Wind Engineering Joint Usage/Research Center
FY2023 Research Result Report

Research Field: Wind Hazard Mitigation

Research Year: FY2023
Research Number: : 23232002
Research Theme: "Preparation of aero-dynamic data base for tornado induced wind loading on structures"

Representative Researcher: Dr. Sabareesh Geetha Rajasekharan

Budget [FY2023]: 360,000 JPY

*There is no limitation of the number of pages of this report.
*Figures can be included to the report and they can also be colored.
*Submitted reports will be uploaded to the JURC Homepage.

1. Research Aim:

   Prepare an aerodynamic database for tornado-wind indued loading of structure

2. Research Method: Tornado simulator experiments on flat roof and gable roof building models exposed to tornado like flow.

3. Research Result

   The surface pressures, wind pressure coefficients and time histories to see the effects of moving average were computed and results were compiled and arranged to form the aerodynamic database. The detailed figures and deliverables are shown in Section 6

5. Research Group
1. Representative Researcher: Dr Sabareesh Geetha Rajasekharan

2. Collaborate Researchers
1. Prof Masahiro Matsui, TPU, Japan

6. Abstract (half page)

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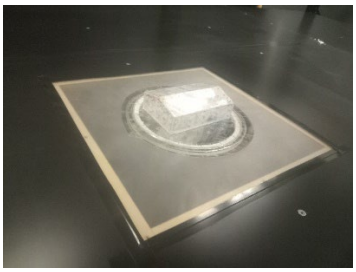
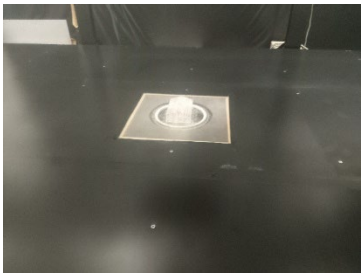
Research Theme: Wind Hazard Mitigation
Representative Researcher (Affiliation)
Summary・Figures



0 deg orientation



90 deg orientation

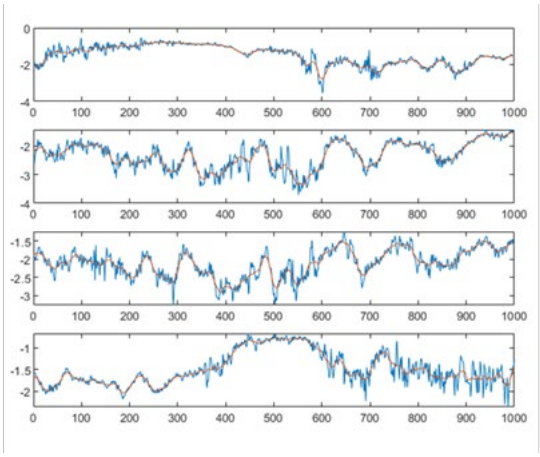
- **Gable Roof Cases**

Total 18 cases
Building Orientation: **0 deg**
Location of building model : x/ rc = 0 to 3
Translating Velocity =0 (Stationary Tornado)

