

# Supplement for: Carbon cycling in mature and regrowth forests globally: a macroecological synthesis based on the global Forest Carbon (ForC) database

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## Appendix S1. Duplicates and Conflicting Records within ForC

### Status of duplicates and conflicting records within ForC

ForC v3.0 contains potential duplicates that have arisen from importing intermediary data sets with overlap in data. In particular, the recent imports of SRDB and GROA resulted in the introduction of numerous potential duplicates. SRDB and ForC were developed independently (but with different foci), resulting in numerous duplicates. The GROA database incorporated ForC data. For records retaining the same site names, GROA duplicates were not imported into ForC (although they were checked against corresponding ForC records, and differences reconciled). There were, however, some records entered into GROA independently of ForC, resulting in mismatched names.

Prior to the merging of the three databases (ForC v2.0, SRDB, and GROA), there were potential duplicates within the ForC and SRDB portions, the latter an artifact of how data were recorded in SRDB and imported into ForC. GROA has no known duplicates, with several steps having been taken to ensure independence of the records within the database.

### Detecting and reconciling duplicate sites

To the extent possible, we used automated scripts in R to detect duplicate records. Potential duplicates were defined as geographically proximate records for stands of **similar age** with the same variable measured in the same year (if known). In cases where site name, plot name, and stand age matched, duplicate status could be automatically detected and reconciled (see below). In cases where site and plot names or reported age differed, our script detected potential duplicate sites that were **geographically proximate**. When all such potential duplicate sites were within GROA, they were assumed independent.

Suspected duplicates require manual review and merging of records, and this process has not been completed for all records. To handle potential duplicates at sites that have yet to be reviewed, we implemented the following procedure. In cases where a single location – generally an established research site where multiple investigators have worked – contained multiple plots in nested or unknown relation to one another, we grouped multiple sites into a “supersite” (e.g., Harvard Forest, Barro Colorado Island, Pasoh Forest Reserve), and duplicates within a supersite were handled in the same way as records with matching site and plot names. (**VALENTINE, IS THIS ACCURATE?**) For suspected duplicate groups that were not flagged as supersites and had not yet been reviewed, we retained only one potential duplicate record, assigning precedence as follows: (1) original GROA record(s), (2) record(s) in ForC prior to SRDB and GROA import, (3) SRDB record(s).

Finally, . . . <https://github.com/forc-db/ERL-review/issues/34>

### Generating ForC\_simplified

Detected duplicates were reconciled as follows. Replicate measurements (*i.e.*, replicates from within a single study) were averaged. Records that subsumed others—*i.e.*, the time period included that of  $\geq 2$  other records or dates were unknown and therefore conflicted with  $\geq 2$  other records—were removed. For each group of duplicate records—*i.e.*, measurements of the same variable in the same plot at the same time—one record was assigned precedence (recorded in D.precedence field). When duplicates were exact matches, **one was dropped**. When measurement periods overlapped or were not specified, precedence was given first to

73 records representing longer measurement periods (*i.e.*, end.date - start.date) and then to more recently  
74 published values. We manually reviewed duplicates that differed only in methodology, assigning precedence  
75 to the record employing a more comprehensive approach (*e.g.*, inclusion of understory, lianas, or bamboo as  
76 opposed to just trees) or using a favored methodology.

77 **Table S1. Numbers of records by biome and age class**

Biome	n records	
	Mature	Young
<b>Boreal climate zones</b>		
Boreal broadleaf	3	408
<b>Boreal conifer</b>	<b>614</b>	<b>1352</b>
Boreal Other	53	302
<b>Excluded climate zones</b>		
Other broadleaf	8	128
Other conifer	30	68
Other Other	6	41
<b>Temperate climate zones</b>		
<b>Temperate broadleaf</b>	<b>877</b>	<b>3327</b>
<b>Temperate conifer</b>	<b>784</b>	<b>3134</b>
Temperate Other	211	2697
<b>Tropical climate zones</b>		
<b>Tropical broadleaf</b>	<b>1292</b>	<b>3467</b>
Tropical conifer	3	13
Tropical Other	8	0

78 Sample sizes refer to data set after merging of duplicates, removal of stands with no age or history data, and  
79 removal of managed and disturbed stands. For vegetation type, “Other” refers to stands that are mixed  
80 broadleaf/ conifer or that have not been classified. Focal biomes are indicated in bold.

81 **Table S2. Model parameter estimates for age trends and biome differences in**  
82 **young forests**

Variable	Parameter	Estimate	SE	$t_{value}$
<i>NEP</i>	log10(stand.age)	1.47	0.75	1.97
<i>NEP</i>	BiomeTemperate broadleaf	-0.14	1.23	-0.11
<i>NEP</i>	BiomeTemperate conifer	-1.9	0.72	-2.66
<i>NEP</i>	BiomeBoreal conifer	0.78	1	0.78
<i>NEP</i>	log10(stand.age):BiomeTemperate conifer	2.2	0.85	2.59
<i>NEP</i>	log10(stand.age):BiomeBoreal conifer	-1.41	0.93	-1.52
<i>GPP</i>	log10(stand.age)	5.08	2.31	2.2
<i>GPP</i>	BiomeTemperate broadleaf	7.04	3.52	2
<i>GPP</i>	BiomeTemperate conifer	9.57	2.24	4.27
<i>GPP</i>	BiomeBoreal conifer	3.33	3.25	1.02
<i>GPP</i>	log10(stand.age):BiomeTemperate conifer	0.04	2.57	0.02
<i>GPP</i>	log10(stand.age):BiomeBoreal conifer	-1.93	2.86	-0.67
<i>NPP</i>	log10(stand.age)	1.24	0.75	1.66
<i>NPP</i>	BiomeTropical broadleaf	9.66	1.77	5.47
<i>NPP</i>	BiomeTemperate broadleaf	4.89	1.37	3.58
<i>NPP</i>	BiomeTemperate conifer	4.1	1.26	3.26
<i>NPP</i>	BiomeBoreal conifer	1.58	1.54	1.03
<i>ANPP</i>	log10(stand.age)	5.46	0.94	5.81
<i>ANPP</i>	BiomeTropical broadleaf	-1.25	1.53	-0.81
<i>ANPP</i>	BiomeTemperate broadleaf	0.98	1.14	0.86
<i>ANPP</i>	BiomeTemperate conifer	1.42	1	1.43
<i>ANPP</i>	BiomeBoreal conifer	0.48	1.41	0.34
<i>ANPP</i>	log10(stand.age):BiomeTemperate broadleaf	-3.19	1.15	-2.77
<i>ANPP</i>	log10(stand.age):BiomeTemperate conifer	-4.23	1.13	-3.75
<i>ANPP</i>	log10(stand.age):BiomeBoreal conifer	-4.32	1.24	-3.48
<i>ANPP<sub>woody</sub></i>	log10(stand.age)	2.96	3.89	0.76
<i>ANPP<sub>woody</sub></i>	BiomeTemperate broadleaf	-2.34	6.94	-0.34
<i>ANPP<sub>woody</sub></i>	BiomeTemperate conifer	-0.05	0.89	-0.06
<i>ANPP<sub>woody</sub></i>	BiomeBoreal conifer	0.71	1.9	0.37
<i>ANPP<sub>woody</sub></i>	log10(stand.age):BiomeTemperate conifer	-1.03	3.9	-0.26
<i>ANPP<sub>woody</sub></i>	log10(stand.age):BiomeBoreal conifer	-2.36	4.04	-0.59
<i>ANPP<sub>stem</sub></i>	log10(stand.age)	-0.03	0.8	-0.03
<i>ANPP<sub>stem</sub></i>	BiomeTropical broadleaf	2.38	1.24	1.92
<i>ANPP<sub>stem</sub></i>	BiomeTemperate broadleaf	2.86	0.66	4.33
<i>ANPP<sub>stem</sub></i>	BiomeTemperate conifer	-0.83	0.75	-1.1
<i>ANPP<sub>stem</sub></i>	BiomeBoreal conifer	-0.37	1.64	-0.23

(continued)

Variable	Parameter	Estimate	SE	$t_{value}$
$ANPP_{stem}$	$\log_{10}(\text{stand.age}): \text{BiomeTemperate broadleaf}$	-0.03	0.9	-0.04
$ANPP_{stem}$	$\log_{10}(\text{stand.age}): \text{BiomeTemperate conifer}$	2.28	0.93	2.45
$ANPP_{stem}$	$\log_{10}(\text{stand.age}): \text{BiomeBoreal conifer}$	0.78	1.28	0.61
$ANPP_{branch}$	$\log_{10}(\text{stand.age})$	0.22	0.13	1.62
$ANPP_{branch}$	BiomeTemperate broadleaf	0.31	0.29	1.07
$ANPP_{branch}$	BiomeTemperate conifer	-0.02	0.23	-0.08
$ANPP_{foliage}$	$\log_{10}(\text{stand.age})$	1.33	0.16	8.4
$ANPP_{foliage}$	BiomeTropical broadleaf	0.67	0.54	1.23
$ANPP_{foliage}$	BiomeTemperate broadleaf	-0.14	0.32	-0.43
$ANPP_{foliage}$	BiomeTemperate conifer	-0.48	0.3	-1.61
$ANPP_{foliage}$	BiomeBoreal conifer	-1.52	0.38	-3.98
$ANPP_{litterfall}$	$\log_{10}(\text{stand.age})$	1.42	0.86	1.64
$ANPP_{litterfall}$	BiomeTropical broadleaf	1.85	1.34	1.37
$ANPP_{litterfall}$	BiomeTemperate broadleaf	-0.51	1.6	-0.32
$ANPP_{repro}$	-	-	-	-
$ANPP_{folivory}$	-	-	-	-
$M_{woody}$	-	-	-	-
$BNPP$	$\log_{10}(\text{stand.age})$	1.13	0.33	3.41
$BNPP$	BiomeTropical broadleaf	2.61	0.76	3.43
$BNPP$	BiomeTemperate broadleaf	0.27	0.59	0.45
$BNPP$	BiomeTemperate conifer	0.14	0.56	0.25
$BNPP$	BiomeBoreal conifer	-0.44	0.71	-0.63
$BNPP_{coarse}$	$\log_{10}(\text{stand.age})$	0.09	0.09	1
$BNPP_{coarse}$	BiomeTemperate broadleaf	0.31	0.16	1.99
$BNPP_{coarse}$	BiomeTemperate conifer	0.59	0.15	3.92
$BNPP_{coarse}$	BiomeBoreal conifer	0.09	0.18	0.5
$BNPP_{fine}$	$\log_{10}(\text{stand.age})$	0.64	0.26	2.45
$BNPP_{fine}$	BiomeTropical broadleaf	4.47	0.61	7.33
$BNPP_{fine}$	BiomeTemperate broadleaf	0.19	0.41	0.45
$BNPP_{fine}$	BiomeTemperate conifer	0.44	0.39	1.13
$BNPP_{fine}$	BiomeBoreal conifer	0.51	0.53	0.97
$R_{eco}$	$\log_{10}(\text{stand.age})$	2.93	1.4	2.09
$R_{eco}$	BiomeTemperate broadleaf	7.55	2.28	3.31
$R_{eco}$	BiomeTemperate conifer	9.67	1.84	5.25
$R_{eco}$	BiomeBoreal conifer	4.2	2.52	1.67
$R_{eco}$	$\log_{10}(\text{stand.age}): \text{BiomeTemperate conifer}$	-1.77	1.75	-1.01
$R_{eco}$	$\log_{10}(\text{stand.age}): \text{BiomeBoreal conifer}$	-1.2	1.91	-0.63
$R_{auto}$	-	-	-	-

