Extreme Value Statistics for Specification of Design Aerodynamic Coefficient

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Abstract

It is seen from statistics of natural hazards that major parts of the world are affected by extreme wind. Statistics of damages clearly reveals that even today structures and structural components are not sufficiently wind hazard resistant. So engineers are interested not only to forecast but also to design the structures properly. The wind load w is obtained as a function of the air density ρ, the wind speed v and the aerodynamic coefficient c. At least v and c have to be treated as random variables. So the specification of the design aerodynamic coefficient is a prerequisite for the specification of the design wind load. The specification of the design aerodynamic coefficient requires extreme value analysis of extreme aerodynamic coefficients. Extreme aerodynamic coefficients can be sampled from different runs of full scale and wind tunnel experiments. Then they can be fitted in a suitable extreme value distribution like Gumbel (type I), Fréchet (type II) or Reverse Weibull (type III) distribution. The different probability distributions for extreme aerodynamic coefficients can be compared and the best one can be found. In this way, the aerodynamic coefficient can be specified for the design working life of a structure.