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American Association for Wind Engineering

the wind engineer

NEWSLETTER OF AMERICAN ASSOCIATION FOR WIND ENGINEERING

In This Issue

International Association for Wind Engineering

Urban aerodynamics in the time of COVID

According to the online COVID-19 Dashboard (Engineering 2020), the number of cases worldwide of the coronavirus is estimated to be over 17 million with 679,000 deaths, on August 2, 2000. Reported coronavirus-related deaths in the Americas include 154,700 in the US; 93,563 in Brazil; 12,557 in Peru; 10,330 in Colombia; 9,608 in Chile and 8,986 in Canada. Transmission of the coronavirus has not been well-understood, although social distancing measures have been recommended by the CDC in the US. The realm of air flow in urban areas, including the ventilation of buildings, has been a research topic in wind engineering since the early 1970s. In 2011, the Task Committee on Urban Aerodynamics of ASCE chaired by Richard M. Aynsley published a monograph citing the importance of using wind engineering principles in the design of urban centers rather than relying on intuitive approaches (Aerodynamics 2011).

The airflow within buildings has been investigated since the COVID-related nursing home deaths in Kirkland, Washington in February. As early as April, designers weighed in on strategies for COVID-19 isolation rooms in medical facilities. ASHRAE has created a website to identify resources available to address HVAC concerns for all types of buildings besides healthcare, such as residential, commercial and schools (ASHRAE 2020). Although airborne transmission of the virus has been debated, a group of over 200 scientists and engineers recently sent a published letter to the World Health Organization stating that "it is time to address airborne transmission." (Morawska and Milton 2020).

Prof. Linsey Marr from the Civil & Environmental Engineering Department at Virginia Tech is investigating the airborne transmission of COVID-19 (Parker-Pope 2020). Her previous focus had been how long the flu virus in microscopic droplets remained floating in the air inside a building, after a sneeze for example. She likes to use the visual of cigarette smoke when explaining the dynamics of viruses and bacteria in the air, and she collaborates with virologists, epidemiologists and others in public health. The results of her work should help explain why some people without symptoms may be spreading the virus.

Health experts have recommended social distancing and the use of face masks. Wind engineering expert Prof. Bert Blocken and his team have examined the effect of social distancing in terms of liquid droplets in a journal article preprint available at www.urbanphysics.net (B. Blocken 2020). A short interview of Dr. Blocken about the study is available at https:///www.youtube.com/watch?v=LwlBdvphuv0.

Figure 1. Screen Print of Blocken Experiments on Youtube.

Blocken et al. (2020) point out that social distancing of 1.5-2.0 m has been established for people standing still or sitting. His group was interested in examining people who are moving. The results of wind tunnel experiments on walkers and runners were validated through CFD simulations. In the experiments, two walkers and runners were investigated, where the second one was located side by side, in the slipstream and outside but trailing the first one. Blocken et al. concluded that walkers and runners should be staggered if not side by side and the social distancing should be increased beyond 1.5 m to 5 to 10 m. Effects of external wind were not considered. It is noted that droplets without COVID-19 were not used, and the amount of droplets required to infect someone is still unknown. Further investigations are underway.

Research is ongoing in this area and AAWE will provide updates in future issues.

References

Aerodynamics, Task Committee on Urban. 2011. "Urban Aerodynamics: Wind Engineering for Urban Planners and Designers." In, 63. 1801 Alexander Bell Drive, Reston, VA 20191-4400: ASCE.

ASHRAE. 2020. 'Building Readiness', ASHRAE, Accessed 2020. https://www.ashrae.org/technical-resources/building-readiness%23ecip

B. Blocken, F. Malizia, T. van Druenen and T. Marchal. 2020. 'Towards aerodynamically equivalent COVID19 1.5 m social distancing for walking and running'.

Engineering, Center for Systems Science and. 2020. 'COVID-19 Dashboard by the Center for Systems Science and Engineering', Accessed August 2. https://www.arcgis.com/apps/opsdashboard/index.html#.

Morawska, Lida, and Donald K. Milton. 2020. 'It is time to address airborne transmission of COVID-19', *Oxford University Press for the Infectious Diseases Society of America*.

Parker-Pope, Tara. 2020. 'The scientist, the air and the virus', *New York Times,* June 12, 2020.

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CALENDAR

COVID19 has resulted in the delay or postponement of many professional meetings. As someone who has organized meetings and conferences in the past, I am very sympathetic to those who have the difficult decision to postpone or cancel events. One of the challenges we face as a community is how to "start up" the next set of meetings in 2021. For example, the wind engineering community has meetings, workshops and conferences scheduled for two or three years in the future, and any rescheduling of postponed events must take into account these previously scheduled events. We will do our best to keep you updated on the AAWE website.

Virtual meetings scheduled for later this year include the following:

- Workshop on Experimental and Computational Simulation of Wind Damage to Structures and Regions, to be held online **August 10-11, 2020**, 9 am-12:30pm PST, 2-day workshop hosted by the Florida International University (FIU) Wall of Wind Experimental Facility and the NHERI SimCenter. More information is available at https://www.designsafe-ci.org/learning-center/training/**workshops/fiu-ef/2020-wow-ef-and-simcenter-workshop/**.

- **IN-VENTO 2020. To be held online on September 7, 2020.** Organized by The Italian Association for Wind Engineering (ANIV) and the wind engineering group of Politecnico di Milano to replace the 2020 Conference of the Italian Association of Wind Engineering. For further information, please see https://in-vento2020.org.

