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Carbon balance modification in Sphagnum-dominated peat mesocosms invaded by Molinia caerulea

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Plant communities have a key role in regulating greenhouse gas (GHG) emissions in peatland ecosystems and thus on their capacity to act as carbon (C) sink. However, in response to global change, boreal and temperate peatlands may shift from Sphagnum to vascular plant-dominated peatlands that may alter their C-sink function. We set up a mesocosm experiment to investigate how the main GHG fluxes (CO_2 and CH4) are affected by plant community modification from Sphagnum mosses to Molinia caerulea dominance. Gross primary production (GPP), ecosystem respiration (ER) and CH4 emissions models were used to compare the C balance and global warming potential under both vegetation cover. While the annual CO_2 and CH4 emissions modeling estimated an output of respectively 652 and 18 gC m-2 y-1 in Sphagnum mesocosms, it represented a release of 1473 and 50 gC m-2 y-1 with Molinia caerulea occurrence. Annual modeled GPP was respectively -495 and -1968 gC m-2 y-1 in Sphagnum and Molinia mesocosms leading to a net ecosystem carbon balance (NECB) of 175 g gC m-2 y-1 in Sphagnum mesocosms (i.e. a C-source) and of -445 gC m-2 y-1 for Molinia ones (i.e. a C-sink). Even if CH4 emission accounted for a small part of the gaseous C efflux ($\sim 3\%$), its global warming potential value to get CO_2 equivalent makes both plant communities acting as a warming climate effect. The vegetation shift from Sphagnum mosses to Molinia caerulea seems beneficial for C sequestration regarding the gaseous pool. However, roots and litters of Molinia caerulea could further provide substrates for C emissions and dissolved organic C release.