



Assessment of spatial variation of extreme wind speeds

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Wind storms can cause significant damage to forests and forestry in northern and central Europe. Detailed high resolution (< 100 m) analysis representing spatial variation in return levels of maximum wind speeds can be used to map the most vulnerable regions and hence support risk assessment in forest management planning. The effective GIS tools and detailed terrain information enable efficient processing of high resolution wind risk maps.

In this work, we applied the so called wind multiplier approach to downscale wind speed return levels up to 100 year return periods derived from ERA-Interim reanalyzed wind speeds. In the wind speed multiplier approach terrain properties are taken into account in assessing local maximum wind speeds. The return level of regional gust wind speed is localized into site specific gust wind speed using terrain roughness multiplier, shielding multiplier and topographic (shape of hill) multiplier. The impact of wind direction is also taken into account by calculating wind speed multipliers for eight directions, i.e. cardinal and intercardinal directions. Regional scale return levels of maximum wind speed were calculated using the Generalized Extreme Value method and ERA-Interim reanalysis dataset. In addition, local wind measurements were used to validate reanalysis based results.

Our mainly forest covered test area was located around the fell of Pyhätunturi (N 67.02204°, E 27.2184°), covering 20 km * 20 km area. The elevation in the area varies from 148 m to 526 m above sea level. In addition to forests, other terrain types included open tundra, agricultural fields, lakes and ski slopes. The land-use classes were derived from the 20 m spatial resolution CORINE dataset.