

Supplementary material for the manuscript "Effect of future forest management on carbon and energy budgets in pine forests on mineral soil in southern Finland"

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Soil property	Value
Porosity	43.28 %
Field capacity	40.59 %
Wilting point	10.47 %
% of clay	9.96 %
% of sand	49.45 %
% of silt	40.59 %
Max. root depth	1 meter

Table S1. Soil properties in Hyytiälä SMEAR II forestry station, used in JSBACH_FOM simulations for pines during 2010–2054

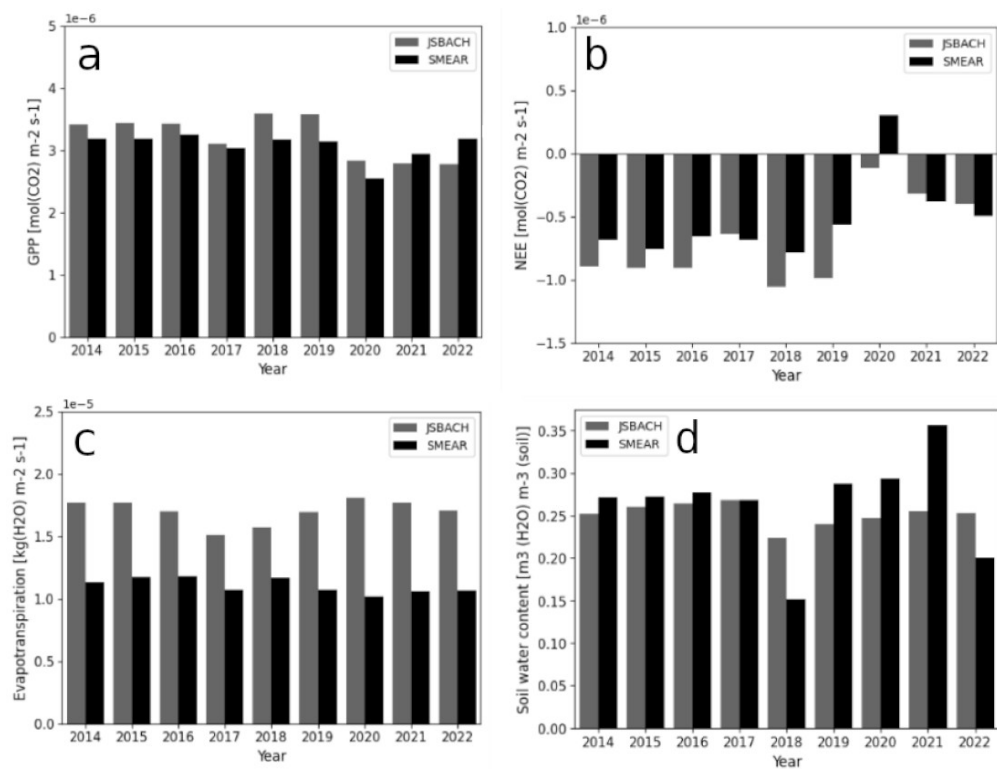


Figure S1. Comparison of JSBACH outputs and SMEAR II measurements of annual mean values during 2014–2022 of **a)** GPP **b)** NEE **c)** evapotranspiration and **d)** soil water content

$$IRF(t) = a_0 + \sum_{i=1}^3 a_i \cdot \exp\left(\frac{-t}{\tau_i}\right) \quad \text{for } 0 \leq t \leq 1000 \text{yr}$$

Equation S1. Impulse response function for k_{CO_2} by Joos et al. (2013)

	a_0	a_1	a_2	a_3	τ_1	τ_2	τ_3
multi-model mean	2.134E-01	2.240E-01	2.824E-01	2.763E-01	3.944E+02	3.654E+01	4.304E+00

Table S2. Coefficients used for the IRF by Joos et al. (2013), based on a multi-model mean decay rate of k_{CO_2} pulses.

