

## **Areal extremity of windstorms in the Czech Republic**

### **Abstract**

This thesis deals with the extremeness of events with strong winds in the Czech Republic in the period from 1961 to 2009. The first part is dedicated to the principles of air flow dynamics and to wind climatology. The second part describes theoretical distributions used for evaluating the extremeness of wind speed and presents various computation methods of distribution parameters and interpolation methods of converting point data to spatial information. At the end of this part, two modern indices are introduced: WEI (Weather Extremity Index) and SSI (Storm Severity Index) which use return periods and wind speeds for evaluating the extremeness of windstorms, respectively. The third part contains an application of the methods to the pre-processed data from meteorological stations. The fourth section presents the files of 50 most extreme and 50 seasonally most abnormal windstorms selected by both indices which determine in different ways the extremeness, the affected area and duration of each event. The spatial and temporal aspects of the events are discussed as well, along with their seasonal and interannual variability and causal synoptic conditions. Among extreme wind events, most of them are synoptic scale windstorms related to great horizontal pressure gradients and are concentrated in the period from October to March. Another period with increased incidence of wind events is in the summer months when short-term events, which are related to convective storms, occur. Neither extreme nor seasonally abnormal events occur in April and September. The most common synoptic type connected with strong winds is the west cyclonic situation. Approximately 60 % of events coincide in both files of extreme events created by the WEI and SSI indices. The SSI index favours large scale events at the expense of the short ones connected with convection. Both indices evaluate large-scale events almost identically. The WEI index evaluates events mostly as longer-lasting than the SSI, In contrast, the affected area is usually smaller according to the WEI. The WEI is also more sensitive to detecting events associated with convection. Another advantage of this index is the automatic determination of the duration of each event and sensitive determination of the affected area.

**Keywords:** strong wind, wind speed, return period, extremity index, seasonality, the Czech Republic