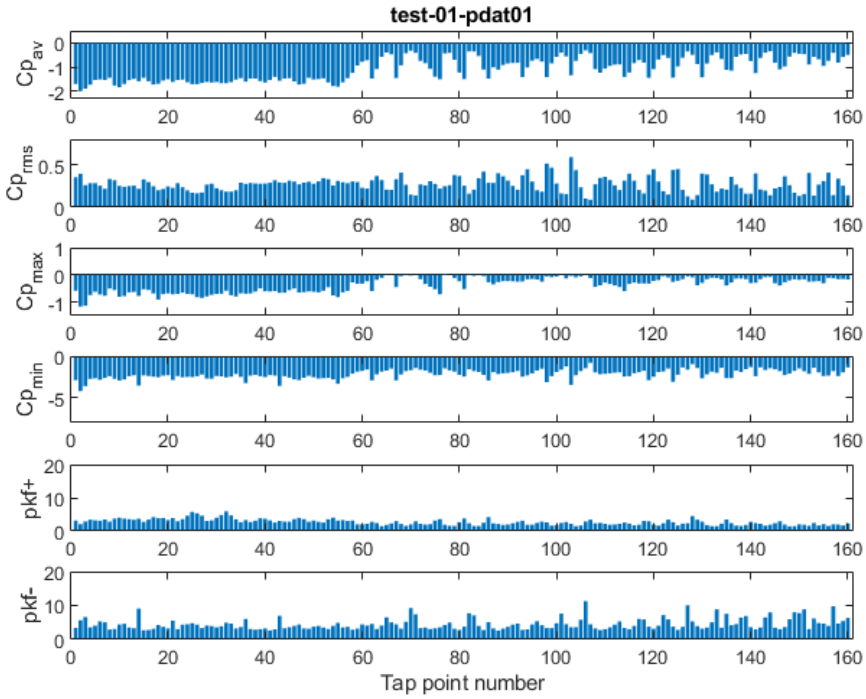
Aerodynamic Database

Building Type	Orientation	Translation Velocity (mm/sec)	Location with respect to tornado vortex										
			$x/r_c = 0$	$x/r_c = 0.1$	$x/r_c = 0.2$	$x/r_c = 0.3$	$x/r_c = 0.4$	$x/r_c = 0.5$	$x/r_c = 0.6$	$x/r_c = 0.7$	$x/r_c = 0.8$	$x/r_c = 0.9$	$x/r_c = 2$
Gable Roof	0 deg	0	●	●	●	●	●	●	●	●	●	●	●
		50	●										
		100	●										
		150	●										
		200	●										
		250	●										

Two typical cases of gable roof buildings and their associated pressure coefficient (statistical) values and its time histories are shown. The same is included in the aerodynamic database for tornado induced wind loading.



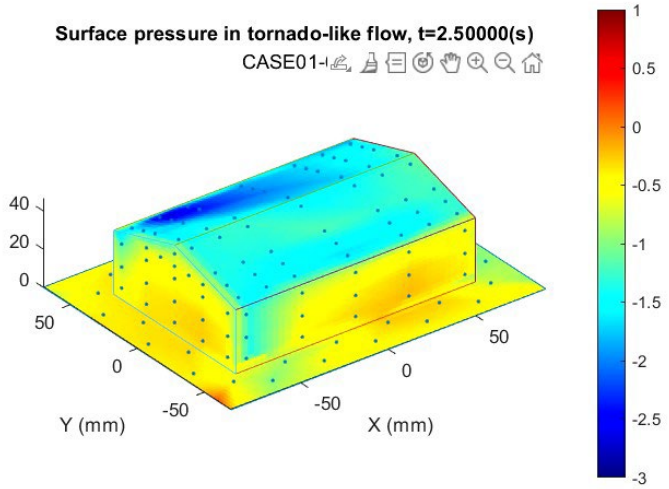
Time histories to see the effects of moving average

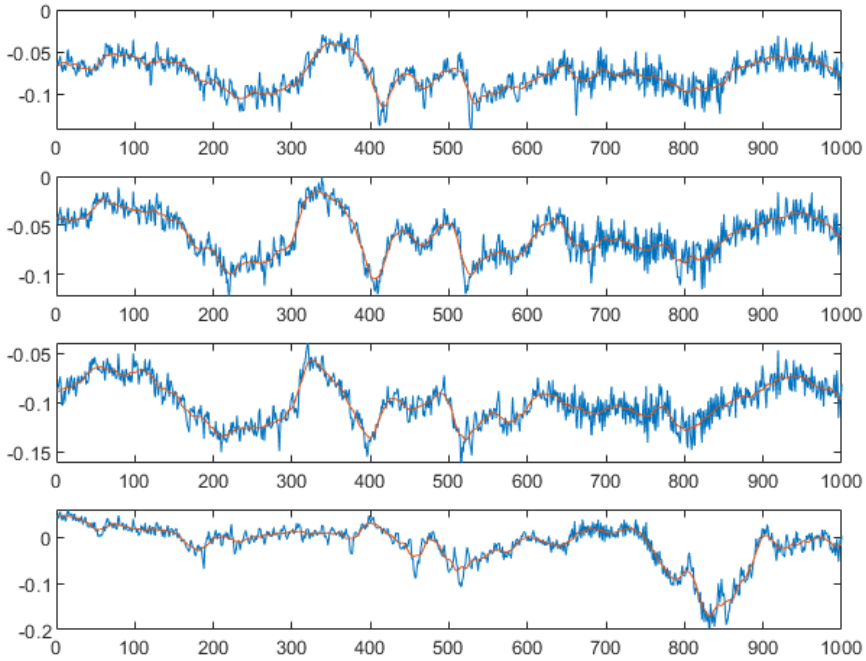


Wind Pressure Coefficient (average, rms, maximum, minimum, and peak factor (positive, negative)) for each pressure measurement point.