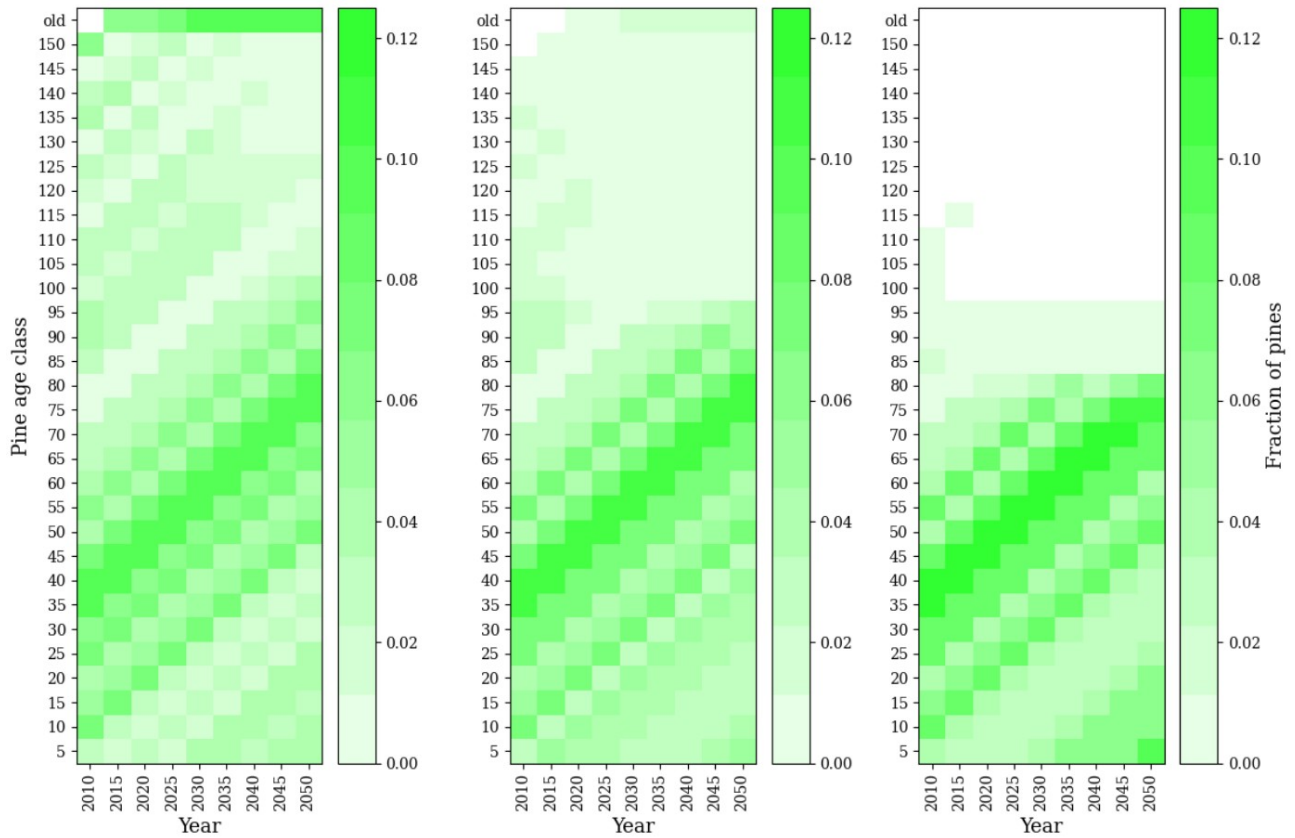


Figure S2. Fraction of trees belonging to each 5-year-old age-class from 2010 to 2050 in EC (left) BA (middle) and PR (right), with harvests taking place once every 5 years. (Lintunen et al., 2015)

	Albedo		Latent heat flux		Sensible heat flux		Total	
	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
CanESM2								
EC - BA	0.128	0.124	-0.819	-0.914	0.714	0.817	0.023	0.027
EC - PR	0.245	0.243	-1.4	-1.56	1.21	1.39	0.05	0.056
CNRM_CM5								
EC - BA	0.106	0.106	-0.667	-0.566	0.6	0.496	0.039	0.036
EC - PR	0.207	0.205	-1.09	-0.739	0.959	0.609	0.076	0.075
MIROC5								
EC - BA	0.102	0.102	-0.637	-0.653	0.579	0.602	0.044	0.051
EC - PR	0.199	0.203	-0.888	-1.02	0.78	0.919	0.091	0.102
Model mean								
EC - BA	0.112	0.111	-0.708	-0.711	0.631	0.638	0.035	0.038
EC - PR	0.217	0.217	-1.126	-1.106	0.983	0.972	0.083	0.063

