

The spatial distribution of icing in Germany estimated by the analysis of weather station data and of direct measurements of icing

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The spatial distribution of icing in Germany was analyzed using weather station data of 71 meteorological stations evenly distributed over the territory of Germany as well as direct measurements of icing at up to 35 stations in the east part of Germany for the period 1980-1999. Five of these stations are situated at altitudes higher than 1000 m and 55 of them are situated at altitudes less than 500 m.

The study was elaborated using the hourly ground SYNOP messages from weather stations as primary data in order to accomplish an accurate description of all icing phenomena from a (nearly) homogeneous data set. All hourly ground SYNOP messages (ww-codes from table 4677) which report icing, that means all messages regarding the occurrence of freezing precipitation, of rime icing and of wet snow accretion, were analyzed. The frequencies of occurrence of icing were computed as the ratio of the number of SYNOP messages reporting icing phenomena to the total number of SYNOP messages.

Results of icing frequencies from weather station data were compared to the frequencies of occurrence of icing that were measured directly. The comparison shows, that low frequencies of icing are generally overestimated, whereas high frequencies of icing are mostly underestimated by the analysis of weather station data.

The spatial analysis of icing in Germany showed that freezing precipitation and rime icing events occur more often in mountainous regions with altitudes between about 500 m and 1500 m above sea level than in lowland regions. The frequency of freezing precipitation decreases remarkably in high altitude areas, mainly at exposed locations, whereas the frequency of rime icing increases in those regions. Wet snow events are in general more frequent in lowland regions of (north-)west Germany than in mountainous areas. Nevertheless, surprisingly high frequencies of wet snow events have been determined for the south part of Germany as well, especially in regions of the foothills of the Alps.

The frequency of occurrence of icing was examined for its dependence on the height above sea level. The results show that the frequency of icing occurrence increases with altitude in general. Furthermore, the (local) exposure of a location plays an important role in the icing process. Therefore, exposed (sheltered) locations may show much higher (lower) icing frequencies.

Finally, an icing map of Germany has been developed applying the knowledge on the dependence of icing on the height above sea level as well as on the exposure.