(continued)

Variable	Parameter	Estimate	SE	$t_{value}$
$R_{auto-ag}$	-	-	-	-
$R_{root}$	log10(stand.age)	1.52	0.47	3.25
$R_{root}$	BiomeTropical broadleaf	6.03	0.85	7.1
$R_{root}$	BiomeTemperate broadleaf	1.22	0.8	1.53
$R_{root}$	BiomeTemperate conifer	1.37	0.74	1.84
$R_{root}$	BiomeBoreal conifer	-0.94	0.97	-0.97
$R_{soil}$	log10(stand.age)	0.13	0.33	0.39
$R_{soil}$	BiomeTropical broadleaf	12.85	0.93	13.75
$R_{soil}$	BiomeTemperate broadleaf	9.05	0.64	14.21
$R_{soil}$	BiomeTemperate conifer	8.02	0.59	13.59
$R_{soil}$	BiomeBoreal conifer	4.63	0.97	4.77
$R_{het-soil}$	log10(stand.age)	0	1.08	0
$R_{het-soil}$	BiomeTropical broadleaf	5.78	1.3	4.46
$R_{het-soil}$	BiomeTemperate broadleaf	2.95	1.3	2.26
$R_{het-soil}$	BiomeTemperate conifer	3.61	0.91	3.96
$R_{het-soil}$	BiomeBoreal conifer	1.1	1.53	0.72
$R_{het-soil}$	log10(stand.age):BiomeTemperate broadleaf	1.16	1.38	0.84
$R_{het-soil}$	log10(stand.age):BiomeTemperate conifer	0.58	1.25	0.47
$R_{het-soil}$	log10(stand.age):BiomeBoreal conifer	1.23	1.4	0.88
$B_{tot}$	log10(stand.age)	48.29	7.6	6.35
$B_{tot}$	BiomeTropical broadleaf	-2.61	19.13	-0.14
$B_{tot}$	BiomeTemperate broadleaf	-8.9	29.5	-0.3
$B_{tot}$	BiomeTemperate conifer	25.03	21.87	1.14
$B_{tot}$	BiomeBoreal conifer	-201.94	46.45	-4.35
$B_{tot}$	log10(stand.age):BiomeTemperate broadleaf	20.13	17.79	1.13
$B_{tot}$	log10(stand.age):BiomeTemperate conifer	-7.41	14.36	-0.52
$B_{tot}$	log10(stand.age):BiomeBoreal conifer	93.94	25.33	3.71
$B_{ag}$	log10(stand.age)	59.63	1.75	34.05
$B_{ag}$	BiomeTropical broadleaf	-18.86	3.34	-5.64
$B_{ag}$	BiomeTemperate broadleaf	-40.11	6.06	-6.62
$B_{ag}$	BiomeTemperate conifer	-59.09	6.42	-9.21
$B_{ag}$	BiomeBoreal conifer	-59.99	14.04	-4.27
$B_{ag}$	log10(stand.age):BiomeTemperate broadleaf	-1.21	4.06	-0.3
$B_{ag}$	log10(stand.age):BiomeTemperate conifer	6.68	4.31	1.55
$B_{ag}$	log10(stand.age):BiomeBoreal conifer	-1.96	8.1	-0.24
$B_{ag-wood}$	log10(stand.age)	43.04	19.12	2.25
$B_{ag-wood}$	BiomeTropical broadleaf	-9.96	31.58	-0.32
$B_{ag-wood}$	BiomeTemperate broadleaf	-49.19	40.47	-1.22

(continued)

Variable	Parameter	Estimate	SE	$t_{value}$
$B_{ag-wood}$	BiomeTemperate conifer	-180.05	30.71	-5.86
$B_{ag-wood}$	BiomeBoreal conifer	-89.11	62.5	-1.43
$B_{ag-wood}$	log10(stand.age):BiomeTemperate broadleaf	37.51	32.42	1.16
$B_{ag-wood}$	log10(stand.age):BiomeTemperate conifer	131.73	27.05	4.87
$B_{ag-wood}$	log10(stand.age):BiomeBoreal conifer	29.8	39.34	0.76
$B_{foliage}$	log10(stand.age)	2.42	0.34	7.23
$B_{foliage}$	BiomeTropical broadleaf	1.45	0.81	1.79
$B_{foliage}$	BiomeTemperate broadleaf	0.93	0.77	1.22
$B_{foliage}$	BiomeTemperate conifer	-4.39	1.16	-3.77
$B_{foliage}$	BiomeBoreal conifer	-2.1	2.04	-1.03
$B_{foliage}$	log10(stand.age):BiomeTemperate broadleaf	-1.69	0.51	-3.31
$B_{foliage}$	log10(stand.age):BiomeTemperate conifer	3.79	0.77	4.94
$B_{foliage}$	log10(stand.age):BiomeBoreal conifer	0.12	1.12	0.11
$B_{root}$	log10(stand.age)	10.2	0.84	12.14
$B_{root}$	BiomeTropical broadleaf	-1.33	1.97	-0.67
$B_{root}$	BiomeTemperate broadleaf	-6.25	1.92	-3.25
$B_{root}$	BiomeTemperate conifer	-9.16	1.71	-5.35
$B_{root}$	BiomeBoreal conifer	-11.07	4.13	-2.68
$B_{root}$	log10(stand.age):BiomeTemperate broadleaf	1.78	1.44	1.24
$B_{root}$	log10(stand.age):BiomeTemperate conifer	1.13	1.34	0.84
$B_{root}$	log10(stand.age):BiomeBoreal conifer	2.86	2.42	1.18
$B_{root-coarse}$	log10(stand.age)	10.11	5.24	1.93
$B_{root-coarse}$	BiomeTropical broadleaf	-5.28	8.87	-0.6
$B_{root-coarse}$	BiomeTemperate broadleaf	-1.63	7.2	-0.23
$B_{root-coarse}$	BiomeTemperate conifer	-39.7	7.55	-5.25
$B_{root-coarse}$	BiomeBoreal conifer	-35.49	18.92	-1.88
$B_{root-coarse}$	log10(stand.age):BiomeTemperate broadleaf	-0.25	6.92	-0.04
$B_{root-coarse}$	log10(stand.age):BiomeTemperate conifer	27.6	7.04	3.92
$B_{root-coarse}$	log10(stand.age):BiomeBoreal conifer	15.11	10.75	1.41
$B_{root-fine}$	log10(stand.age)	-0.06	0.2	-0.28
$B_{root-fine}$	BiomeTropical broadleaf	2.72	2.41	1.13
$B_{root-fine}$	BiomeTemperate broadleaf	2.64	1.19	2.21
$B_{root-fine}$	BiomeTemperate conifer	2.67	1.2	2.22
$B_{root-fine}$	BiomeBoreal conifer	11.92	2.92	4.08
$DW_{tot}$	log10(stand.age)	2.9	0.95	3.04
$DW_{tot}$	BiomeTropical broadleaf	1.69	2.78	0.61
$DW_{tot}$	BiomeTemperate broadleaf	16.83	7.58	2.22
$DW_{tot}$	log10(stand.age):BiomeTemperate broadleaf	-1.07	3.31	-0.32



(continued)

Variable	Parameter	Estimate	SE	$t_{value}$
$DW_{standing}$	-	-	-	-
$DW_{down}$	log10(stand.age)	2.87	1.71	1.68
$DW_{down}$	BiomeTropical broadleaf	4.27	3.57	1.2
$DW_{down}$	BiomeTemperate broadleaf	15.17	11.89	1.28
$DW_{down}$	BiomeTemperate conifer	45.34	6.68	6.79
$DW_{down}$	BiomeBoreal conifer	45.2	10.93	4.14
$DW_{down}$	log10(stand.age):BiomeTemperate broadleaf	-9.03	7.67	-1.18
$DW_{down}$	log10(stand.age):BiomeTemperate conifer	-13.9	3.45	-4.03
$DW_{down}$	log10(stand.age):BiomeBoreal conifer	-22.38	6.99	-3.2
$OL$	log10(stand.age)	0.51	0.76	0.67
$OL$	BiomeTropical broadleaf	3.42	2.34	1.46
$OL$	BiomeTemperate broadleaf	13.85	3.39	4.08
$OL$	BiomeTemperate conifer	0.87	2.93	0.3
$OL$	BiomeBoreal conifer	35.84	5.89	6.09
$OL$	log10(stand.age):BiomeTemperate broadleaf	-2.58	2.04	-1.26
$OL$	log10(stand.age):BiomeTemperate conifer	6.28	1.59	3.96
$OL$	log10(stand.age):BiomeBoreal conifer	3	3.68	0.82