- **The Seventh Asian-Pacific Symposium on Structural** Reliability and Its Applications (APSSRA2020), to be a virtual online meeting, **October 4–7 2020,** Tokyo, Japan. For information, please see http://risk.arch.t.u-tokyo.ac.jp/APSSRA2020/index.html

Here is a listing of 2020 and 2021 meetings that have been postponed or cancelled:

- ASCE Meetings
  - Structures Congress 2020, St. Louis, MO: Cancelled. A virtual event was held on April 7, 2020, 1:30-5:00pm Eastern.
  - Structures Congress 2021, Seattle WA: Scheduled for March 10-13, 2021. Submissions deadline was June 3, 2020. Please see https://www.structurescongress.org for details.
  - Engineering Mechanics Institute Conference and Probabilistic Mechanics and Reliability Conference, scheduled to be hosted by Columbia University, New York, New York, May 26-29, 2020. Postponed until May 25-28, 2021 at the same location. Please see https://www.emi-conference.org for details.
- BBAA IX 2020, 9th International Colloquium on Bluff Body Aerodynamics and Applications, University of Birmingham, UK. Postponed and then cancelled. It is unclear if BBAA IX will be held sometime in the future, or if BBAA X will be the next meeting.

- Americas Conference on Wind Engineering (ACWE), scheduled for 2021 at Texas Tech University has been delayed. The AAWE Board in consultation with IAWE and EAWE has been discussing the options for this important conference, such as fully online, hybrid, or completely in-person. Updates should be provided to the community in September 2020.

- AAWE Workshop. This workshop is typically not held in the same year as the ACWE. The AAWE board is discussing the scheduling of the workshop during 2021 or 2022 depending upon the status of the ACWE.

Hurricane Season Is Underway

As we go to press, Hurricane Isaias is active in the Atlantic. It is moving toward Florida after wreaking havoc on the Bahamas, and parts of Puerto Rico and the Dominican Republic. According to the National Hurricane Center Summary for July, four tropical storms and one tropical cyclone have formed in the Atlantic. Data are provided in Table 1.

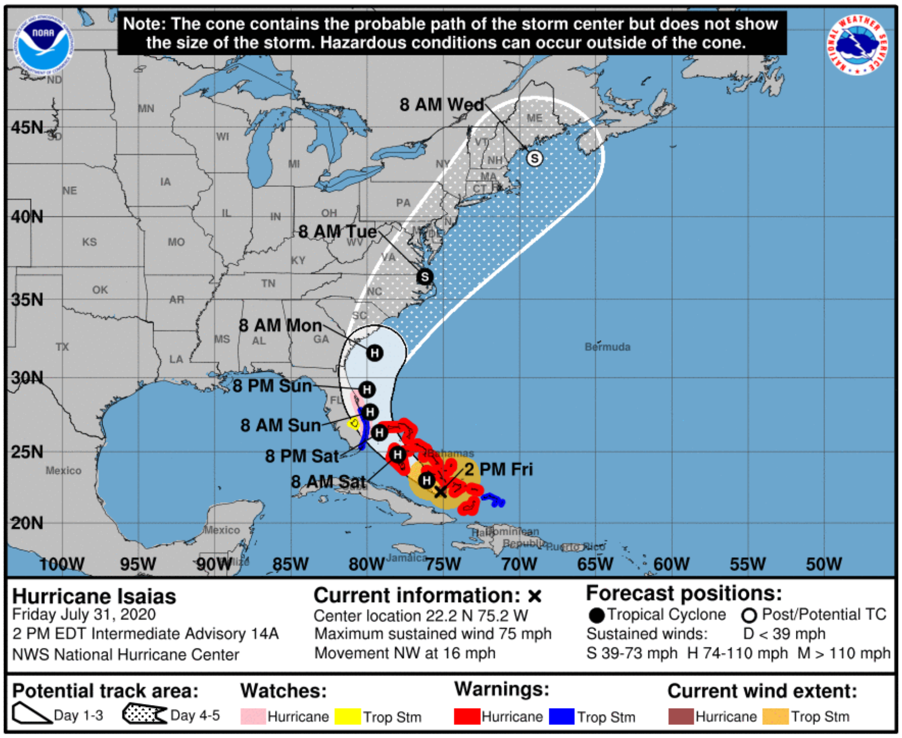
Table 1. Atlantic events in 2020. Source: National Hurricane Center

Name	Dates	Max Wind Speed [mph]; 1 mph =0.44704 m/s
Tropical Storm Arthur	16-19 May	60
Tropical Storm Bertha	27-28 May	50
Tropical Storm Cristobal	1-9 June	60
Tropical Storm Dolly	22-24 June	45
Tropical Cyclone Isaias	29-31 July 31 and ongoing	75 [31 July]

Maps from the National Hurricane Center are provided below that indicate the presumed path, wind speed and rainfall as Isaias heads toward Florida. Figure 1 is a screen print of the satellite video. Florida is in the upper left-hand corner of the screenshot. Figure 2 is a 5-day cone path predictor, showing movement along the Floridian Atlantic coastline.

Figure 1. Screen print of satellite video of Isaias on July 31, 2020. Source: National Hurricane Center.

Figure 2. Isaias 5-day Cone, Starting on Friday July 31, 2020. Source: National Hurricane Center.



Figures 3 and 4 illustrate the wind speed and rainfall probabilities.

Figure 3. Isaias Wind Speed Probabilities from July 31- August 5, 2020; 1 mph =0.44704 m/s . Source: National Hurricane Center.

