Supplementary Information

Contribution of fine roots on carbon allocation patterns in Norwegian forests

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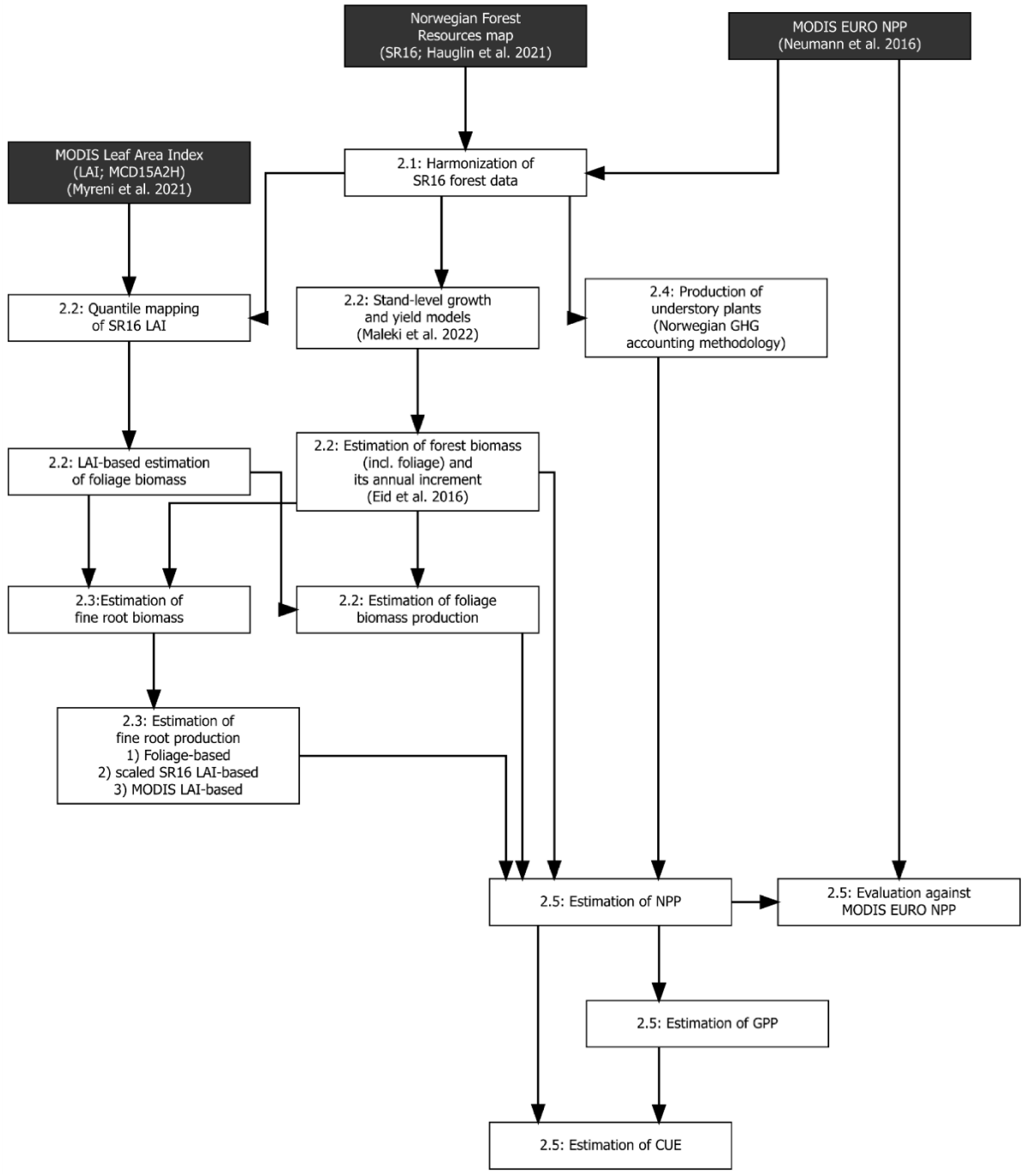
Table S1 Vegetation biomass look-up table according to the Norwegian GHG accounting

