Full-scale measurements of wind and wind loading: A renewed importance

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Abstract

Windstorms induce significant damage and losses worldwide. Recently, justified focus has been placed on transient winds generated from severe convective storms (e.g., thunderstorms and tornadoes) which cause a significant proportion of those impacts.

Transient winds by their nature make full-scale wind speed data difficult to capture. Wind loading data for these events are practically non-existent, meaning there are extremely limited collocated measurements of wind speed and wind loading. In short, there is no transient analog for the atmospheric boundary layer (ABL). Full-scale data is not only critical for transient events. The explosion of novel and large-scale experimental facilities and rapid advancements in computational modeling means the importance of full-scale data to validate and even strengthen these simulations is more important than ever.

Building on the important work done others on transient full-scale data collection, including by Solari and Genoa, a state-of-the-art assessment in full-scale data collection for transient events will be discussed including ongoing full-scale data collection and analysis by the Wind Engineering Research Laboratory at Illinois and other research groups. The use of ABL wind data as a proxy for transient winds and the need to collect for other purposes is highlighted. Practical items such as the need for wind engineers to advocate to for collection of engineering-centric data from existing weather stations and the need for international collaboration, data sharing, and investigating new technologies for full-scale data collection will be presented. Moreover, Lombardo will seek questions from and dispense advice to graduate students and young professionals regarding research and career choices - especially an academic path.

Short CV

Lombardo received his Ph.D. from Texas Tech University in 2009 studying thunderstorm wind characteristics and subsequent loading on a low-rise building. After receiving his Ph.D., Dr. Lombardo was a postdoctoral research associate the National Institute of Standards and Technology (NIST) where he played a significant role in the investigation of the Joplin, Missouri tornado in 2011 and the creation of updated wind maps for ASCE 7-16. Work on the Joplin investigation earned himself and his team members the Department of Commerce Gold Medal in 2014. Lombardo has continued his work as an Assistant Professor at the University of Illinois at Urbana-Champaign (UIUC) since 2015. In his time at UIUC, he has been awarded competitive research projects through NOAA, NSF and NIST studying wide-ranging aspects of wind science and engineering and was the recipient of the 2019 International Association of Wind Engineering Junior Award for his contributions to the field. He has started the Smart Wind Engineering Research Facility (SWERF) to advance knowledge of windstorms and mitigate their impacts. To put this knowledge into practice, he also serves on professional committees related to windstorms including the ASCE Wind Load Subcommittee (WLSC). He serves as vice-chair of the tornado task committee of WLSC, which has developed tornado loading provisions for inclusion in ASCE 7-22.