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Towards a reproducible snow load map – an example for Austria

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The European Committee for Standardization provides coarse rules for the estimation of snow load maps for structural design. European countries can apply their own methodologies, resulting in inconsistencies for the 50-year return level of snow load at national borders. Commonly used approaches base on more or less sophisticated interpolation of snow depths with a subsequent assignment of snow density, or spatial extreme value interpolation of snow load measurements.

We propose a novel methodology for Austria, where snow load observations are not available. It is based on (1) modeling yearly snow load maxima with the specially developed Δ SNOW model, and (2) a generalized additive model, where explaining covariates and their combinations are represented by penalized regression splines, fitted to such derived snow load series. Results show an RMSE of 0.7 kN/m², and a BIAS of -0.2 kN/m² over all altitudes, thereby outperforming a smooth spatial extreme value model and the actual Austrian standard, when compared to locally estimated, “quasi-observed “ 50-year snow load maxima at 870 stations in and tightly around Austria.

The new approach requires no zoning and provides a reproducible and transparent approach. Due to the relatively ease of use and snow depth measurements as single prerequisite, the method is applicable in other countries as well. Negative BIASes, that significantly underestimate 50-year snow loads at a small number of stations, are the only objective problem that has to be solved before the new map can be proposed as a successor of the actual Austrian snow load map.