83 **Figure S1. Age trends and biome differences for *NEP***

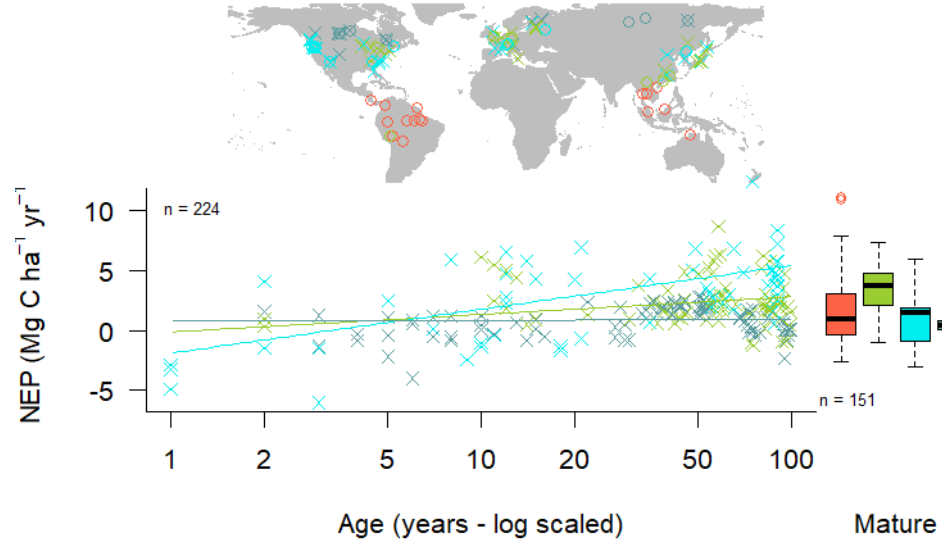


Figure S1 | Age trends and biome differences for *NEP*. Map shows data sources (*x* and *o* indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

84 **Figure S2. Age trends and biome differences for *GPP***

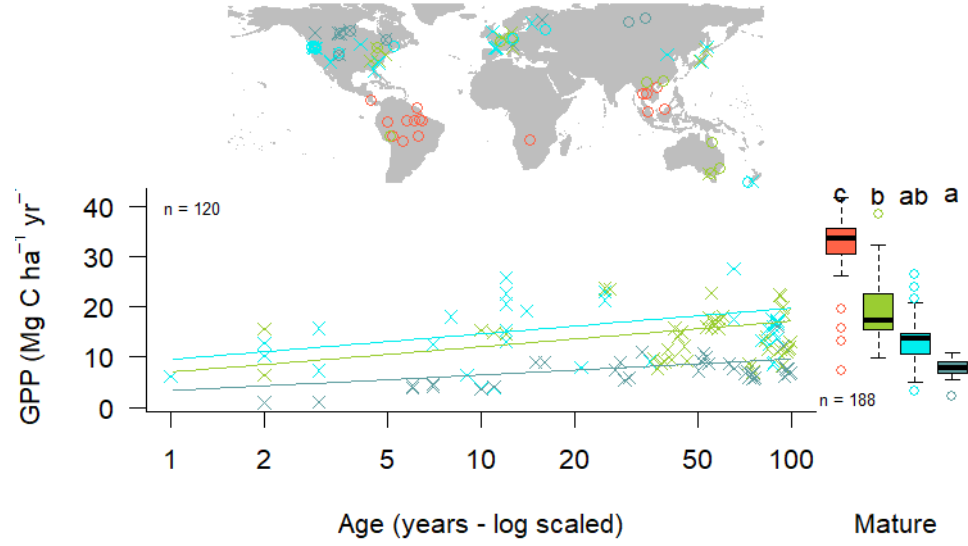


Figure S2 | Age trends and biome differences for *GPP*. Map shows data sources (*x* and *o* indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

85 **Figure S3. Age trends and biome differences for *NPP***

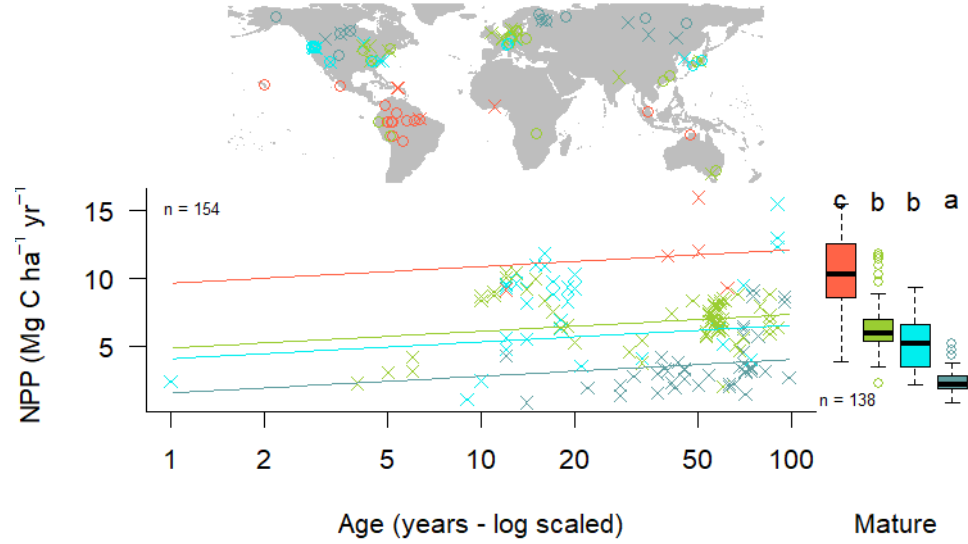


Figure S3 | Age trends and biome differences for *NPP*. Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

86 **Figure S4. Age trends and biome differences for *ANPP***

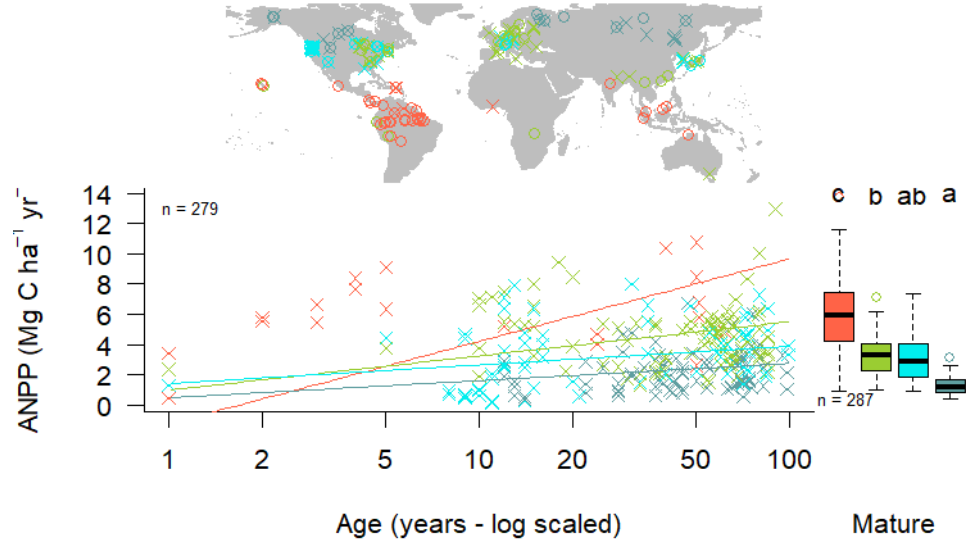


Figure S4 | Age trends and biome differences for *ANPP*. Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

87 **Figure S5. Age trends and biome differences for  $ANPP_{woody}$**

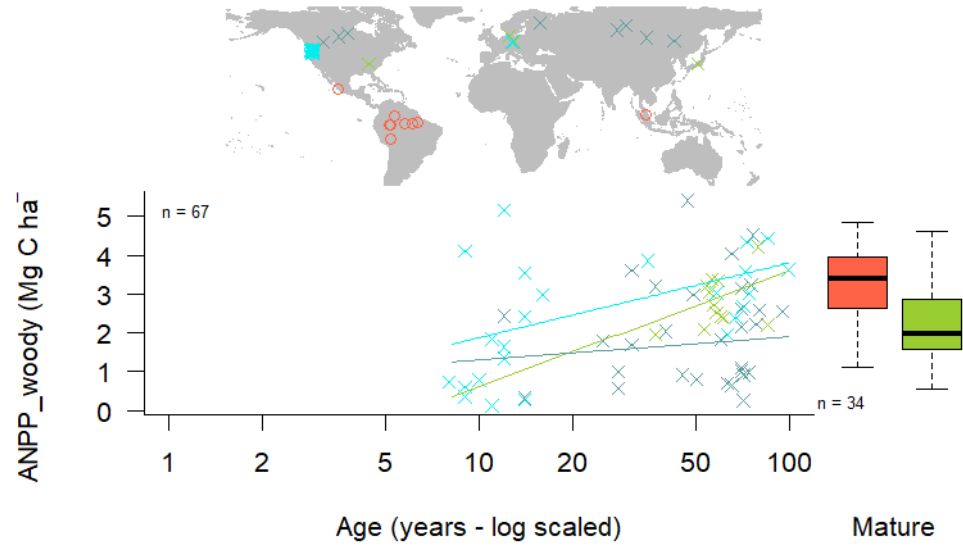


Figure S5 | Age trends and biome differences for  $ANPP_{woody}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

