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Including small-scale topographic effects on local climate substantially affects modelled vegetation distribution in a central European mountain area

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Understanding the effect of climate on the distribution and composition of vegetation is crucial to investigate its response to climate change. However, process-based vegetation models usually use comparably coarse-grain climatic data, which underestimate topographic effects on local climate.
To evaluate potential effects of topoclimate on vegetation redistribution predicted by the process-based vegetation model LPJmL, we compared modelled vegetation based on different climate inputs, namely coarse-grained climatic data, data corrected for temperature lapse rate according to local elevation and data incorporating topographic effects responsible for cool-air pooling and anisotropic heat load in a hilly region in the Czech Republic.
The results showed the pronounced effect of terrain topography as well the large discrepancy between coarse-scale climate and locally adapted climate. Our results thus give a hint on how sensitive modelled vegetation distribution is to climate input correction. We found that despite future climate change, including higher temperatures and less precipitation, the current vegetation might be able to remain in some local refuges, which are however not captured by coarse-scale climatic dataset. Therefore, the inclusion of topographic effects is crucial for realistic estimates of the vegetation redistribution in the response to climate change.