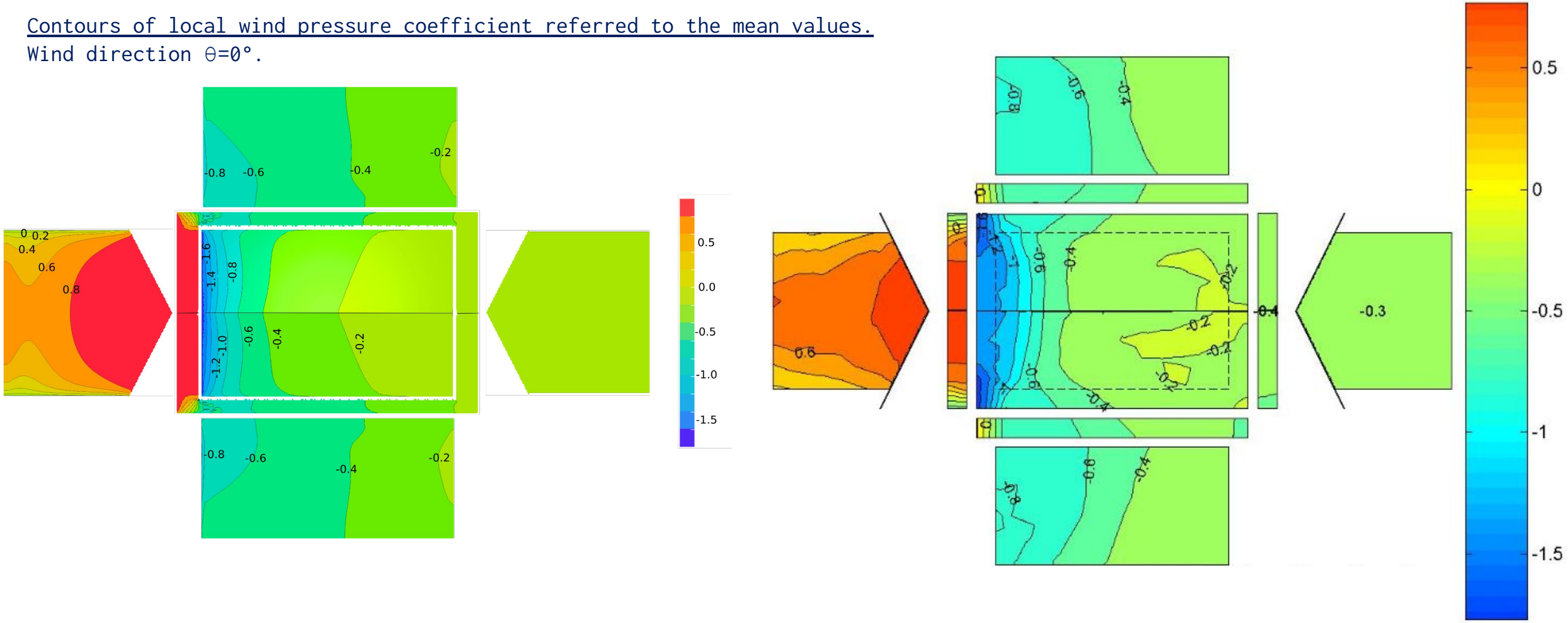




Isolated Low-Rise Building with Eaves

VENTO AEC results vs reference

Contours of local wind pressure coefficient referred to the mean values.
Wind direction θ=0°.