88 **Figure S6.** Age trends and biome differences for  $ANPP_{stem}$

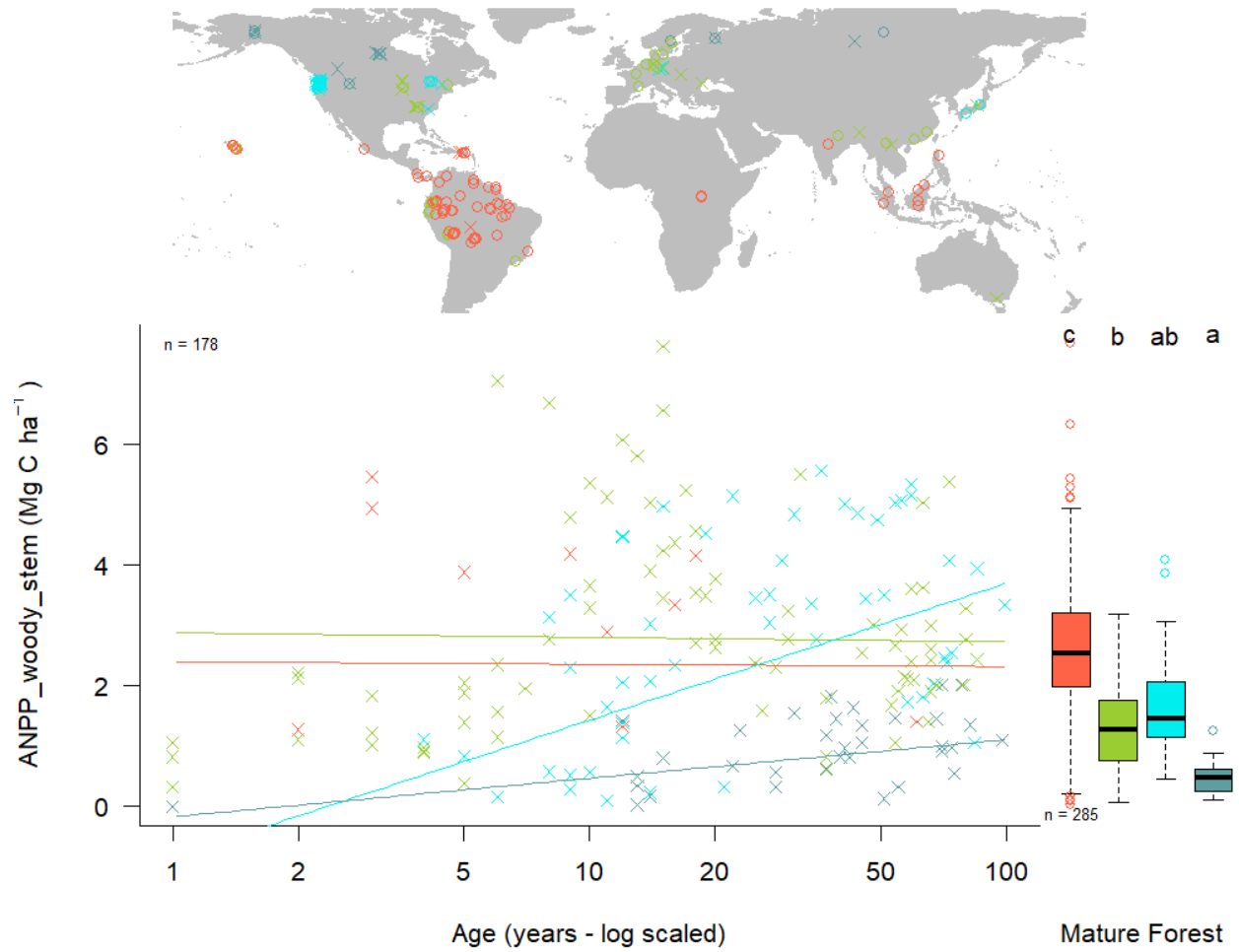


Figure S6 | Age trends and biome differences for  $ANPP_{stem}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

89 **Figure S7.** Age trends and biome differences for  $ANPP_{foliage}$

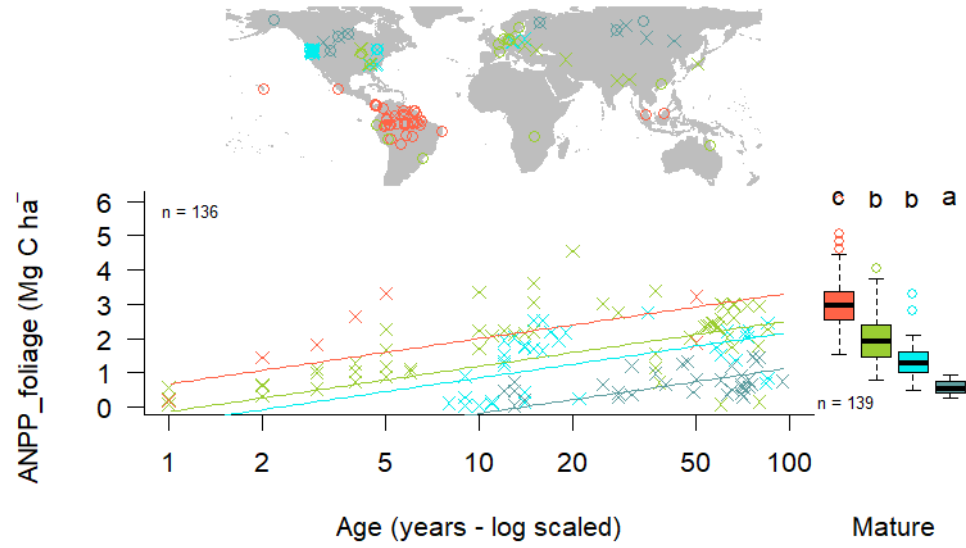


Figure S7 | Age trends and biome differences for  $ANPP_{foliage}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.



90 **Figure S8. Age trends and biome differences for  $ANPP_{litterfall}$**

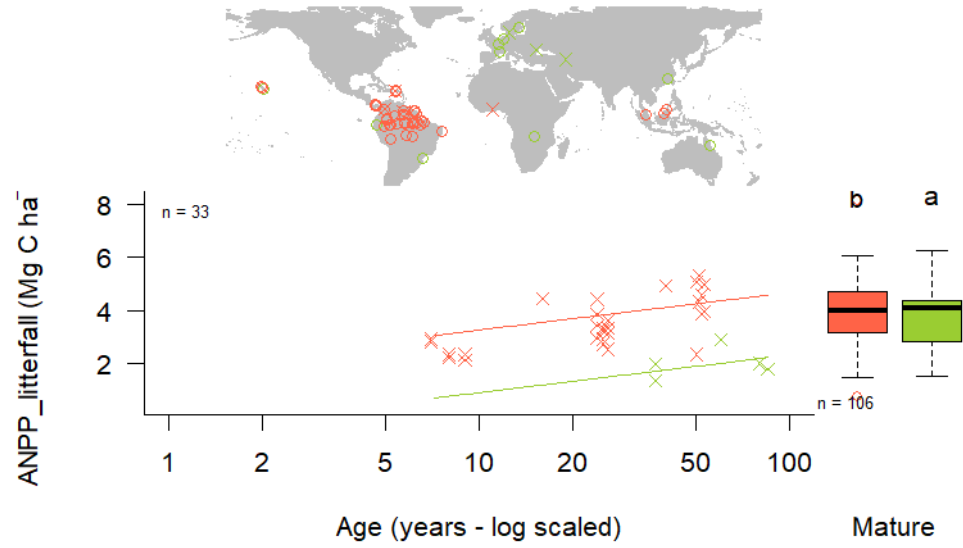


Figure S8 | Age trends and biome differences for  $ANPP_{litterfall}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

91 **Figure S9. Age trends and biome differences for *BNPP***

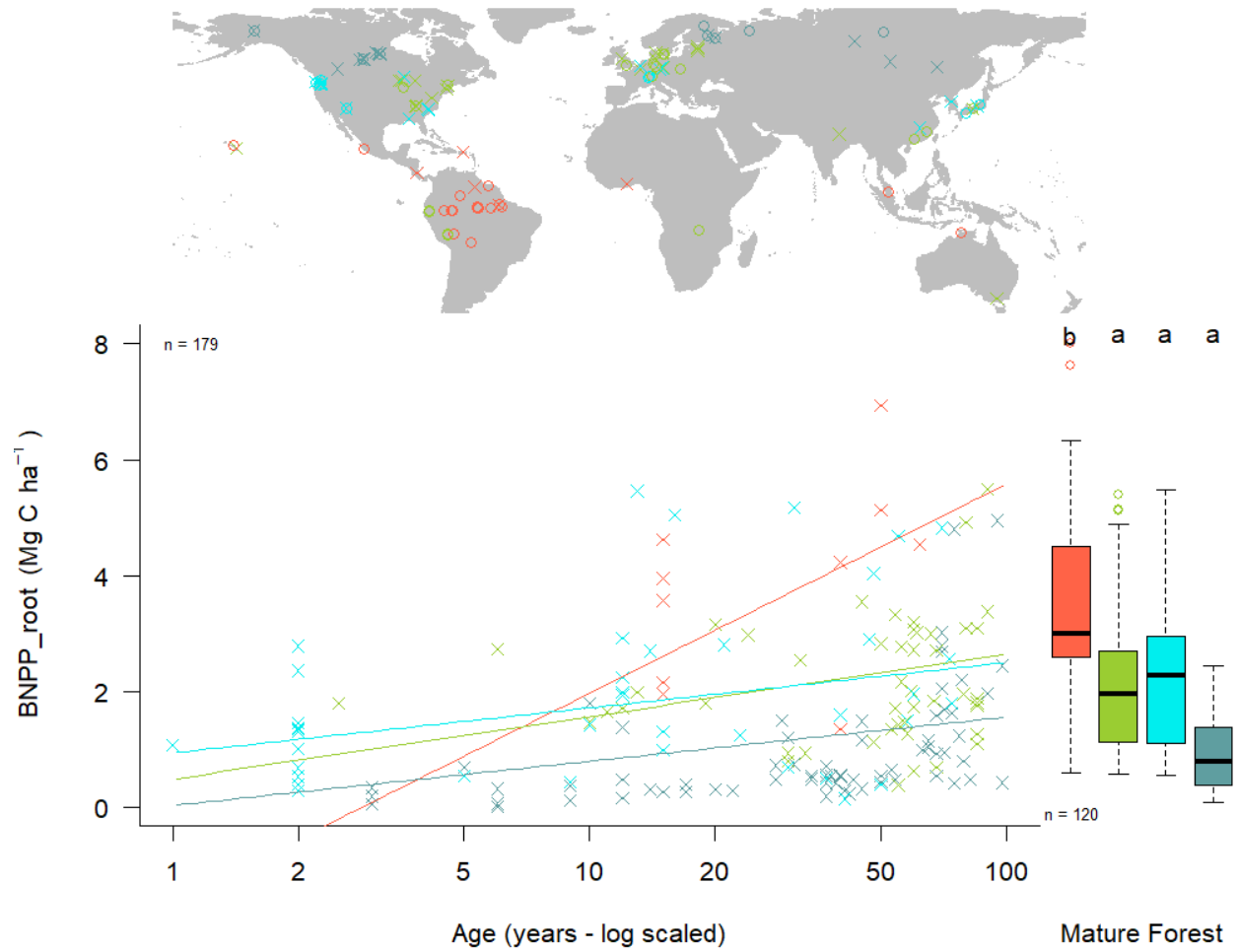


Figure S9 | Age trends and biome differences for *BNPP*. Map shows data sources (*x* and *o* indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