Table S3. 45-year mean [2010–2054] radiative forcing differences between EC and BA and EC and PR under RCP 4.5 and RCP 8.5 in CanESM2, CNRM_CM5 and MIROC5. Values are in W m⁻² and positive values indicate EC warming more by the specified amount.

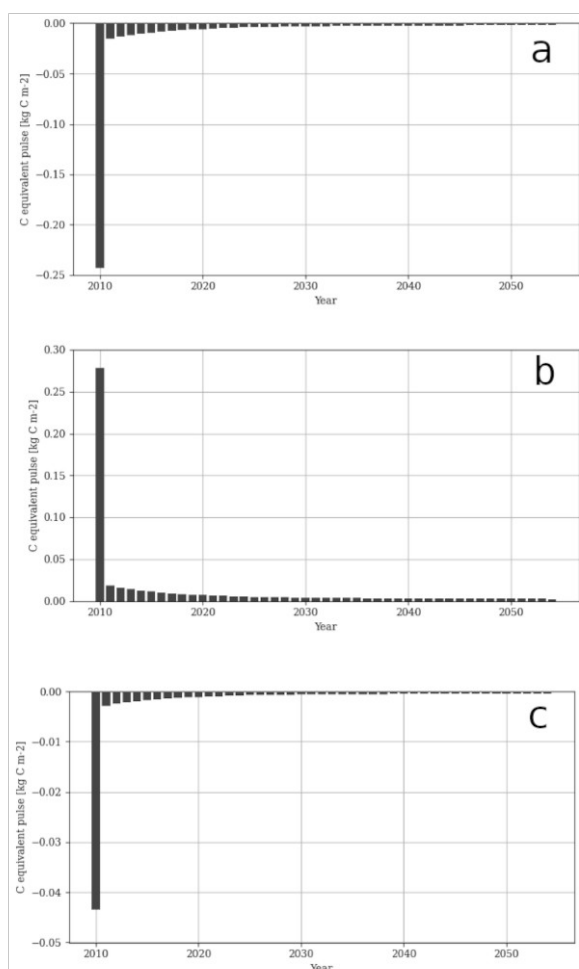


Figure S3. Yearly carbon equivalent pulses based on the radiative forcing differences between EC and BA under RCP 4.5 in CanESM2 resulting from **a)** albedo , **b)** latent heat flux and **c)** sensible heat flux, from which the total carbon equivalent value during 2010–2054 is based on

