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Editorial

Since the collapse of Tacoma Narrows Suspension Bridge in the 1940, due to wind action, there have been significant advances in aerodynamics of bridge structures. Even with contested effect of climate change on modern life, different parts of the globe have experienced dramatic changes in weather pattern and wind events. This issue of *Bridge Structures* presents five papers, which discuss stability, resilience and adequacy of bridges under major weather events.

During large hurricanes, resilient transportation networks are essential to provide evacuation and assistance to large population centers, facilitate post-disaster recovery efforts, and restore economic activity, so the disruption to the economy of the affected region is minimized. Past storms illustrate the effect of inadequate planning for resilience. Hurricane Katrina caused widespread damage to the transportation infrastructure in the Gulf Coast, including damage to highways, the loss of many bridge structures, damage to ports and rail facilities, and waterways. Damage to the port of New Orleans severely affected grain exports and other commodities, impacting freight rates and fuel pricing in the US. In "Vulnerability of coastal bridges under extreme hurricane conditions', Nasouri et al. describe a high-resolution coupled Eulerian-Lagrangian (CEL) finite element model to evaluate the vulnerability of coastal bridges to wave-induced forces during large storms. The modeling technique was calibrated and shown to be in good agreement with experimental results from a reduced-scale bridge structure tested at the O.H. Hinsdale Wave Research Laboratory at Oregon State University. The high-resolution bridge model was used to simulate the response of common types of bridge structures to hydrodynamic loads under hurricane conditions (i.e. surge height, wave height, and frequency) expected in the Texas-Louisiana coast. Results show that superstructure-substructure connection demands for bridges under wave impact loading are sensitive to the flexibility of the substructure, which has historically been modeled as rigid in flume experiments and computer simulations used to develop current design provisions. On the theme of wind load caused by climate change, Wang et al. collect the annual maximum wind speed in Beijing from 1951 to 2009, in an attempt to establish a relationship between the reliability and the flexural load-bearing capacity of a highway continuous girder bridge. In their paper "Effect of climate change on flexural reliability of highway continuous girder bridge under wind load", the authors assume different wind speed over a period of time and predict changes of the flexural reliability of the bridge, based on actual statistical wind speed data. The authors conclude that the change of flexural reliability of the bridge is affected by the probability distribution of wind speed. Multi-box girder decks (typically twin-box) are becoming a common solution in modern bridge design, because they improve the bridge structural and aerodynamic performances. From a structural point of view, multi-box sections allow increasing the lateral stiffness of structure, which is critical for very-long span bridges. In addition, they improve the bridge structural redundancy. From an aerodynamic perspective, multi-box sections allow increasing the aeroelastic stability threshold. In "Peculiar aerodynamic advantages and problems of twin-box girder decks for long span crossings", Zasso et al. present the advantages and challenges associated with this structural form. At the design stage of bridges, all possible actions and their combinations are to be considered. In certain cases, the influence of the environment must be taken into account in addition to design values of traffic loads. In order to assess the current state of an existing bridge, actual applied actions must be considered: updated traffic situation, monitored climatic actions, and their unfavorable combinations. Therefore, monitoring all actions makes it possible to adequately study a structure. Since only limited data are generally available, the important question is how the quality and the duration of monitoring influence the assessment of the structure. In "Probabilistic analysis of the effect of the combination of traffic and wind actions on a cable-stayed bridge", Nesterova et al. study effects from monitored traffic and wind actions on the to the Millau Viaduct, in France. The statistical analysis of applied actions and caused effects is performed according to the Peaks Over Threshold (POT) approach. Results include the comparison between confidence intervals of predictions, for each studied load case and for various periods of monitoring. The authors also study of the influence of the length of monitoring data on predictions of future extreme load cases, and propose an alternative algorithm for threshold choice in the POT approach. In recent years several parallel bridges were designed and built in North America. These bridges have been selected to replace existing structures and to meet the ever-increasing demands of vehicle traffic. To meet the demands of increased traffic, the parallel configuration is often selected where each bridge deck carries traffic of opposite direction. This pair of decks, even when remaining dynamically independent, becomes coupled aerodynamically due to their proximity. In this configuration the aerodynamic forces can be enhanced by the similar cross-sections of each bridge and by the close dynamic properties of the twin structures. Becoming aerodynamically coupled, these twin-deck systems have been found to display aerodynamic behavior noticeably different to what could be expected from a single deck of the same cross-section. Typical known aerodynamic solutions to cure instabilities such as vortex shedding and flutter may not be as efficient for these cases. In "Aerodynamic problems of parallel deck bridges", Stoyanoff et al. present results of the aerodynamic studies for three different bridges, and propose suggestions for future twin-bridge configurations of similar arrangements.

Khaled M. Mahmoud, PhD, PE
Editor-in-Chief
New York, NY, USA