

Reproduction of 2-D non-synoptic wind field in an actively controlled wind tunnel

*Wei Cui¹⁾, Lin Zhao²⁾ and Shuyang Cao³⁾

1), 2), 3) *State Key Lab of Disaster Reduction in Civil Engineering, Tongji University, Shanghai 200092, China*

1) cuiwei@tongji.edu.cn

2) zhaolin@tongji.edu.cn

3) shuyang@tongji.edu.cn

ABSTRACT

This work mainly discusses the simulation of 2-D non-synoptic wind field in a novel actively controlled wind tunnel. The vibrating fins with airfoil shape are installed at the downstream of multiple fans in the updated active wind tunnel, which will work with fans simultaneously to generate 2-D non-synoptic flow. The fins mainly control the vertical flow while the fans control the along-wind flow, and the input signal of equipment can be adjusted in a predefined way. Then, based on Banach fixed-point theorem, the input signal of fans and fins is constantly updated by an iteration-based method to derive the generated wind characteristics to approach the different target values within an acceptable error range. According to the degree of interference between the longitudinal and the vertical wind characteristics, different iteration strategies are proposed for different wind fields. Two typical non-synoptic wind fields are taken as application examples: irregular turbulence spectra in typhoons and non-stationary winds in mountainous terrains. After iterations, both case studies were generated appropriately in the active tunnel.

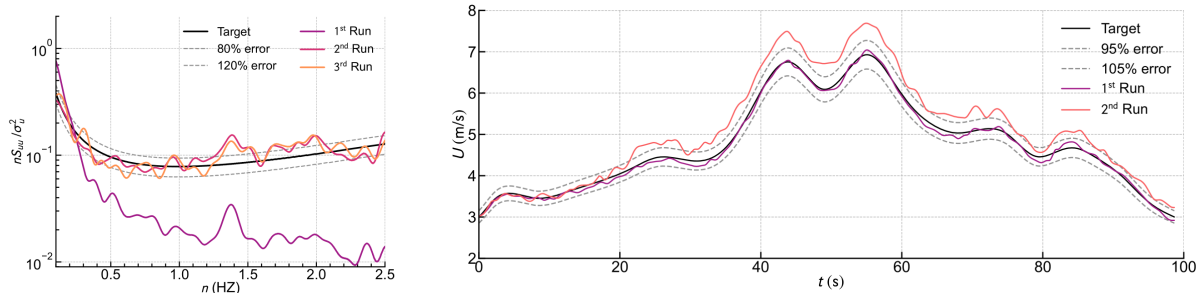


Fig. 1 Generate typhoon wind spectra and non-stationary mountain wind

1) Assistant Professor

2) Professor

3) Professor

The 2024 World Congress on

Advances in Civil, Environmental, & Materials Research (ACEM24)

19-22, August, 2024, The K hotel, Seoul, Korea