Stand age range	Norway spruce (kg ha^{-1})				Scot spine (kg ha^{-1})				Deciduous (kg ha^{-1})			
	Mosses	Lichens	Herbaceous plant	Shrubs	Mosses	Lichens	Herbaceous plant	Shrubs	Mosses	Lichens	Herbaceous plant	Shrubs
<15	700	0	200	200	1125	350	200	450	425	0	350	120
15 - 30	800	0	200	200	1300	350	200	500	400	0	225	130
30 - 45	900	0	150	200	1400	350	150	550	375	0	125	140
45 - 60	1050	0	125	200	1500	350	125	600	350	0	100	150
60 - 75	1200	0	100	250	1525	350	100	700	330	0	75	160
75 - 90	1300	0	100	250	1550	350	100	750	325	0	50	175
90 - 105	1500	0	75	250	1600	300	75	800	300	0	50	200
105 - 120	1600	0	50	250	1700	300	50	800	300	0	50	200
>120	2000	0	50	250	1700	300	50	750	300	0	50	200

Table S2 Vegetation biomass turnover rates according to the Norwegian GHG accounting

Vegetation component	Turnover (times yr^{-1})		Comment
	Aboveground biomass	Belowground biomass	
Mosses	0.33	_	
Lichen	0.1	_	
Herbaceous plant	1	0.33	Belowground biomass is assumed to be 2x the aboveground biomass
Shrubs	0.25	0.33	



15 **Figure S1: Flowchart of the workflow used to derive estimates of net primary production (NPP), gross primary production (GPP), and carbon use efficiency (CUE) of Norwegian forests. Filled boxes represent the main datasets used in the study, whereas open boxes indicate the different methodological steps. Numbers within the boxes refer to the corresponding sections in the Materials and Methods.**

