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Extreme snow loads in Austria

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In the framework of European standards for structural design, acceptable snow loads on constructions and buildings are based on maps for $s_{k,}$ the "characteristic snow load on the ground" with an average reoccurrence time of 50 years. The Austrian snow load standard is built on a very detailed zoning map from 2006, but underlying snow data is from the 1980s.

An updated snow load map for Austria is presented. It is based on 870 snow depth records with at least 30 years of regular daily observations between 1960 and 2019. ΔSNOW, a novel snow model, was used to simulate respective snow loads. Extreme value theory and generalized additive models led to a smooth map of extreme snow loads at 50x50m resolution. The methods are transparently published, reproducible and, thus, applicable in other regions as well.

The map can reasonably assign s_k values up to 2000m altitude, a significant advantage compared to actual standards which are only valid up to 1500m. New insights in the spatial picture of extreme snow loads are provided and the quadratic altitude-s_k-relation, which is widely used in snow load standards, is evaluated. Validation with station data reveals a higher accuracy for the presented map than for the currently used snow load map. The number of outliers, i.d. stations with significantly higher or lower s_k values than the snow load maps would suggest, could be decreased in comparison with the actual standard. However, some problematic places remain, mostly in topographically and climatologically highly complex areas. In case the presented map will become a new base for future Austrian standards, those places will have to be treated in a special way.