**Figure S10. Age trends and biome differences for  $BNPP_{coarse}$**

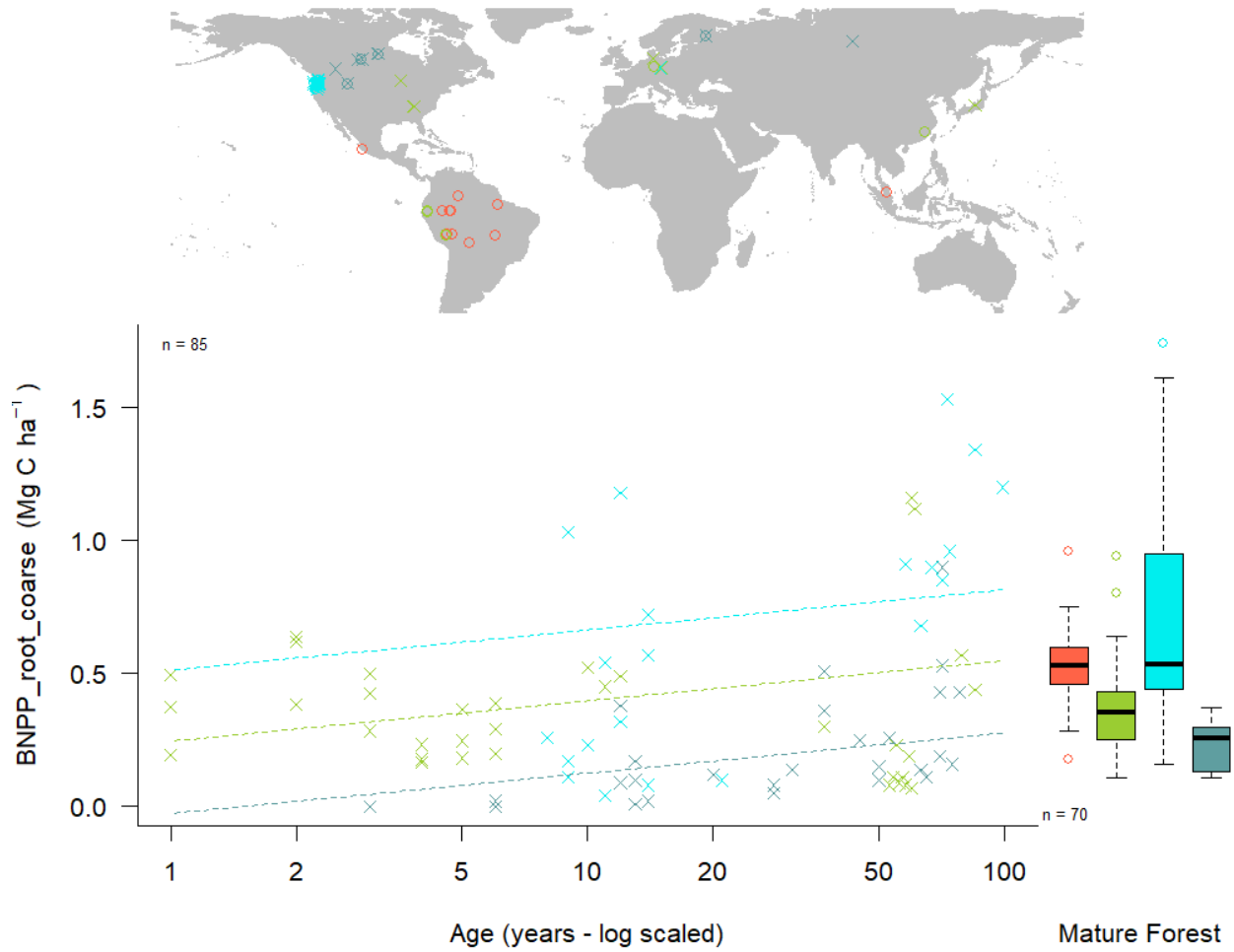


Figure S10 | Age trends and biome differences for  $BNPP_{coarse}$ . Map shows data sources (x and o indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

93 **Figure S11. Age trends and biome differences for  $BNPP_{fine}$**

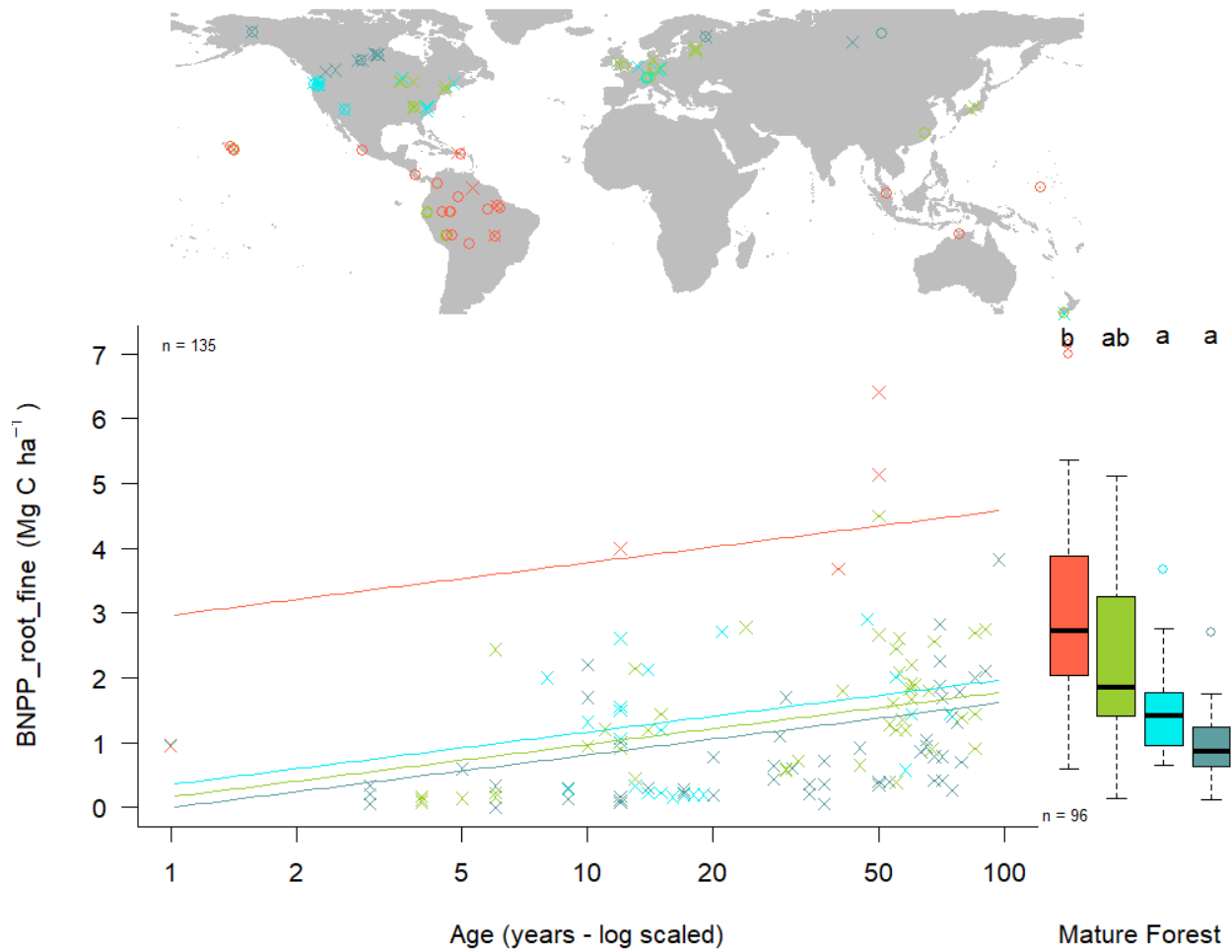


Figure S11 | Age trends and biome differences for  $BNPP_{fine}$ . Map shows data sources (x and o indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

94 **Figure S12.** Age trends and biome differences for  $R_{eco}$

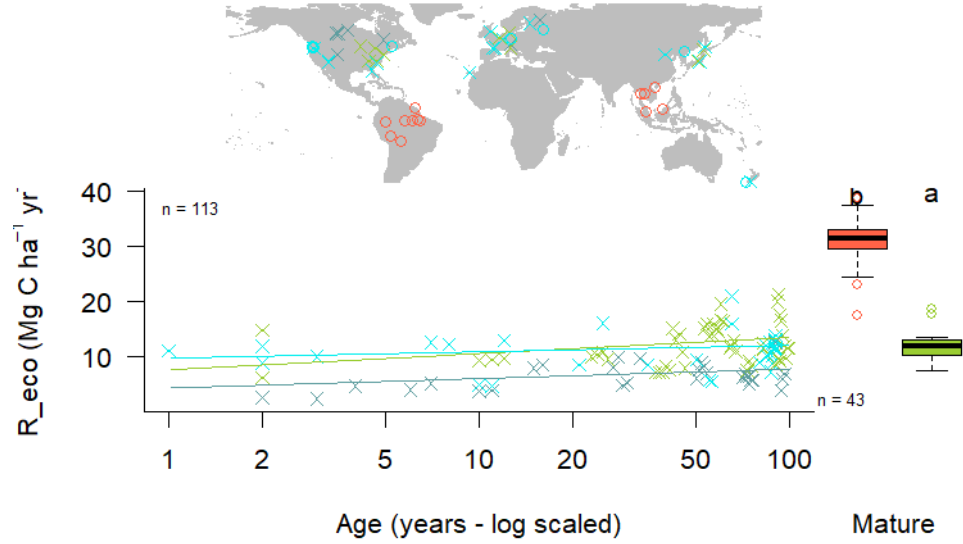


Figure S12 | Age trends and biome differences for  $R_{eco}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

