

Keynote Paper

Analysis and prediction of extreme wind speeds and loads – mysteries and misconceptions

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ABSTRACT

The prediction of the extreme wind climate at a site is an important first stage in the design for wind loads of any structure. This presentation will discuss various aspects of the probabilistic prediction of extreme wind speeds and structural response. Two different concepts related to long-term risk of extreme wind speeds are: return period (RP) and average recurrence interval (ARI). Although these have often been conflated in the past, and they converge numerically at high values of both, they are different measures of probability, and diverge at values less than ten. The relationship between the Generalized Extreme Value (GEV) and Generalized Pareto (GPD) distributions follows logically from the RP vs ARI relation.

Some of the requirements of practical extreme wind-speed analysis will be considered: the need for correction for terrain, height and peak duration (for the analysis of gusts). The choice of distribution types will be discussed with their advantages and disadvantages. Several methods of fitting the Type III GEV distribution, with a fixed shape factor, will be compared with examples. Two different probabilistic methods for combining wind speed and direction will be compared for a location in Australia, and for the response of a tall building at that site. The special case of the risk of overload of a transmission line, which represents a 'line target', will be introduced.

REFERENCES

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