Extreme value analysis of the wind speeds for Germany

abstract

In contrast to the actual wind loading code DIN 1055, part 4, August 1986, the new code will present a wind zone map for Germany, specifying the characteristic value of the wind speed in dependence of the geographical position. In Annex A of the draft DIN 1055, part 4, March 2001, a first proposal of a wind zone map for Germany is presented, however, this proposal contains several shortcomings. In the scope of this research project, which has been sponsored by the *Deutsche Institut für Bautechnik, DIBt,* therefore the wind speeds of 183 stations in Germany have been analysed to produce a revised version of the wind zone map.

The strong wind climate in Germany is governed by three storm phenomena: storms induced by frontal depressions, thunder storms and gust fronts which may be superimposed to frontal depressions and are induced by additional convective processes. Assuming that these three storm phenomena are physically and statistically independent, for each of the storm phenomena a respective extreme value distribution can be obtained. As basic model for the extreme wind speeds, an extreme value distribution type III is introduced. Due to statistical uncertainties, an extrapolation beyond the 98%-fractile is less advisable.

For the analysis of directionality effects a method is proposed which allows the specification of directionality factors. Especially for frontal depressions, a considerable dependency on the wind direction is observed. However, in the scope of codification, it is not possible to specify a uniform distribution of these directionality factors for larger areas in Germany, since many local effects contribute to a large variation in the directionality effects.

The new proposal of the wind zone map for Germany contains five wind zones. The specification of wind zone I, which recommends as characteristic value an hourly wind speed of 22.5 m/s, is required to include the favourable wind climate in many areas of Germany. The new zoning deviates considerably from the older proposal. For many sites, smaller wind loads are obtained, e.g. for the conurbation Rhine-Ruhr with reduction of 50% compared to the old proposal.