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# Improvement of boreal vegetation modelling and climate interactions through the introduction of new bryophyte and artic-shrub plant functional types in a land surface model.

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Boreal and tundra vegetation, which represents 22% of the global land area, has had a significant impact on climate through changes of albedo, snow cover, soil thermal dynamics, etc. However, it is frequently poorly represented in earth system models used for climate predictions. We improved the description of high-latitude vegetation and its interactions with the environment in the ORCHIDEE land surface model by creating new plant functional types with specific biogeochemical and biophysical properties: boreal shrubs, bryophytes (mosses and lichens) and boreal C3 grasses.
The introduction of shrub specificities allows for an intermediate stratum between trees and grasses, with a new carbon allometry within the plant, inducing new interactions between wooden species and their environment, especially the complex snow-shrubs interaction. Similarly, the introduction of non-vascular plants (i.e. bryophytes) involves numerous changes both in physical and biological processes, such as the response of photosynthesis to surface humidity, the decomposition of carbon and the soil thermal conductivity. These changes in turn lead to new processes and interactions between vegetation and moisture (soil and air), carbon cycle, energy balance, etc. For the boreal C3 grasses we did not include new processes compared to the generic C3 grass PFT, but improved the realism of the carbon and water budgets with new boreal adjusted parameters.
We assess the performance of the modified ORCHIDEE land surface model and in particular its ability to represent the new plant types (their phenology etc.), and evaluate the effects of these new PFTs on the simulated energy, water and carbon balances of boreal ecosystems. The potential impact of these refinements on future climate simulations will be discussed.