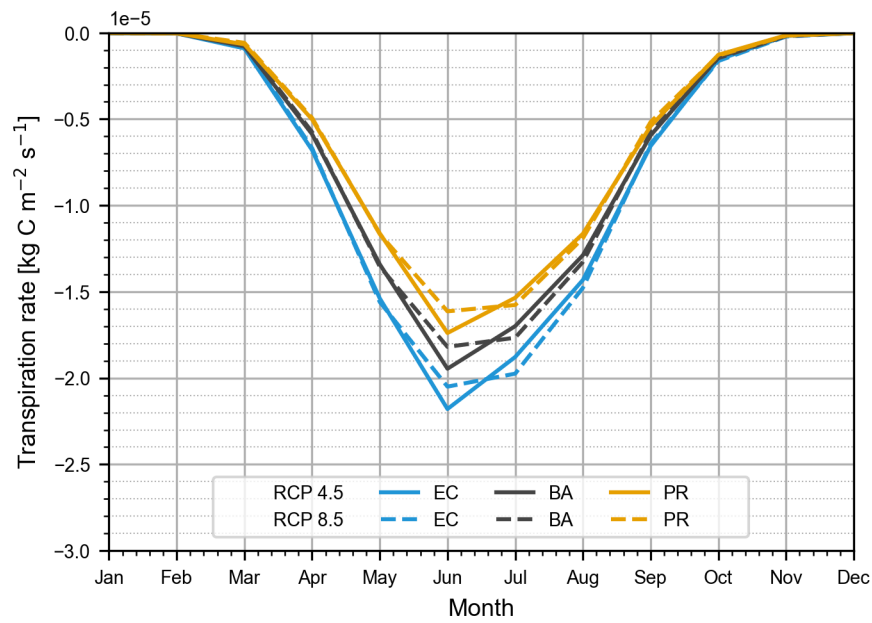


Figure S4. Monthly mean transpiration rate from the pine trees during 2010–2054 in EC (blue), BA (grey) and PR (orange) in CanESM2, under both RCP 4.5 (dashed lines) and RCP 8.5 (solid lines)

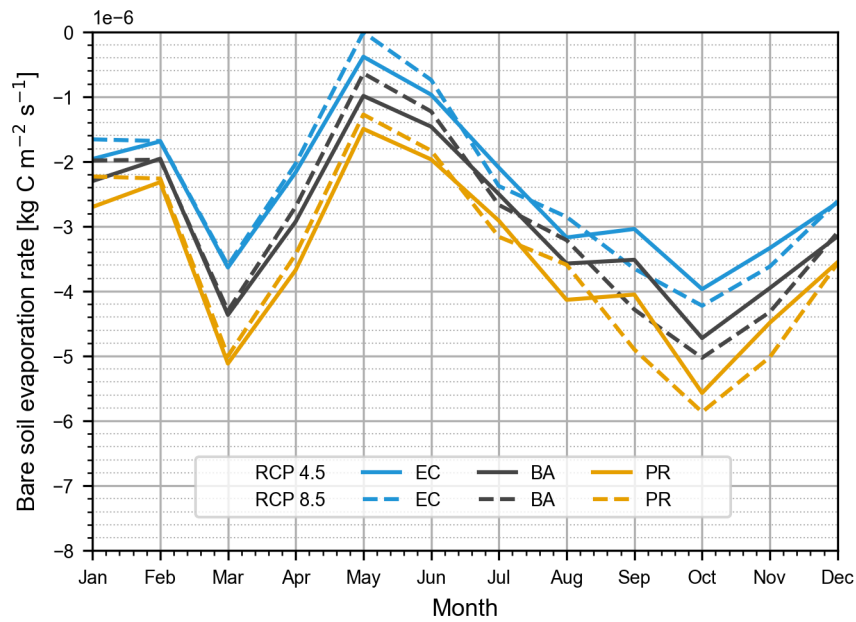


Figure S5. Monthly mean bare soil evaporation rate from the pine trees during 2010–2054 in EC (blue), BA (grey) and PR (orange) in CanESM2, under both RCP 4.5 (dashed lines) and RCP 8.5 (solid lines)

References

Joos, F., Roth, R., Fuglestvedt, J. S., Peters, G. P., Enting, I. G., von Bloh, W., Brovkin, V., Burke, E. J., Eby, M., Edwards, N. R., Friedrich, T., Frölicher, T. L., Halloran, P. R., Holden, P. B., Jones, C., Kleinen, T., Mackenzie, F. T., Matsumoto, K., Meinshausen, M., Plattner, G.-K., Reisinger, A., Segschneider, J., Shaffer, G., Steinacher, M., Strassmann, K., Tanaka, K., Timmermann, A., and Weaver, A. J.: Carbon dioxide and climate impulse response functions for the computation of greenhouse gas metrics: a multi-model analysis, *Atmospheric Chemistry and Physics*, 13, 2793–2825, <https://doi.org/10.5194/acp-13-2793-2013>, publisher: Copernicus GmbH, 2013.

Lintunen, J., Laturi, J., and Uusivuori, J.: Finnish Forest and Energy Policy Model (FinFEP): A Model Description, Tech. Rep. 59/2015, Luonnonvarakeskus (Luke), Helsinki, Finland, ISBN 978-952-326-118-1, <https://urn.fi/URN:ISBN:978-952-326-119-8>, 2015.