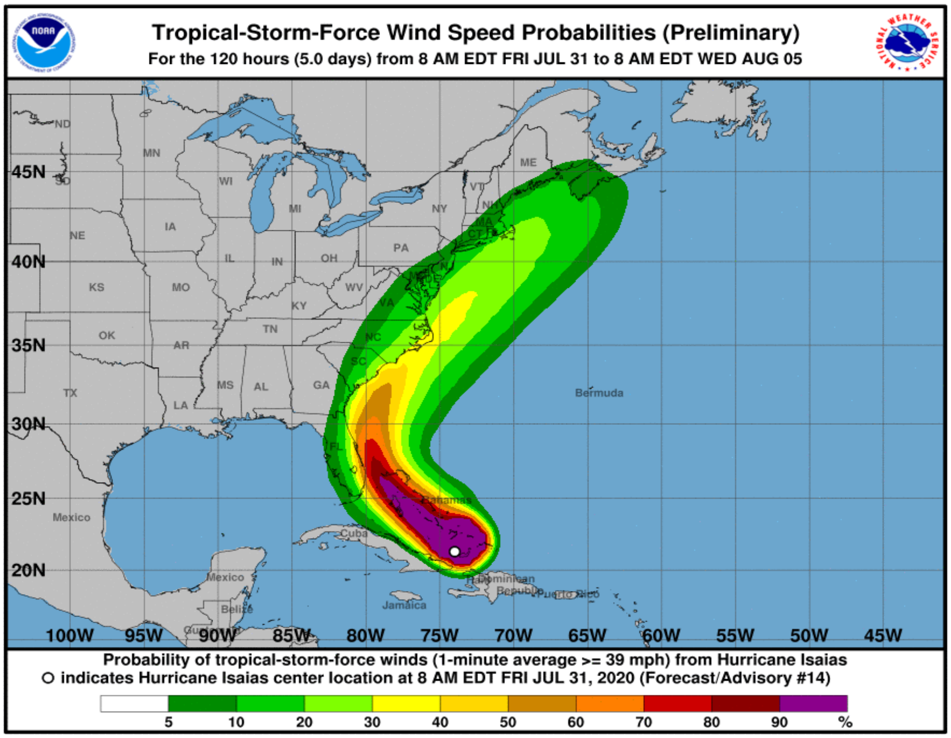
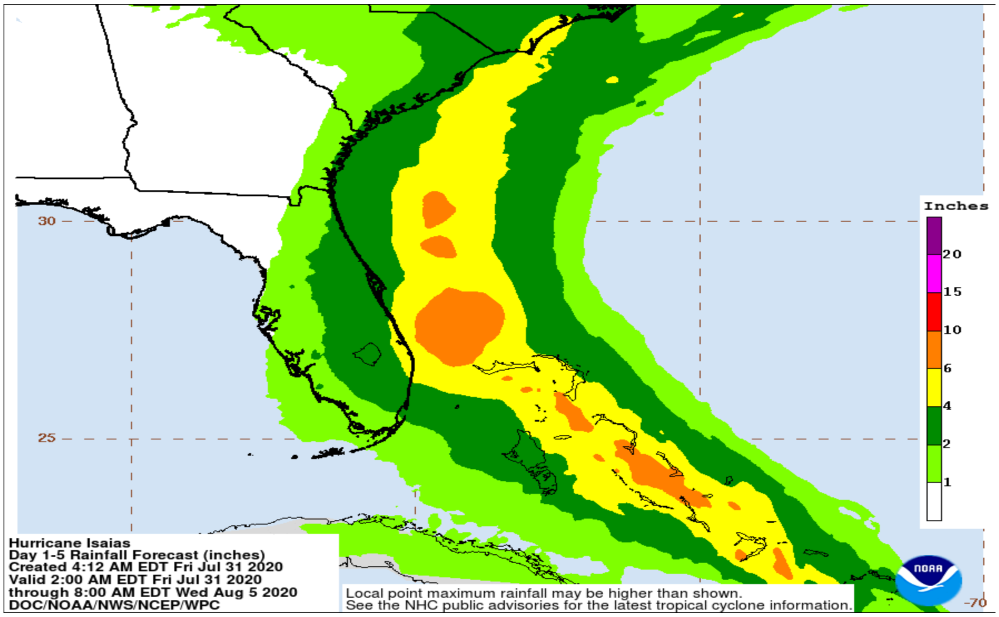


Figure 4. Rainfall predictions for Isaias, July 31-August 5; 1 inch = 2.54 cm. Source: National Hurricane Center



Damage investigation reports published by StEER (Structural Extreme Event Reconnaissance) for hurricanes are provided on the NHERI (Natural Hazards Engineering Research Infrastructure) website at https://www.designsafe-ci.org/data/browser/public/. Access to the NSF DesignSafe-CI is free, but you must register for an account. The director of DesignSafe, Prof. Ellen Rathje has an article in this month's newsletter (p. 7). More updates for the hurricane season will be provided in the next AAWE newsletter.

Looking for something to watch?

In May 2020, PBS (Public Broadcasting Service) released an hour-long film in the American Experience Program entitled "One Man's Pursuit to Understand the Deadliest Storms: Mr. Tornado" about Ted Fujita. The video is also available on youtube. The PBS link is https://www.pbs.org/wgbh/americanexperience/films/mr-tornado/.