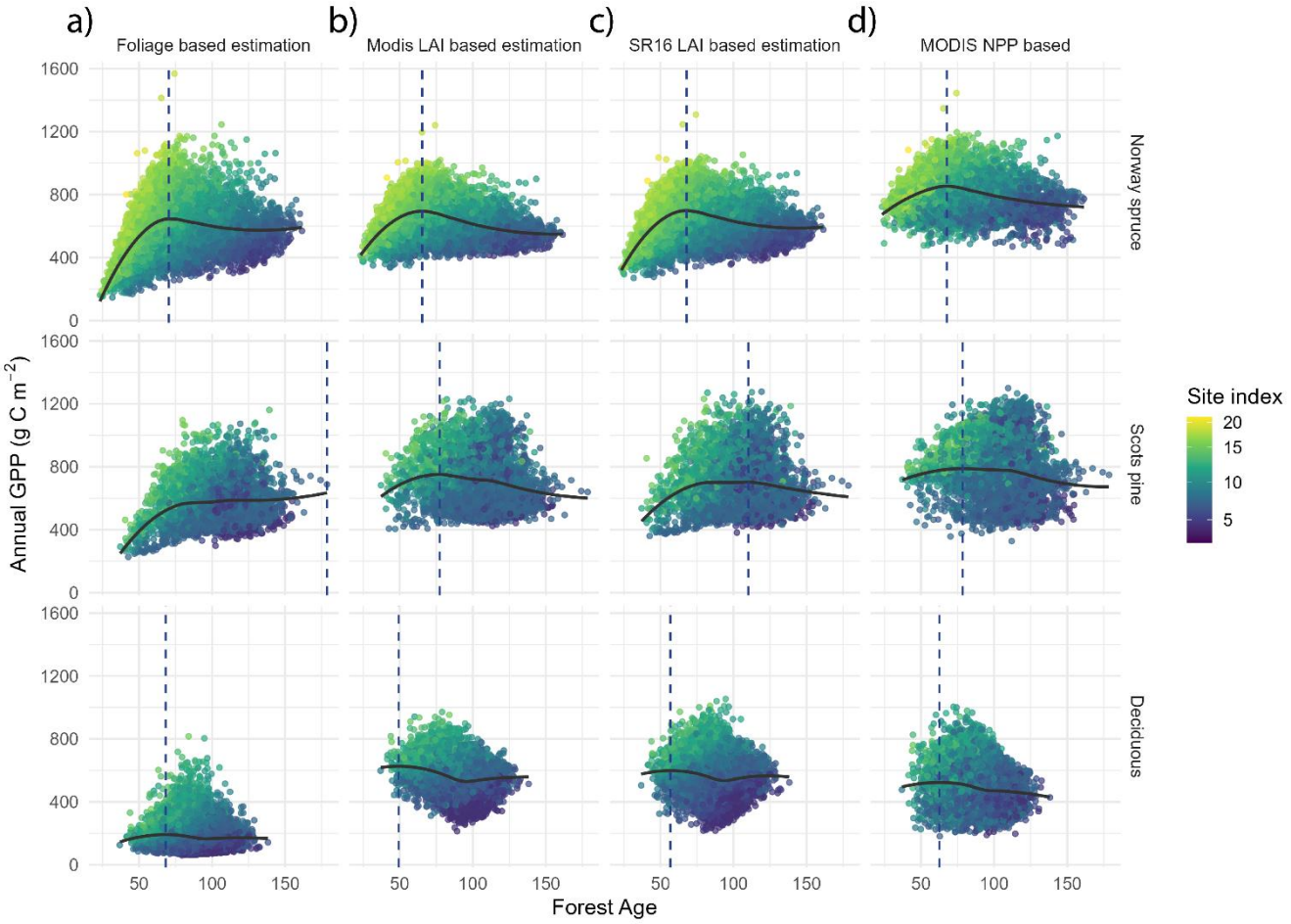


Figure S2: Relationships between total annual gross primary production (GPP) and forest age across Norwegian forests dominated by Norway spruce, Scots pine, or deciduous trees (primarily Betula spp.). GPP represents total carbon fixed by plants through photosynthesis, including carbon incorporated into plant biomass and lost via respiration. Panels (a-c) present GPP estimates based on data from the Norwegian Forest Resources Map SR16, with different methods for estimating fine root biomass and production. The foliage-based method used allometric foliage biomass estimates, and the two LAI-based methods used LAI and specific leaf area values. LAI data came from either MODIS (column b; MODIS LAI) or optically scaled SR16 LAI (column c). Column (d) displays GPP from MODIS Euro NPP data, following a similar approach to the MODIS algorithm for GPP estimation, including ecosystem respiration based on biomass estimates. Solid lines in all panels represent LOESS regression to show the non-linear development of GPP with forest age, with the color gradient reflecting site index (a proxy for fertility) and site index values log10 transformed in all panels.