95 **Figure S13. Age trends and biome differences for  $R_{root}$**

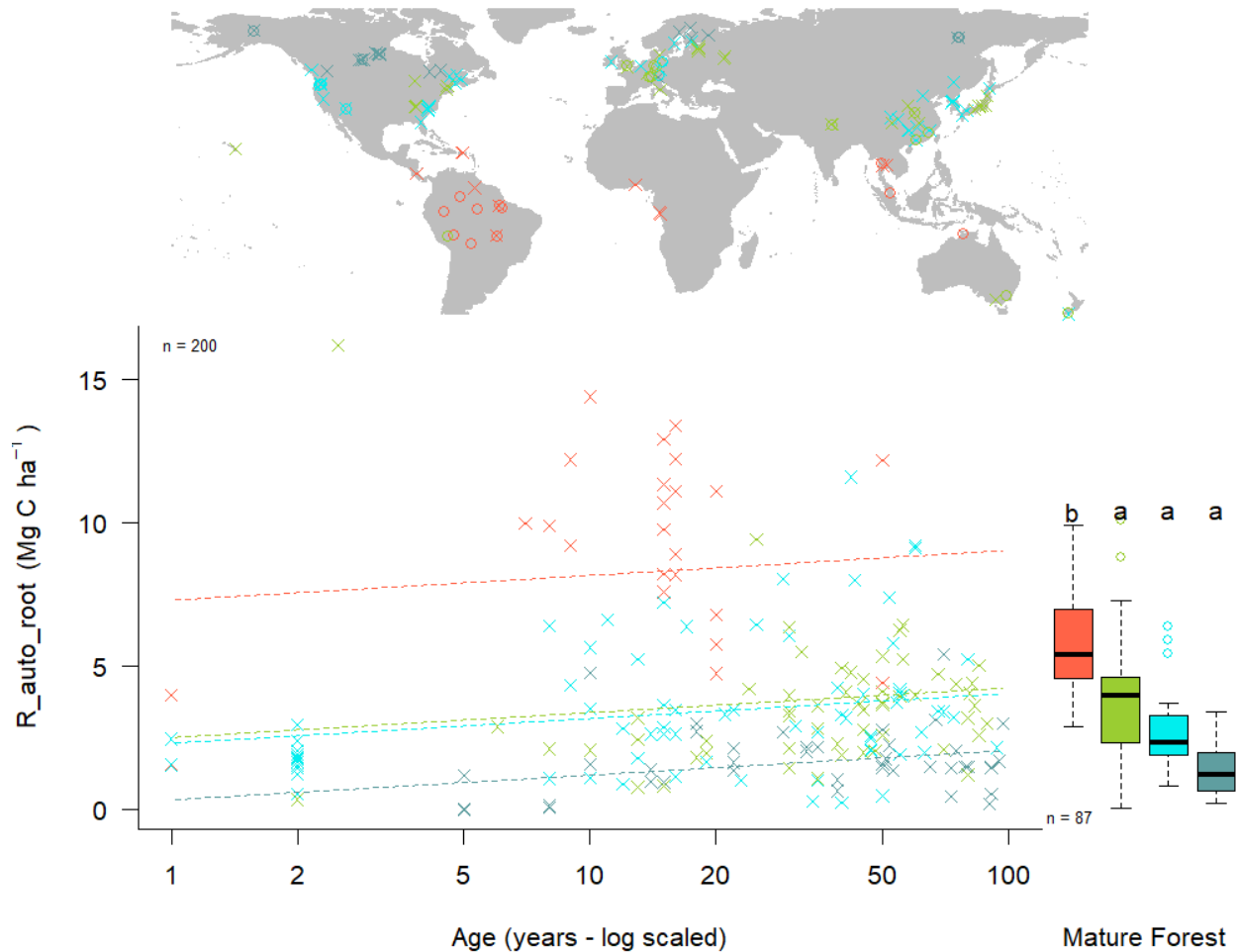


Figure S13 | Age trends and biome differences for  $R_{root}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

96 **Figure S14.** Age trends and biome differences for  $R_{soil}$

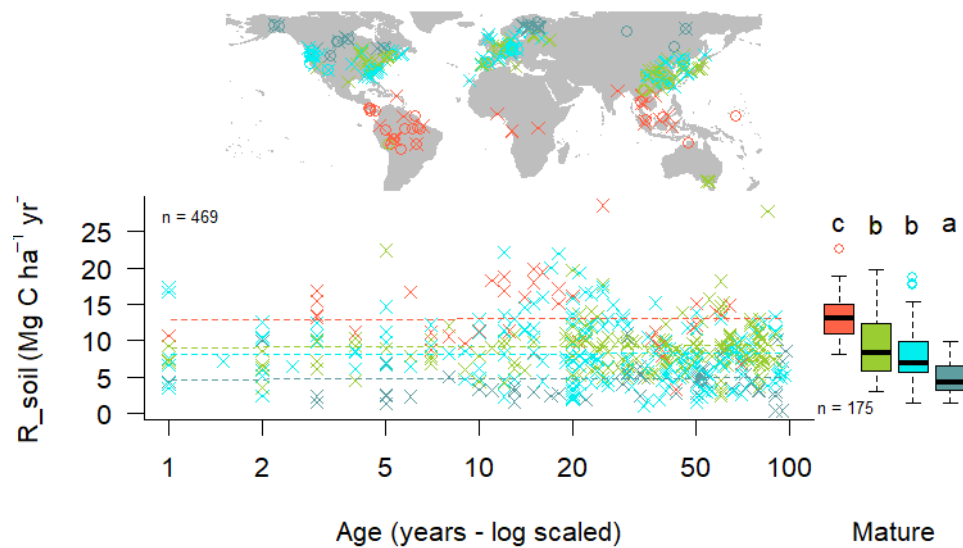


Figure S14 | Age trends and biome differences for  $R_{soil}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

97 **Figure S15.** Age trends and biome differences for  $R_{het-soil}$

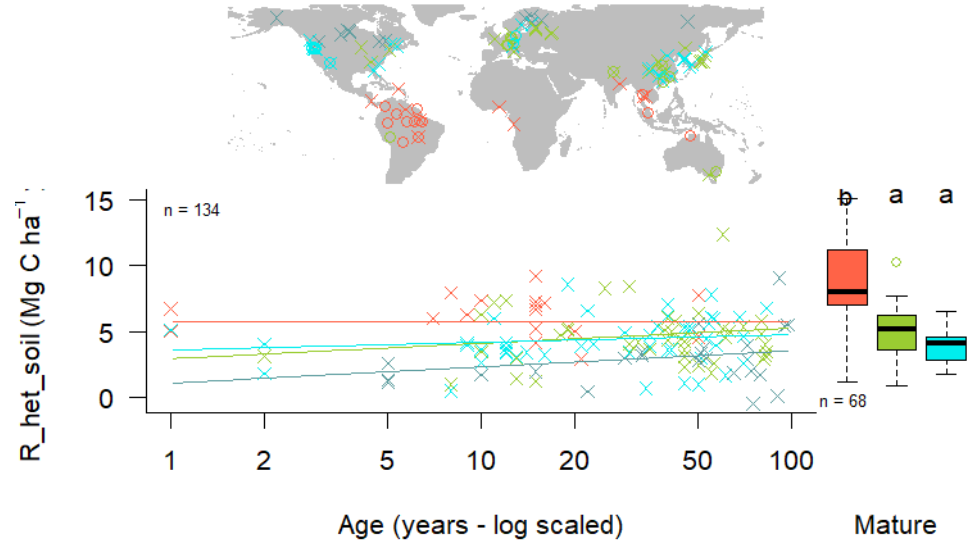


Figure S15 | Age trends and biome differences for  $R_{het-soil}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.



98 **Figure S16. Age trends and biome differences for  $B_{tot}$**

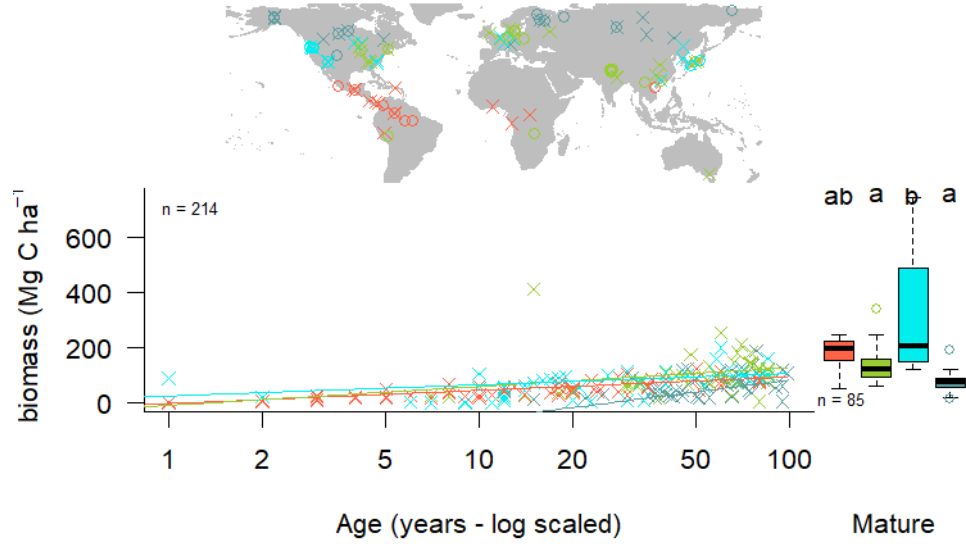


Figure S16 | Age trends and biome differences for  $B_{tot}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