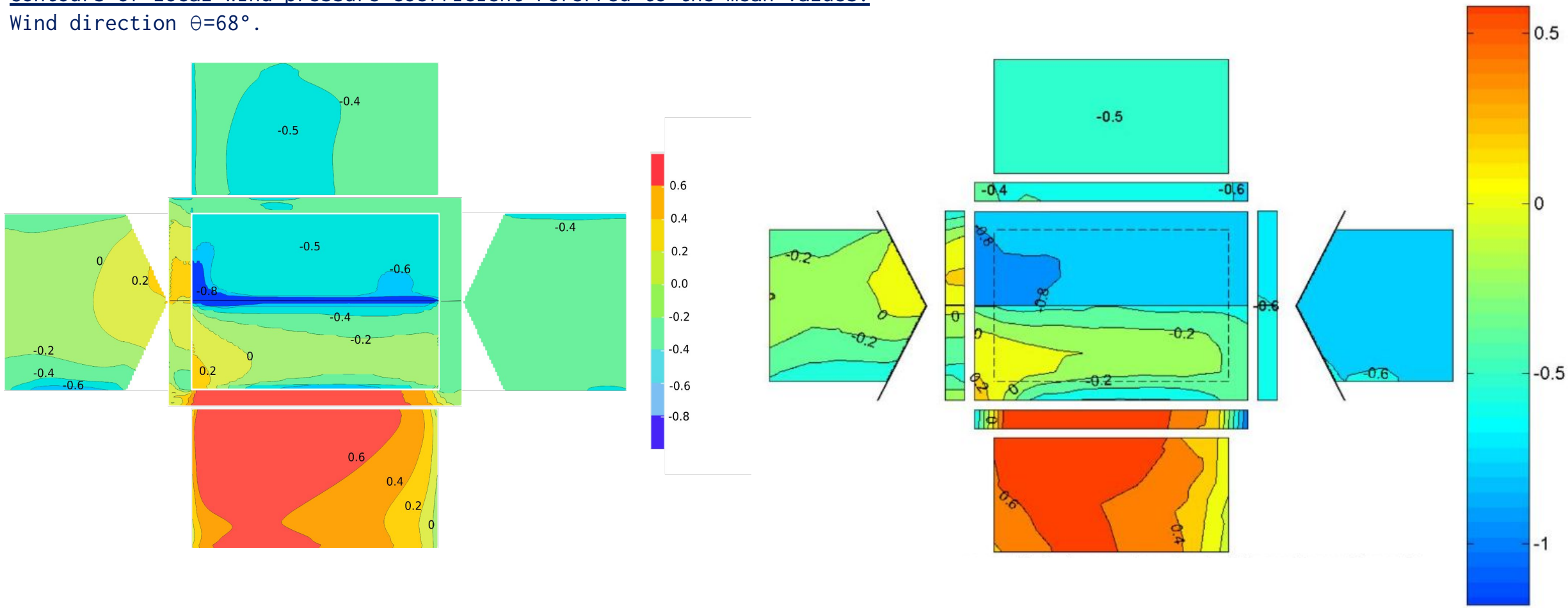


Pressure coefficient is calculated considering the wind pressure of the approaching wind velocity at the average roof height ($0.5\rho V_H^2$, V_H mean longitudinal wind speed at the reference height H, ρ the air density). The scales used for the comparison differ slightly in color shade.

Isolated Low-Rise Building with Eaves

VENTO AEC results vs reference

Contours of local wind pressure coefficient referred to the mean values.
Wind direction θ=68°.



