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Effects of species selection and management on forest canopy albedo

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Forest management is considered to be one of the key instruments available to mitigate climate change as it can lead to increased sequestration of atmospheric carbon dioxide. However, the changes in canopy albedo may neutralise or offset the climate benefits of carbon sequestration. Although there is an emerging body of literature linking canopy albedo to management, understanding is still fragmented.

We make use of a generally applicable approach: we combine a stand-level forest gap model with a canopy radiation transfer model and satellite-derived model parameters to quantify the effects of forest management on canopy albedo for different forest species and management strategies.

We find that the most intensive management measures lead to largest albedo change. The choice of species in combination with thinning dominates the variation in canopy albedo. In addition, the canopy albedo of forest stands changes with the latitude, i.e. forest stands with similar structure have different albedo depending on the latitude. The structural changes associated with forest management can be described by change in LAI in combination with crown volume. However, not only the removal of trees but also the type of understorey affects the canopy albedo. The lower the canopy cover, the larger the background albedo contributes to the canopy albedo. In summary, forest albedo is strongly altered by humans.