99 **Figure S17. Age trends and biome differences for  $B_{ag}$**

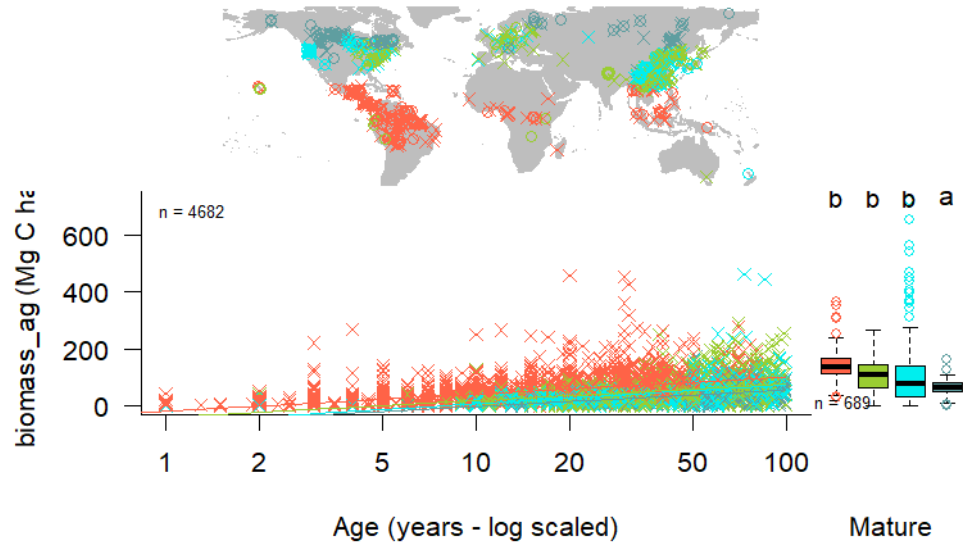


Figure S17 | Age trends and biome differences for  $B_{ag}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

100 **Figure S18. Age trends and biome differences for  $B_{ag-wood}$**

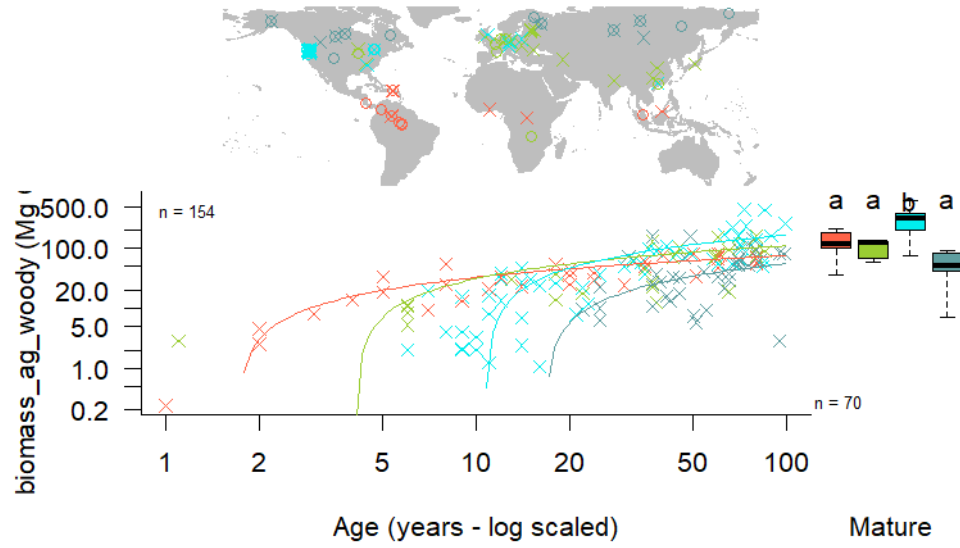


Figure S18 | Age trends and biome differences for  $B_{ag-wood}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

101 **Figure S19. Age trends and biome differences for  $B_{foliage}$**

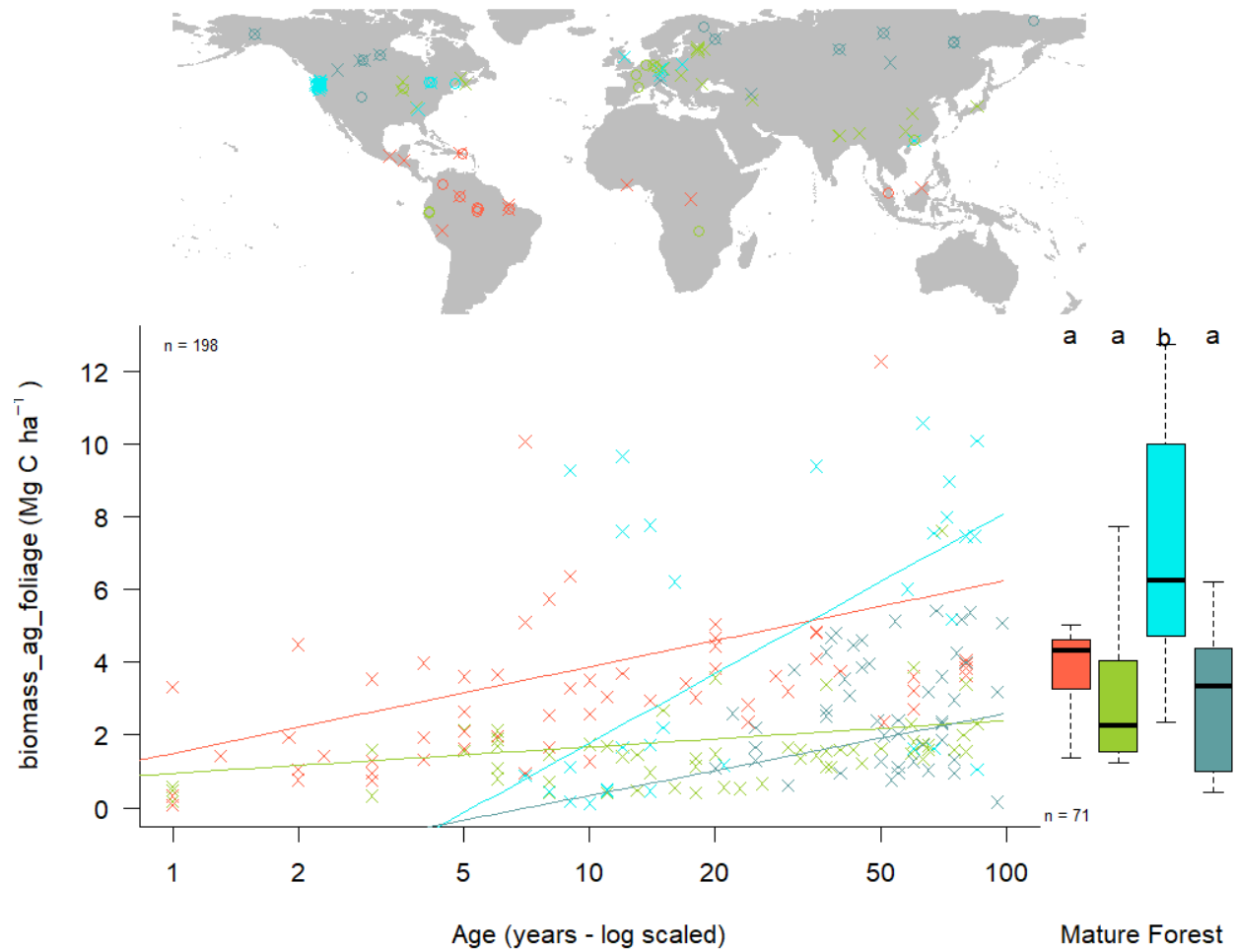


Figure S19 | Age trends and biome differences for  $B_{foliage}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

102 **Figure S20. Age trends and biome differences for  $B_{root}$**

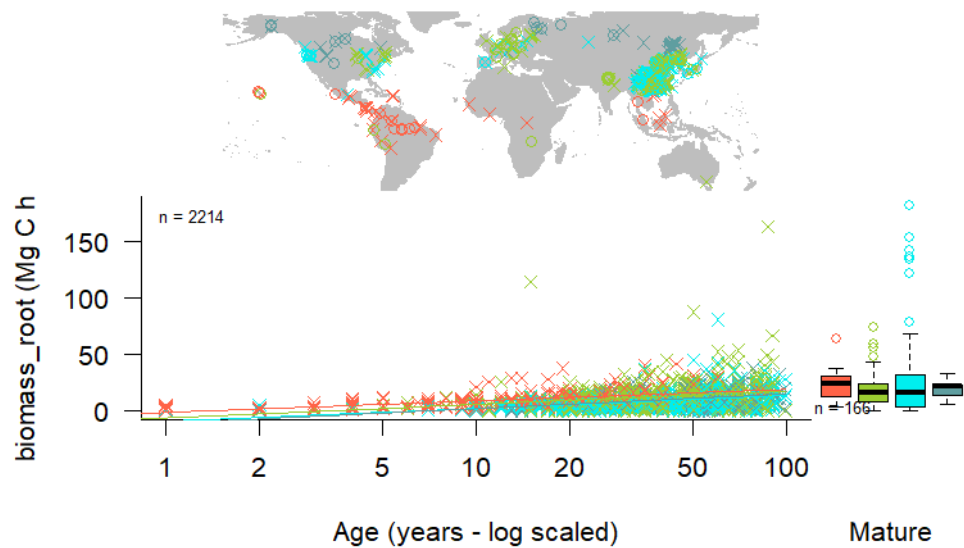


Figure S20 | Age trends and biome differences for  $B_{root}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

103 **Figure S21. Age trends and biome differences for  $B_{root-coarse}$**

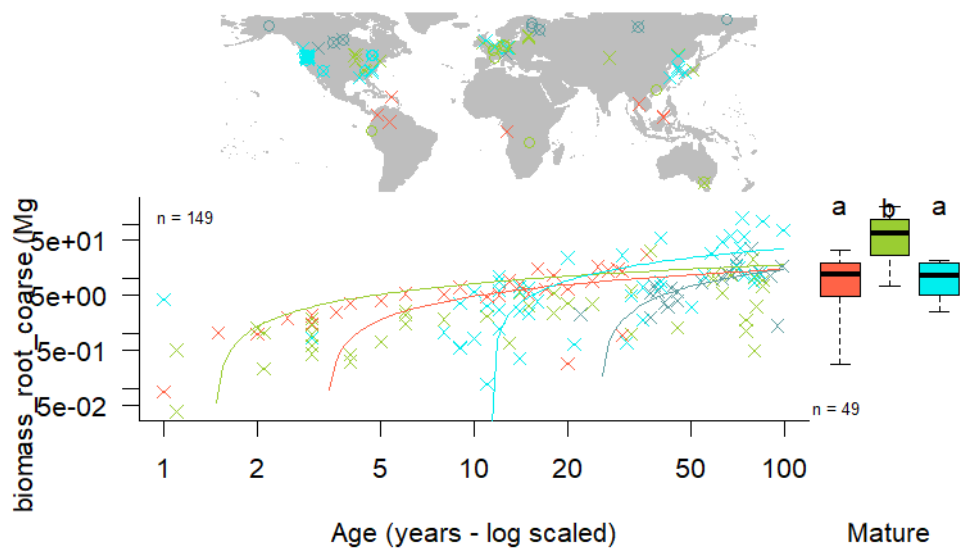


Figure S21 | Age trends and biome differences for  $B_{root-coarse}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age  $\times$  biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

