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Peak Factor Evaluation for Wind Pressure and Structural Responses in Tall Buildings

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ABSTRACT

The peak factor is presented to evaluate the maximum wind load or wind response on structures affected by dynamic loads and is utilized in the structural design process. Davenport (1964) integrated his research on stationary probability processes and gaussian probability into wind engineering, proposing a peak factor that has been adopted by most structural design standards. However, as Davenport's peak factor assumes a gaussian distribution, it may present non-conservative values. To address this, Kwon and Kareem (2011) proposed a new peak factor considering non-gaussian distributions, and there has been active research regarding peak factors that consider non-gaussian distributions. Most research on the peak factor, which is crucial for securing the safety of structures, primarily focuses on wind pressure and wind loads, often overlooking the importance of applying peak factors to wind responses. Applying wavelet transformation and decomposition, the differences in the distributions of skewness and kurtosis for each component, including background, resonant, and total response, were analyzed to derive the peak factor (Fig. 1). Therefore, this study aims to provide foundational data for wind-induced design through the analysis of prior research and to emphasize the necessity of applying the peak factor in the evaluation of wind responses.

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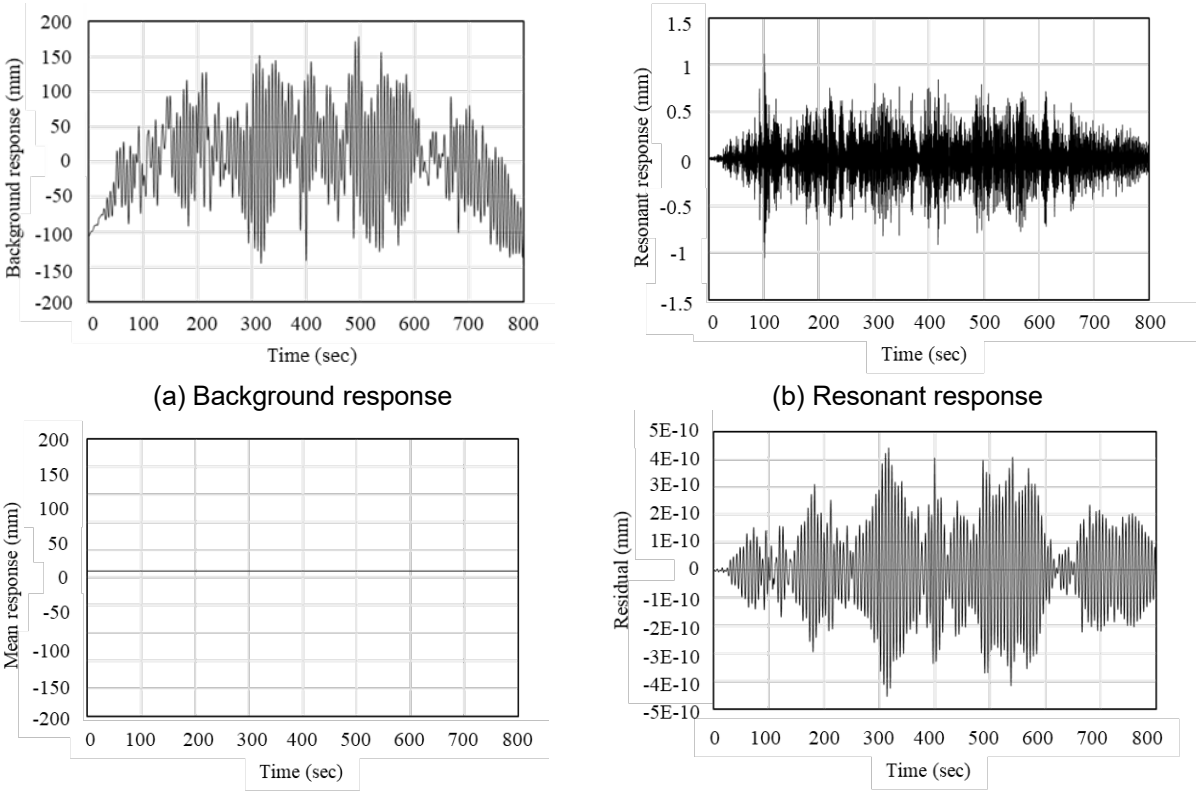

(a) Background response (b) Resonant response

(c) Mean response (d) Residual

Fig. 1 Time history background, resonant, mean response and residual

REFERENCES

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