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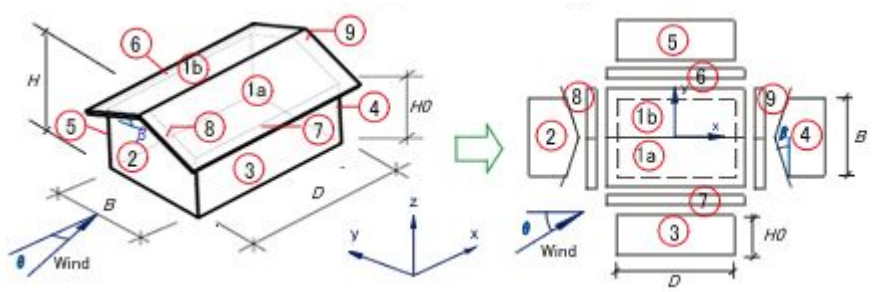
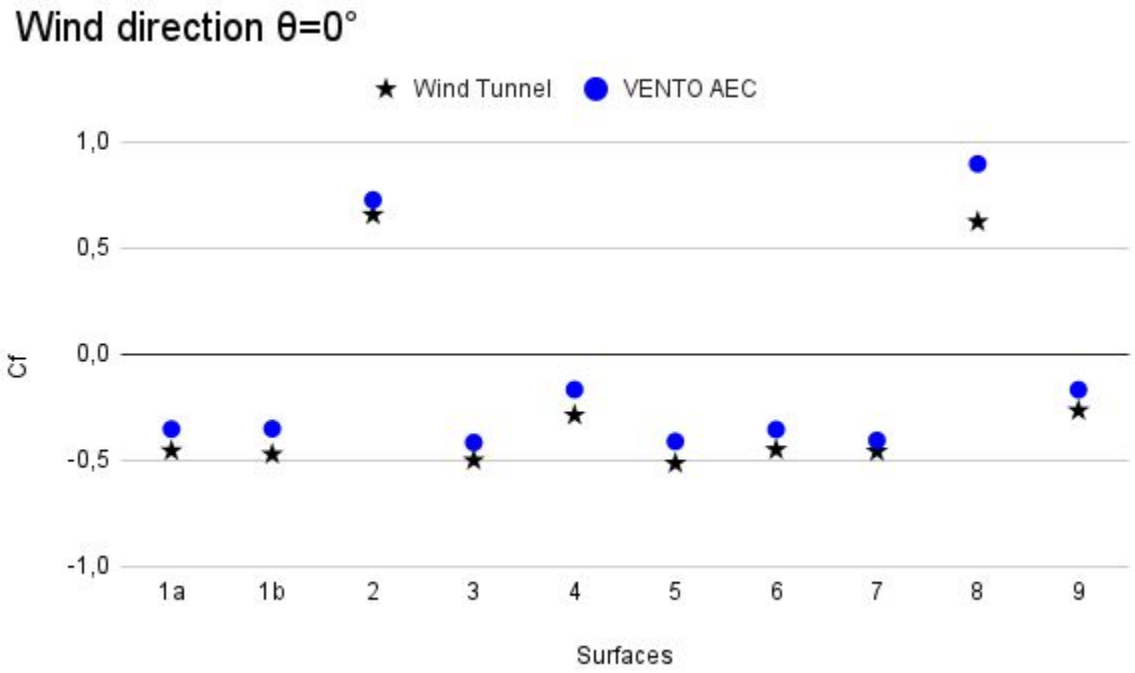
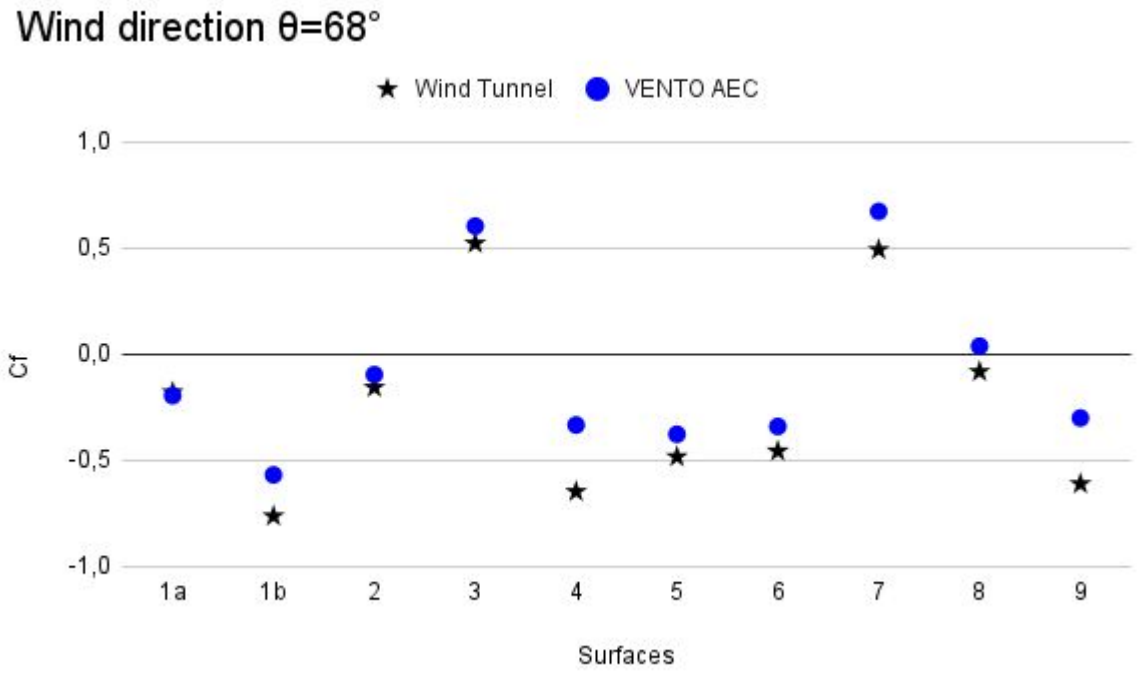
Isolated Low-Rise Building with Eaves

VENTO AEC results vs reference

Area averaged wind pressure coefficients





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