104 **Figure S22. Age trends and biome differences for  $B_{root-fine}$**

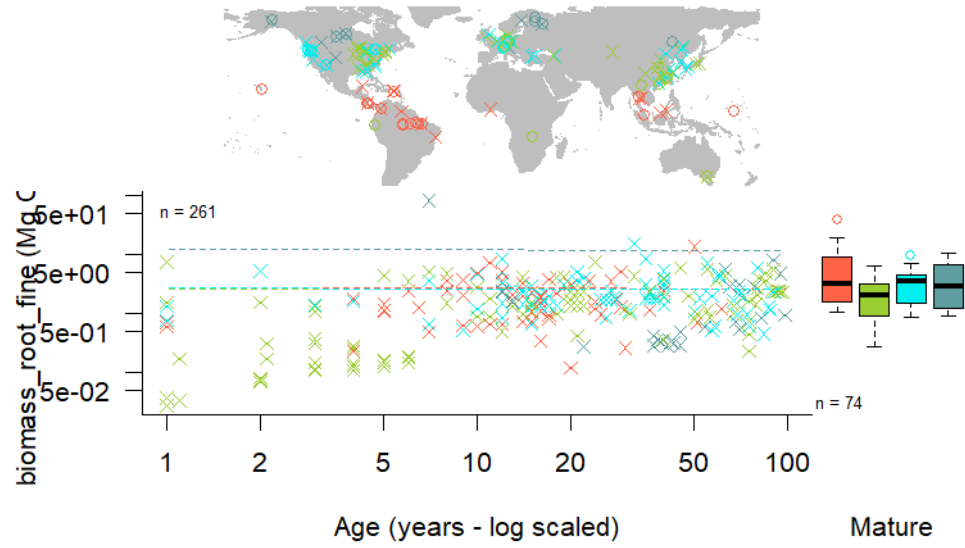


Figure S22 | Age trends and biome differences for  $B_{root-fine}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age  $\times$  biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

105 **Figure S23. Age trends and biome differences for  $DW_{tot}$**

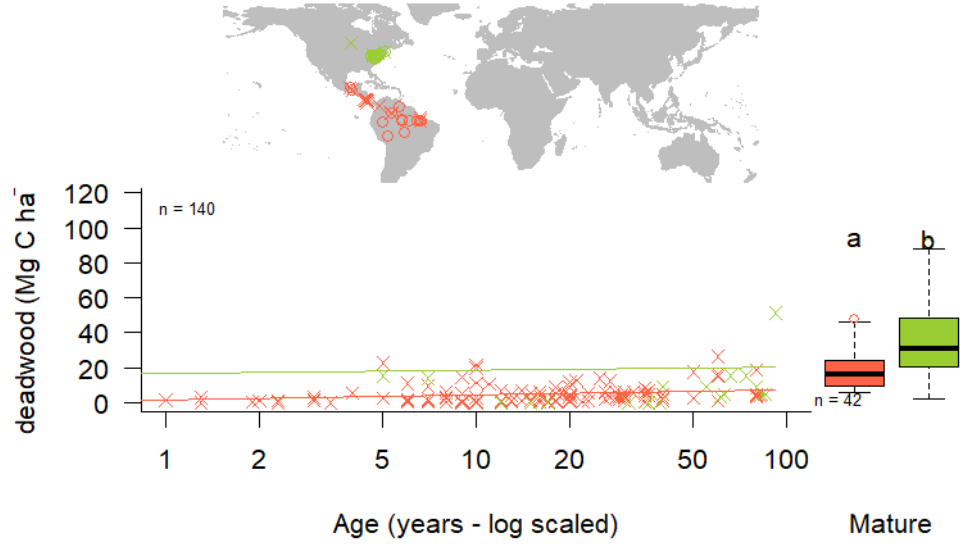


Figure S23 | Age trends and biome differences for  $DW_{tot}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.



106 **Figure S24.** Age trends and biome differences for  $DW_{standing}$

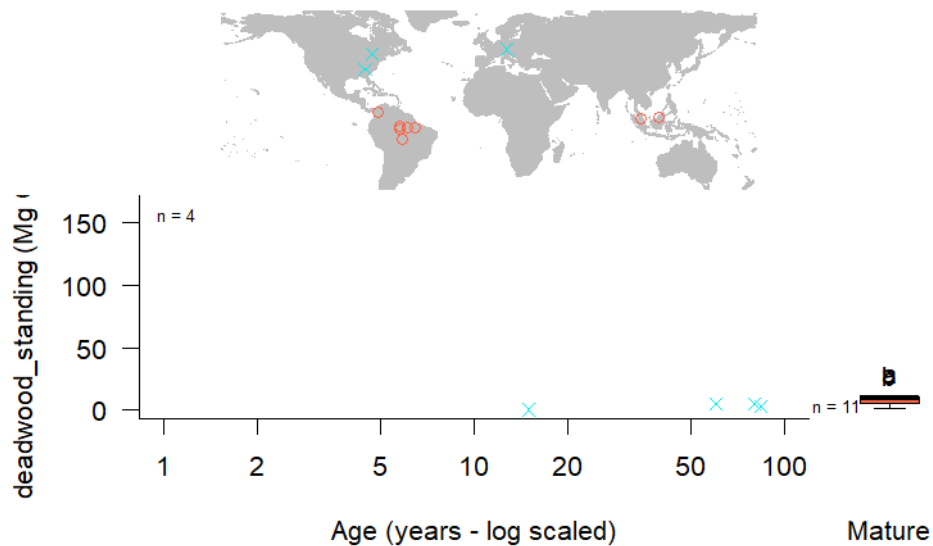


Figure S24 | Age trends and biome differences for  $DW_{standing}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

107 **Figure S25. Age trends and biome differences for  $DW_{down}$**

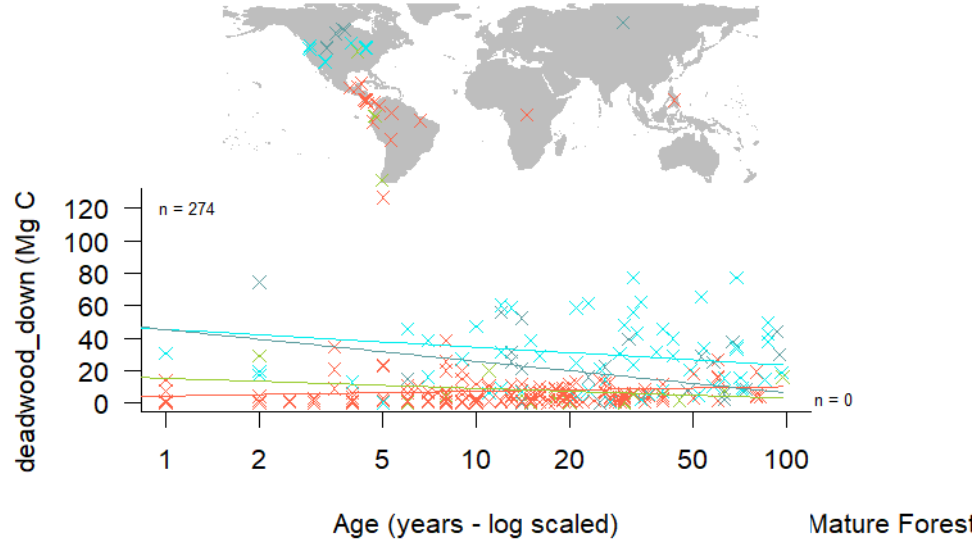


Figure S25 | Age trends and biome differences for  $DW_{down}$ . Map shows data sources ( $x$  and  $o$  indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.

108 **Figure S26. Age trends and biome differences for *OL***

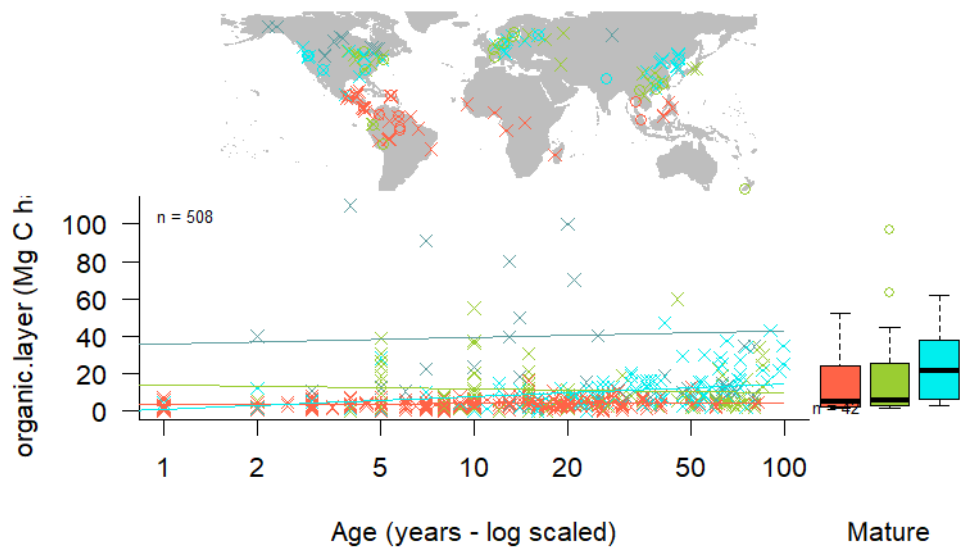


Figure S26 | Age trends and biome differences for *OL*. Map shows data sources (*x* and *o* indicate young and mature stands, respectively). Left plot shows age trends in forests up to 100 years old, as characterized by a linear mixed effects model with fixed effects of age and biome. Solid lines indicate significant effect of age, non-parallel lines indicate a significant age x biome interaction. Boxplot illustrates distribution across mature forests, with different letters indicating significant differences between biomes.