Statistical Modelling of Weather-Related Car Accidents in Germany

Nico Becker (1,2), Tobias Pardowitz (1,2), and Uwe Ulbrich (1)

(1) Freie Universität Berlin, Institut für Meteorologie, Berlin, Germany (nico.becker@met.fu-berlin.de), (2) Hans Ertel Centre for Weather Research, Berlin, Germany

Weather effects can have a strong impact on car accident counts. Important factors are for example rain, snow and ice, wind, or dazzling sun. Several studies have addressed the impact of weather on monthly or daily car accident counts in different regions. However, little research is available regarding hourly accident counts, in particular for the area of Germany.

In this work, we use a data set of eleven years of heavy car accident records for Germany to analyse frequency and circumstances of weather-related car accidents. On average, almost 10% of all accidents can be directly attributed to weather effects, however, in winter and at higher driving speeds the percentages exceed 30%. We use a Poisson regression approach to statistically model weather-related accident counts on different temporal and spatial scales. Different weather related predictor variables are created from the COSMO reanalysis data set. In general, we find that increasing the spatial and temporal scales improves the model performance. For example, for a model of weather related car accident counts in North Rhine-Westphalia, using only precipitation as a weather-related predictor variable, the explained variance is 20% and 35% on an hourly and daily time scale, respectively.