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Modelling solar energy effects on rewetted peatlands

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The rewetting of agriculturally used peatland is essential to reduce carbon (C) emissions and may thus make an important contribution to climate protection. As one possibility to maintain economical use of the areas despite permanently wet ground, the installation of photovoltaic systems was suggested. In addition to generating energy, the solar panels could have other positive effects on the ecosystem: They potentially reduce evaporation and thus dryness in summer, which is important for reducing emissions. More stable moist conditions may also promote the establishment of specialized species of raised bog vegetation, which are the goal of nature conservation efforts. However, high coverage of solar panels could also lead to a lack of light, and the resulting absence of specialized bog species may even increase C emissions via indirect effects. Here we present a new bog vegetation modelling approach that aims to provide an initial estimate of the optimal degree of solar panel coverage from the perspective of climate protection and nature conservation, for given climatic and soil conditions. The model is validated against observational data of microclimate variables, soil temperature and water level from a test site on rewetted peat soil, under the influence of different coverage levels of solar panels in a multifactorial experiment. With our approach, we plan to provide recommendations for action for the planning of solar parks on rewetted, formerly agricultural peatlands to landowners and other stakeholders.