Ted Fujita | Mr. Tornado | American Experience | PBS

Source of figure: https://www.youtube.com/watch?v=eIAysI2oBRU

DESIGNSAFE-CI

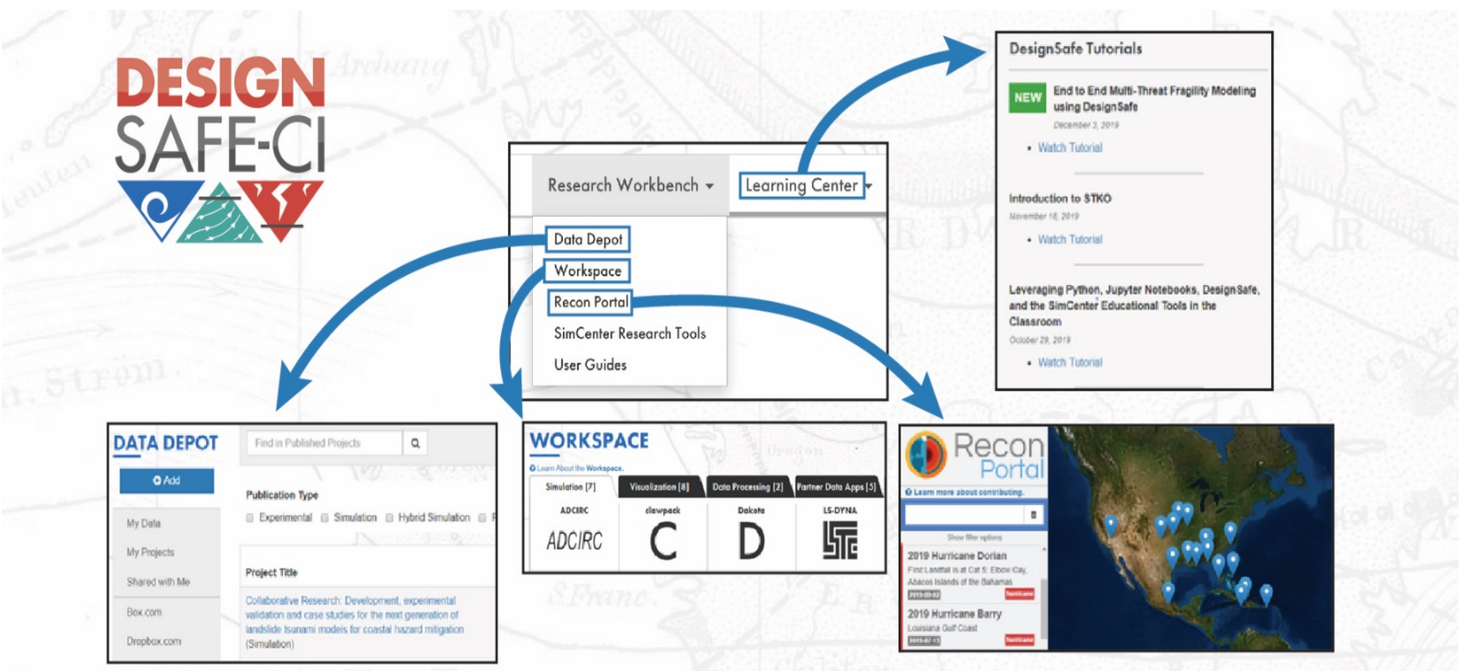
NHERI: NATURAL HAZARDS ENGINEERING RESEARCH INFRASTRUCTURE

Article by Ellen Rathje.

DesignSafe-CI (**www.designsafe-ci.org**) is the cyberinfrastructure component of NSF's Natural Hazards Engineering Research Infrastructure (NHERI), and provides cloud-based tools to manage, analyze, and publish critical data for research in natural hazards engineering, including wind engineering. The DesignSafe-CI ***Data Depot*** provides private and public disk space to support research collaboration and data publishing through a web interface, while DesignSafe-CI ***Reconnaissance Portal*** uses a map interface to provide easy access to field data collected to investigate the effects of hurricanes, windstorms, and earthquakes. The DesignSafe-CI ***Discovery Workspace*** provides cloud-based tools for simulation, data analytics, and visualization; as well as access to high performance computing (HPC). The ***Learning Center*** provides various training materials, including links to webinars that describe how DesignSafe-CI is being used by the research community.

DesignSafe-CI is glad to serve the research needs of the wind engineering community and account registration is **free**. Register and login to explore how you can use DesignSafe-CI in your research. We shall follow-up in subsequent issues of the AAWE newsletter with more detailed information.

Contact: Professor Ellen Rathje, Director and PI, DesignSafe-CI (e.rathje@mail.utexas.edu)



Looking for the latest journal articles? Here's brief list:

Wind and the built environment

- J. Tian and X. Chen. "Evaluation of wind directionality on wind load effects and assessment of system reliability of wind-excited structures." Journal of Wind Engineering & Industrial Aerodynamics 199 (2020) 104133, March 2020. This paper evaluates the effect of wind directionality on structural performance using a numerical approach, including the AIJ directionality recommendations. https://doi.org/10.1016/j.jweia.2020.104133.
- A. Rossi, C. Jubayer, H. Koss, D. Arriaga and H. Hangan. "Combined effects of wind and atmospheric icing on overhead transmission lines." Journal of Wind Engineering & Industrial Aerodynamics 204 (2020) 104271, May 2020. This paper presents a method for estimating combined wind and ice loads on overhead transmission lines that is complementary to the one in IEC 60826:2003. https://doi.org/10.1016/j.jweia.2020.104271.
- J. Xue, F. Mohammadi, X. Li, M. Sahraei-Ardakani, G. Ou and Z. Pu. "Impact of transmission tower-line interaction to the bulk power system during hurricane." Reliability Engineering and System Safety 203 (2020) 107079. This paper investigates the impact of transmission tower damage and failure on the transmission network during a hurricane. https://doi.org/10.1016/j.ress.2020.107079 .
- G.A. Kopp and C-H Wu. "A framework to compare wind loads on low-rise buildings in tornadoes and atmospheric boundary layers." Journal of Wind Engineering & Industrial Aerodynamics 204 (2020) 104269, June 2020. This paper presents a framework to compare building aerodynamics measured in a tornado simulator with those derived from a typical boundary layer wind tunnel. https://doi.org/10.1016/j.jweia.2020.104269.
- M. Jafari and A. Alipour. "Methodologies to mitigate wind-induced vibration of tall buildings: A state of the art review". Journal of Building Engineering. June 2020. This paper evaluates state of the art methodologies developed for control of wind-induced vibration of tall buildings. doi: https://doi.org/10.1016/j.jobe.2020.101582 .
- F. Hou and M. Jafari. "Investigation approaches to quantify wind-induced load and response of tall buildings: A review." Sustainable Cities and Society 62 (2020) 102376. This paper investigates wind-induced response of tall buildings in the context of urban sustainability and examines energy efficiency and occupant comfort as well. https://doi.org/10.1016/j.scs.2020.102376.
- J. Holmes. "Comparison of probabilistic methods for the effects of wind direction on structural response." Structural Safety 87 (2020) 101983. This paper examines the outcrossing, multi-sector and direct calculation methods of predicting extreme wind load effects on buildings while allowing for varying directionality. https://doi.org/10.1016/j.strusafe.2020.101983.
- A. Paleo-Torres, K. Gurley, J.P. Pinelli, M. Baradaranshoraka, M. Zhao, A. Suppasri and X. Peng. "Vulnerability of Florida residential structures to hurricane induced coastal flood." Engineering Structures 220 (2020) 111004. This paper presents coastal flood vulnerability functions for residential construction based upon empirically derived tsunami fragility functions. https://doi.org/10.1016/j.engstruct.2020.111004.
- J. Wang, Q. Yang, P.V. Phuc and Y. Tamura. "Characteristics of conical vortices and their effects on wind pressures on flat-roof-mounted solar arrays by LES. Journal of Wind Engineering & Industrial Aerodynamics 200 (2020) 104146, March 2020. This paper uses Large Eddy Simulations (LES) to examine the flow characteristics around solar arrays on flat-roof-buildings for two wind directions. The study was undertaken to clarify the mechanisms of wind pressures previously determined by wind tunnel experiments. https://doi.org/10.1016/j.jweia.2020.104146.

