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Permafrost distribution in the Southern Carpathians, Romania, derived from statistical modeling

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Mountain permafrost and rock glaciers have been intensely investigated in Southern Carpathians highest ranges in the last 15 years using thermal, geophysical and remote sensing methods. However, a complete estimation of permafrost area has not been done so far. Thus, using statistical modeling we intend to offer an image of potential permafrost distribution in Southern Carpathians ranges of Făgăraș, Iezer, Parâng, Retezat, Godeanu and Țarcu. Model 1 is based on machine learning algorithms and model 2 is based on Maxent model. Both models use bottom temperature of snow (BTS) data as independent variable and land cover, altitude, slope curvature, solar radiation and snow probability as independent variables. Land cover is considered the key variable as the field methods indicated that permafrost can only be present in the talus deposits that produce negative thermal anomalies in the underground. Results indicated an area of about 45-60 km^2 of potential permafrost distribution depending on the BTS threshold used for permafrost presence (-3°C, -2.5°C and -2°C). This represent about 0.01% from a total surface of about 4334 km^2 of the six ranges used in this analysis being a typical sporadic mountain permafrost in a marginal periglacial environment.