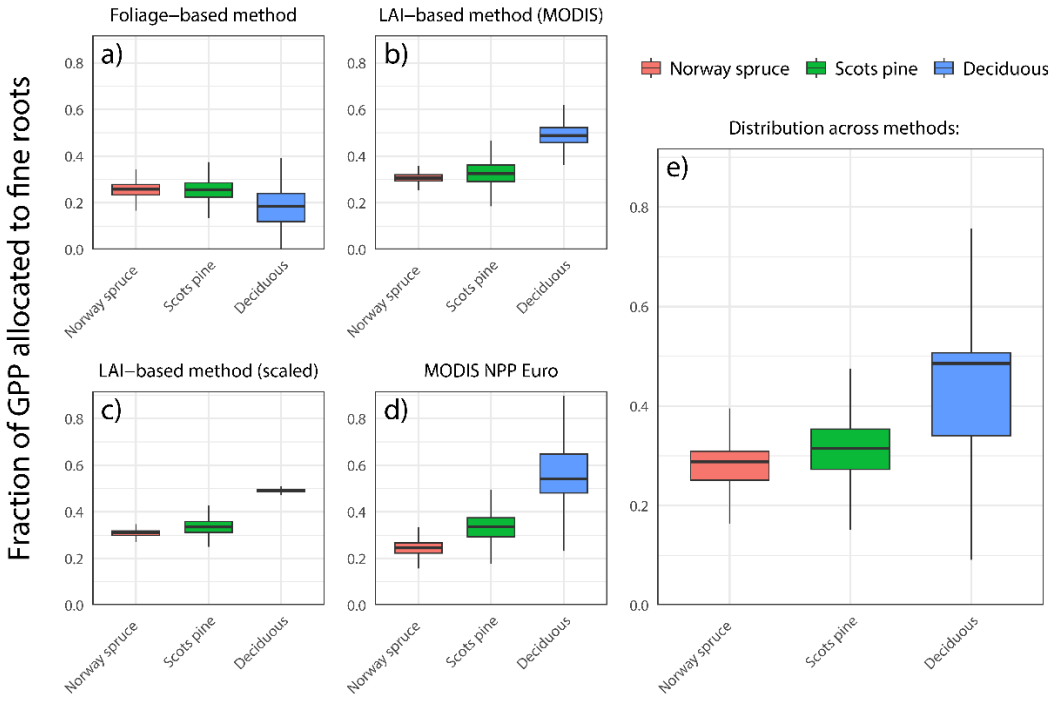


Figure S3: Fraction of gross primary production (GPP) allocated to fine roots, estimated using three methods for determining foliage biomass and related fine root dynamics. All values rely on ratios of foliage-to-fine root biomass. The foliage-based method (a) used allometric estimates of foliage biomass, while the two LAI-based methods (b-c) used specific leaf area values for biomass calculation. Panel (d) incorporates MODIS LAI and NPP data, in contrast to panels (a-c), which used SR16 data for NPP estimation. Panel (e) shows distribution of estimated belowground C allocation across all methods (a - d).

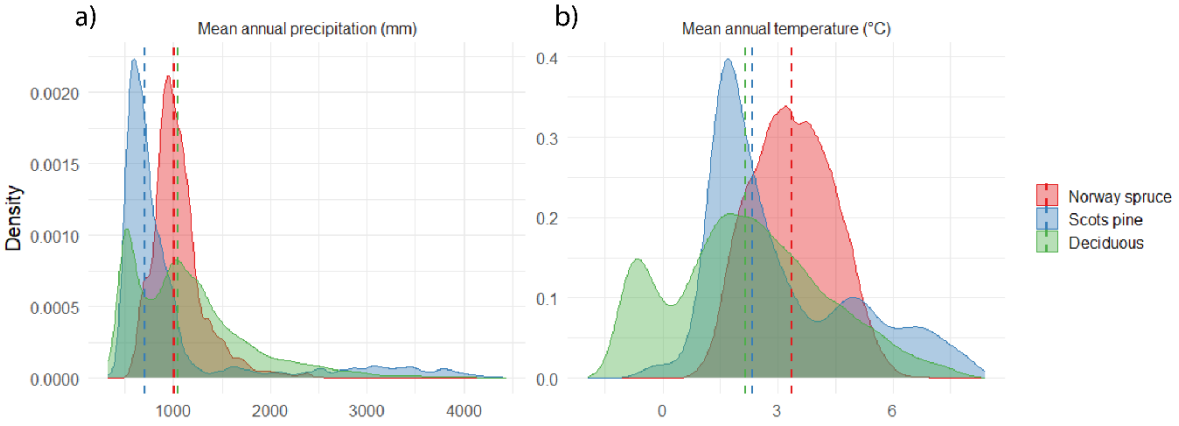


Figure S4: Density distributions of mean annual precipitation (a) and temperature (b). Vertical lines indicates the median values of the density distributions.

References

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