Wind energy

- C. Qiao, A.T. Meyers and S.R. Arwade, Characteristics of hurricane-induced wind, wave and storm surge." Renewable Energy 150 (2020) 712-721. This paper investigates the modeling of combined wind, surge and waves on proposed off-shore wind turbine facilities in the northeastern US. https://doi.org/10.1016/j.renene.2020.01.030

- G. Vita, H. Hemida, T. Andrianne and C. Baniotopoulos. "The effect of the integral length scale of turbulence on a wind turbine aerofoil." Journal of Wind Engineering & Industrial Aerodynamics 204 (2020) 104235, May 2020. This paper uses wind tunnel experiments to ascertain the influence of turbulence intensity and length scale on a DU96w180 wind turbine aerofoil. https://doi.org/10.1016/j.jweia.2020.104235.

Research Article

Incorporating Low-frequency Gusts and Dynamic Effects for Small Structures Tested at Large Scales

by Johnny Estaphan and Arindam Chowdhury

Introduction

The use of photovoltaic (PV) arrays as a source of renewable energy has become widespread in the U.S. in recent years. Extreme wind events such as hurricanes have been a cause of damage to PV arrays installed on the rooftop of low-rise buildings. This is mainly due to the peak wind loads, including wind-induced dynamic effects, being underestimated when designing the supporting structures. Wind tunnel testing of low-rise buildings and their appurtenances requires large model scales to allow for accurate architectural modeling and testing at high-Reynolds number. However, using large model scales will render the low-frequency turbulence eddies largely unaccounted for in the simulations. This is mainly due to the size limitations imposed by the boundary layer wind tunnel test sections. Also, the natural frequency criterion of ≤1 Hz, proposed by (American Society of Civil Engineers, 2017) ASCE7-16 standard for dynamically sensitive structures, does not apply to smaller structures (e.g. solar panels). Hence, a new method is required to advance knowledge on wind-induced dynamic effects on smaller structures.

A new hybrid experimental-numerical method is proposed herein. It consists of extending the Partial Turbulence Simulation (PTS) method, which has been developed by researchers at the NSF NHERI Wall of Wind Experimental Facility (WOW EF) at Florida International University. The proposed method requires a post-test numerical analysis which consists of mathematically applying a transfer function to account for the missing low-frequency turbulence in large-scale testing (Asghari Mooneghi et al., 2016; Banks et al., 2015). Also, resonant dynamic response effects are mathematically incorporated using the mechanical admittance function (Moravej et al., 2015).

Theoretical Background

Based on the "Quasi-steady" assumption, the fluctuating force or pressure on a structure (e.g. PV panels) is assumed to follow the variations in longitudinal wind velocity upstream (Holmes, 2015). As shown in **Fig. 1**(a), the *aerodynamic admittance function* $|\chi(f)|^2$ can be incorporated in the gust spectral density $S_u(f)$ to obtain the aerodynamic force coefficient spectral density $S_{C_F(B)}(f)$ on the PV panels (Eq. 1).

$$S_{C_F(B)}(f) = |\chi(f)|^2 . \frac{4\bar{F}^2}{\bar{U}^2} . S_u(f) \tag{1}$$

where $\bar{F}$ is the mean aerodynamic force, and $\bar{U}$ is the mean wind speed. $|\chi(f)|^2$ tends towards 1.0 for small structures (e.g. PV panels) and at low frequencies. For high-frequency fluctuations, its effects are already captured in the experiments. The net force coefficient spectral density $S_{C_F(B+R)}(f)$, which includes both the background and resonant components (**Fig. 1**b), can be calculated from $S_{C_F(B)}(f)$ by mathematically applying a *mechanical admittance function* $|H(f)|^2$ (Eq. 2).

$$S_{C_F(B+R)}(f) = |H(f)|^2 . S_{C_F(B)}(f) \tag{2}$$

where $|H(f)|^2$, shown in Eq. (3), is a function of the natural frequency of the structure f_0, the frequency of the applied force f, and the total damping ratio ζ (Moravej et al., 2015). The total damping ratio ζ consists of the aerodynamic damping ζ_a and the structural damping ζ_s.

$$|H(f)|^2 = \frac{1}{\left[1 - \left(\frac{f}{f_0}\right)^2\right]^2 + 4\zeta^2\left(\frac{f}{f_0}\right)^2} \tag{3}$$

where C is the damping coefficient, K and M are the stiffness and mass of the structure, respectively.

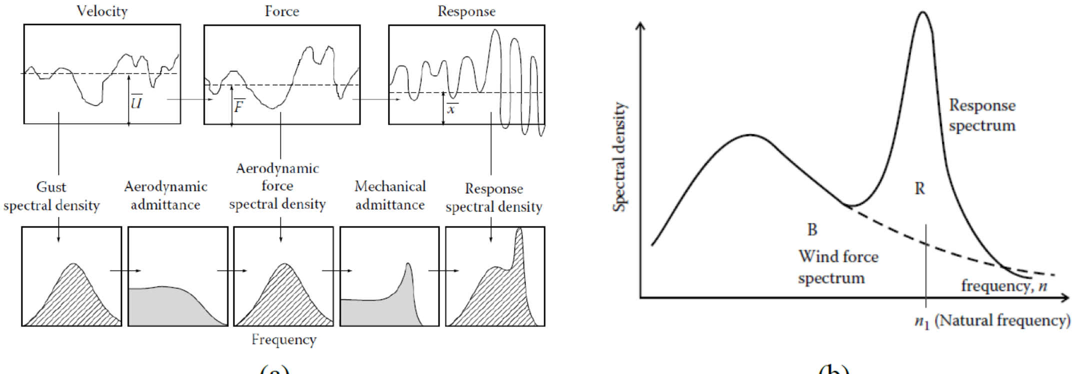


Fig. 1. (a) The random vibration approach to the resonant dynamic response; (b) Background and resonant components of the response spectrum (Davenport, 1963; Holmes, 2015).

