MODELLING OF EXTREME GUSTS IN HIGH ROUGHNESS ATMOSPHERIC BOUNDARY LAYERS

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The response of a body to extreme events is a fundamental issue of many wind engineering problems such as: load design, microclimate comfort or wind damage. The aim of the present project is the characterization of extreme gusts in high roughness atmospheric boundary layers. A bidimensional forest clear-cut model has been implemented in L2-B wind tunnel at the von Karman Institute. Different layouts of the model are tested, using PIV and hot-wire measurements, with regard to the porosity and length of the leading forest and clear-cut. Extreme Value Analysis determines the probability of extremes so that predictions of the highest wind over long-term recurrence periods can be made. The predicted extreme wind strongly depends on the velocity distribution Weibull fitting. NewGust model provides the deterministic part of the gust shape in time, which resembles the normalized autocorrelation function scaled with a predefined gust threshold. The model has been validated with hot-wire measurements. The results are applied to study the feasibility of wind turbines in forest clear-cuts. Good practice recommendations are provided to wind energy developers.

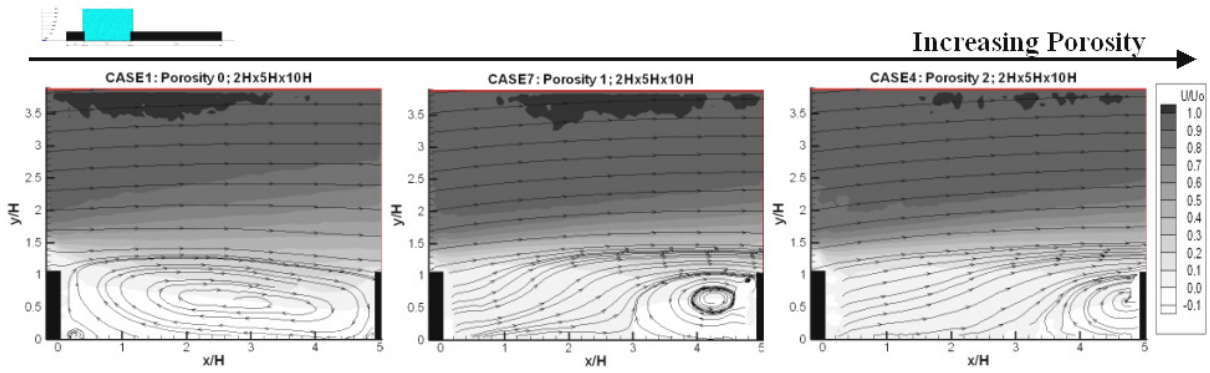

Figure 1: Extreme Value Analysis on PIV measurements.