Mapping Return Values of Extreme Wind Gusts

Adam Pintar*, National Institute of Standards and Technology
Antonio Possolo, National Institute of Standards and Technology

Abstract

Buildings, especially tall ones, are subjected to wind stresses. In particular, high velocity gusts can impart a large amount of stress. Thus, a building's design must take into account the wind velocities it must endure. A particular quantity of interest to engineers is the estimated n-year return value for an extreme wind gust at the necessary geographical coordinate. A two-stage approach to creating maps of n-year return values is considered in this talk. The available data are a single irregular time series of wind velocities at multiple wind reporting stations spread throughout the contiguous United States. The first stage of the analysis involves estimation of the n-year return value at each station using a non-homogeneous Poisson process. In the second stage, local regression based on the estimated n-year return values at the stations is used to create an interpolant so that the n-year return value may be estimated at a geographic coordinated of interest. Standard errors and confidence bounds for the estimates are calculated using a non-parametric bootstrap algorithm. Results are presented for a region within Kansas.

Keywords: n-year return value; Irregular time series; Non-homogeneous Poisson process; Local regression; Non-parametric bootstrap.

* Presenting author