A full turbulence spectrum (FS) contains both the low and high-frequency fluctuations, as in the atmospheric boundary layer. A partial turbulence spectrum (PS), simulated during a large-scale wind tunnel testing, is missing the low-frequency component of the spectrum. To overcome this limitation, a *gust transfer function* $|T(f)|^2$ is used to incorporate the effects of the missing low-frequency turbulence in the partial net force coefficient spectrum, as shown in Eq. (4) (Asghari Mooneghi et al., 2016; Banks et al., 2015).

$$\frac{S_{C_F(B+R),FS}(f)}{S_{C_F(B+R),PS}(f)} = \frac{S_{u,FS}(f)}{S_{u,PS}(f)} = |T(f)|^2 \tag{4}$$

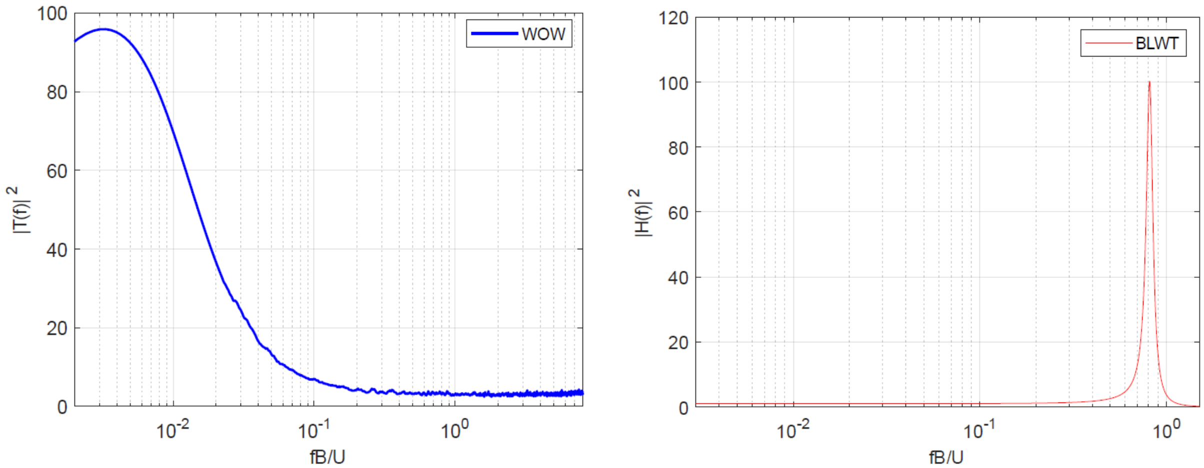
To sum up, a full net force coefficient spectrum can be obtained by mathematically applying a mechanical admittance function and a gust transfer function to the partial aerodynamic force coefficient spectrum, as shown in Eq. (5).

$$S_{C_F(B+R),FS}(f) = |H(f)|^2 . |T(f)|^2 . S_{C_F(B),PS}(f) \tag{5}$$

A compensated time history $C_{F(B+R),FS}(t)$ can be obtained from $S_{C_F(B+R),FS}(f)$ by applying the Inverse Fast Fourier Transform (IFFT) approach. The peak net force coefficients $\hat{C}_{F,FS}$ can then be obtained using an extreme value analysis (Gumbel fit) where the fit parameters are estimated by the best linear unbiased estimation (BLUE) method (Lieblein, 1974) with a probability of non-exceedance of 0.78.

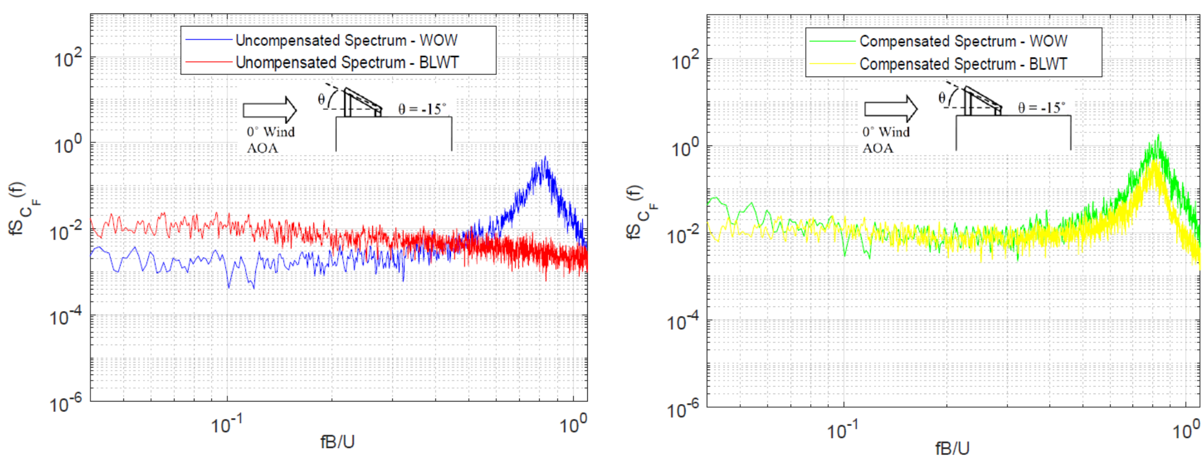
Validation of the PTS Extension Approach