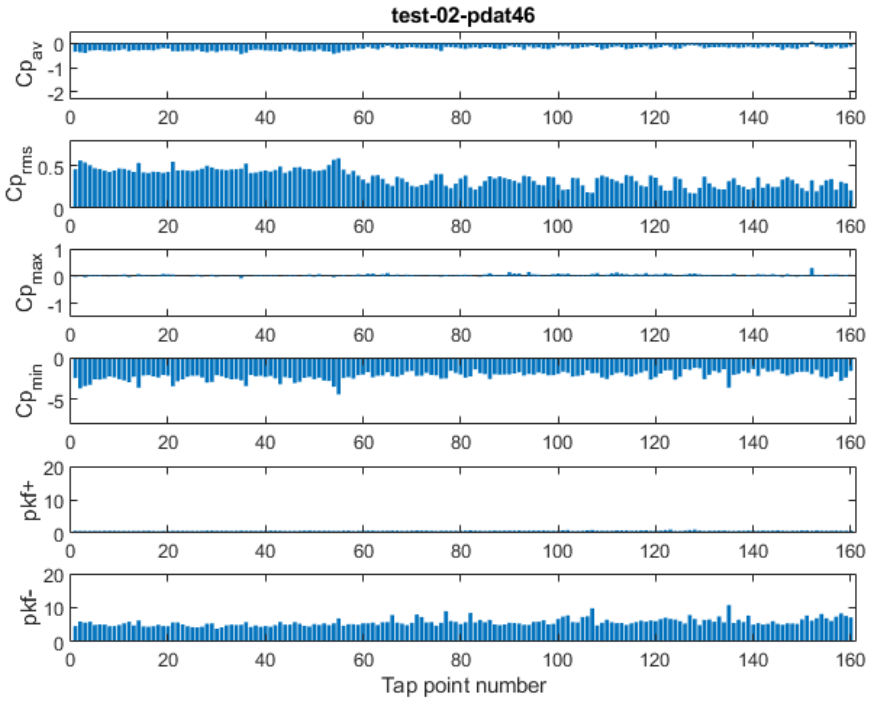
Surface Pressure on Gable Roof Model

Building Orientation: 0 deg
Location of Model : x/ r_c= 0
Translating Velocity : 0 mm/sec





Time histories to see the effects of moving average



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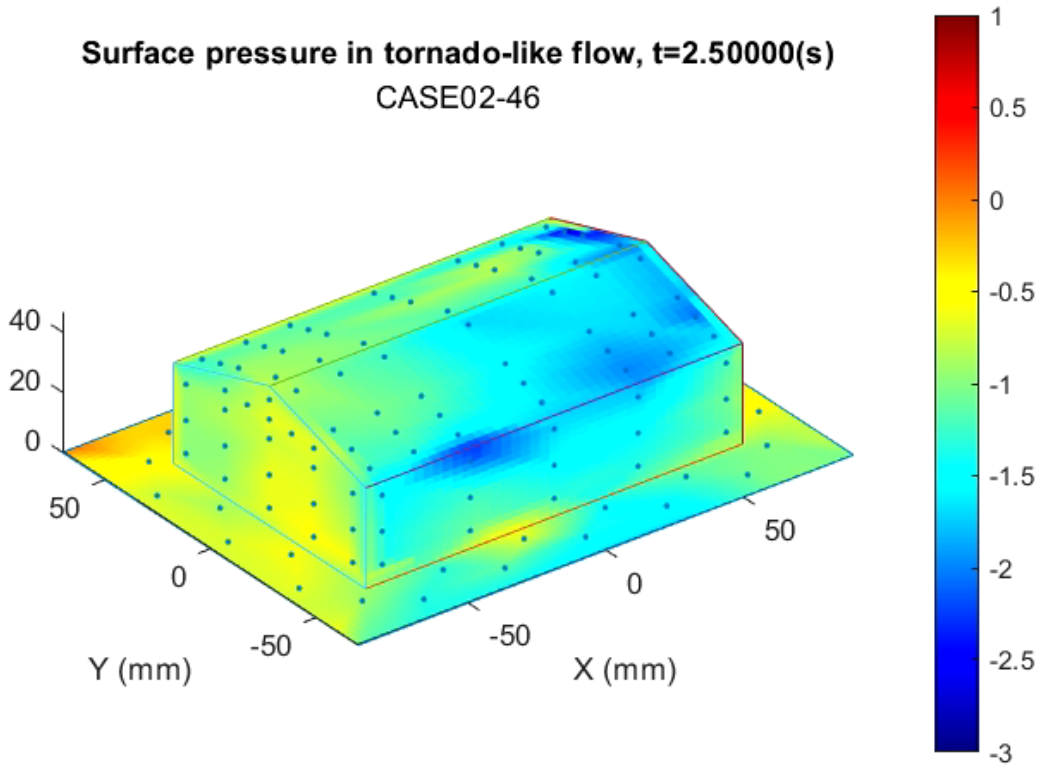

Summary

- Aerodynamic database for tornado induced wind pressures and its statistical values were prepared.
- Wind Pressures on Stationary and Translating tornado cases were determined.