Full- and large-scale (1:12) experimental testing of a rooftop PV panel was performed at the NSF NHERI Wall of Wind Experimental Facility (WOW EF) at Florida International University, and the boundary layer wind tunnel (BLWT) of RWDI USA LLC, respectively. Detailed information on the experimental testing can be found in (Moravej et al., 2015). Net force coefficient data, collected from WOW and BLWT measurements with a 0° wind angle of attack (AOA) and a 15° PV panel tilt angle, were used to validate the proposed PTS extension approach. **Fig. 2** portrays the two compensation functions $|T(f)|^2$ and $|H(f)|^2$. The former will be used to incorporate the effects of missing low-frequency turbulence in the WOW net force coefficient spectrum. The latter will be used to compensate for the dynamic resonant effects in the BLWT net force coefficient spectrum with a natural frequency f_0 = 14Hz, a damping ratio of 5%, and a panel width B = 5ft.



a) Gust transfer function $|T(f)|^2$ b) Mechanical admittance function $|H(f)|^2$

Fig. 2. Compensation functions

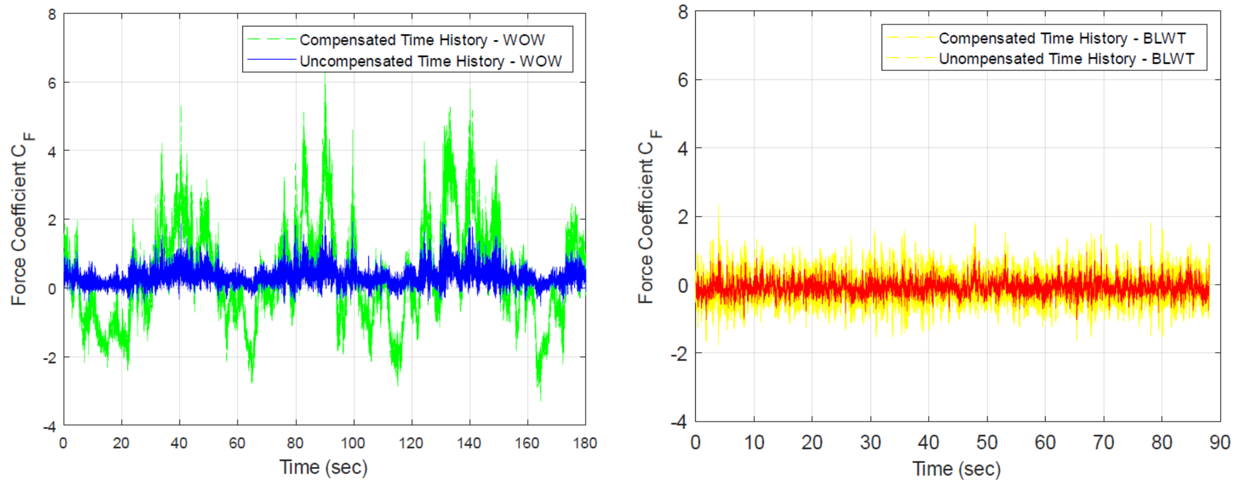


a) Uncompensated Spectra b) Compensated Spectra

Fig. 3. Net force coefficient spectra

Fig. 3(a) and (b) show the uncompensated and compensated WOW and BLWT force coefficient spectra, respectively. A good agreement can be seen between the two compensated spectra.

Next, the Inverse Fast Fourier Transform (IFFT) approach was applied to obtain the compensated net force coefficient time histories $C_{F(B+R),FS}(t)$, as shown in **Fig. 4**.



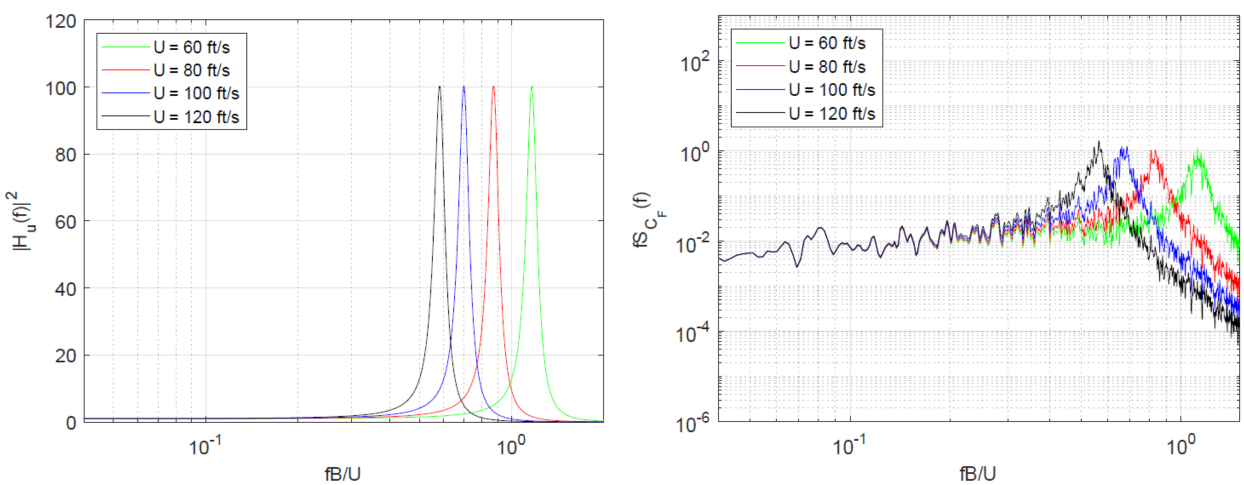
a) WOW b) BLWT

Fig. 4. Net force coefficient time history

A *modified mechanical admittance function* $|H_u(f)|^2$, shown in Eq. (6), is used to obtain force coefficient spectra at various wind speeds.

$$|H_u(f)|^2 = \frac{1}{\left[1-\left(\frac{uf}{f_0}\right)^2\right]^2 + 4\zeta^2\left(\frac{uf}{f_0}\right)^2} \qquad (6)$$

where $u = \frac{U_i}{\bar{U}}$, U_i is the target wind speed, and $\bar{U}$ is the measured mean wind speed.



a) $|H_u(f)|^2$ b) BLWT force coefficient spectra

Fig. 5. Force coefficient spectra at various wind speeds

Fig. 5 shows $|H_u(f)|^2$ and the respective net force coefficient spectra at various wind speeds. Using the BLUE method, the peak force coefficients $\hat{C}_{F,FS}$ of WOW and BLWT were predicted for a wind event duration of one hour. A comparison was made between the 3-sec peak force coefficients $\hat{C}_{F,3s-FS}$ at various wind speeds and a good agreement was observed, as shown in **Fig. 6**.

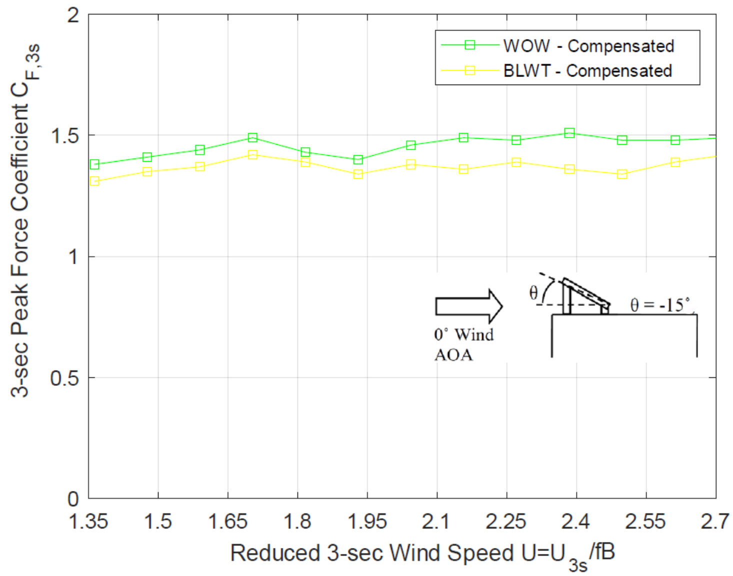


Fig. 6. 3-sec peak force coefficients

Concluding Remarks

A new hybrid experimental-numerical approach is proposed to incorporate the effects of low-frequency gusts and dynamic effects in the measured force coefficient spectra. Net force coefficient data from full- and large-scale (1:12) experimental testing of a rooftop PV panel at the WOW EF and RWDI BLWT were used to validate the proposed method. A comparison between the 3-sec peak force coefficients of WOW and BLWT, obtained for various wind speeds, showed a good agreement. Hence, the proposed PTS Extension approach can be used to advance knowledge on wind-induced dynamic effects on smaller structures and subsequently incorporate the findings in the current code provisions.

Future Work

Collaborative research efforts are ongoing to investigate the wind-induced dynamic effects on rooftop PV panels:

- Field measurements have been conducted by (Bender et al., 2018; Reed et al., 2016) on a rooftop PV array located on the Hogue Technology Center (HTC) building at Central Washington University (CWU) in Ellensburg, Washington.
- The field measurements will be significantly enhanced for comparison with full- and large-scale wind tunnel testing to be conducted at the NSF NHERI Wall of Wind Experimental Facility (WOW EF) at Florida International University (FIU) in Miami, Florida.

References

American Society of Civil Engineers. (2017). *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (7th ed.). American Society of Civil Engineers. http://ascelibrary.org/doi/book/10.1061/9780784414248

Asghari Mooneghi, M., Irwin, P., & Gan Chowdhury, A. (2016). Partial turbulence simulation method for predicting peak wind loads on small structures and building appurtenances. *Journal of Wind Engineering and Industrial Aerodynamics*, *157*, 47–62. https://doi.org/10.1016/j.jweia.2016.08.003

Banks, D., Guha, T. K., & Fewless, Y. J. (2015). *A hybrid method of generating realistic full-scale time series of wind loads from large-scale wind tunnel studies: Application to solar arrays*. Proceedings of the 14th International Conference on Wind Engineering, Porto Alegre, Brazil.

Bender, W., Waytuck, D., Wang, S., & Reed, D. A. (2018). In situ measurement of wind pressure loadings on pedestal style rooftop photovoltaic panels. *Engineering Structures*, *163*, 281–293. https://doi.org/10.1016/j.engstruct.2018.02.021

Holmes, J. D. (2015). *Wind Loading of Structures*. CRC Press. https://doi.org/10.1201/b18029

Lieblein, J. (1974). *Efficient methods of extreme-value methodology* (NBS IR 74-602; p. NBS IR 74-602). National Bureau of Standards. https://doi.org/10.6028/NBS.IR.74-602

Moravej, M., Chowdhury, A., Irwin, P., & Zisis, I. (2015). *Dynamic effects of wind loading on photovoltaic systems*. Proceedings of the 14th International Conference in Wind Engineering, Porto Alegre, Brazil.

Reed, D., Morrison, M., Bender, W., & Wang, S. (2016). *Measurement and analysis of wind loadings on rooftop photovoltaic panels*. 4AAWE Workshop, Miami, Florida.

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President's Corner

Dear Members:

This is the first newsletter for 2020. You may note that it is slightly different from previous ones – it is more "letter" than news perhaps. The new AAWE Board will be tweaking the newsletter and the website over the next couple of months to better serve the wind engineering community. Board member Luca Caracoglia is spearheading the website renovation. I put together many of the articles for this newsletter edition and I have requested articles from several members for the next. There is always room for more! Please contact me at newsletter@aawe.org if you have any articles, news or suggestions for the future.

The newly elected Board has been meeting via zoom on a monthly basis since May. Our primary objective has been to reinvigorate the organization. We are reviewing the AAWE bylaws so that we may better align the activities of the organization with its stated objectives. The objectives are also under review. The Committees are being reformulated so that we may present awards and conduct other business. In the coming months, we will be contacting you through email, zoom meetings and newsletters to open a dialog about the future of AAWE.

Take care and be safe. With best wishes.

Dorothy

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