

1 **Supplementary Information**

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3 **Identifying major environmental factors of early-stage decomposition**
4 **dynamics in *Pinus halepensis* and *Pinus brutia* stands**

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20 **A. Hierarchical structure of dataset analysis through NLMMs**

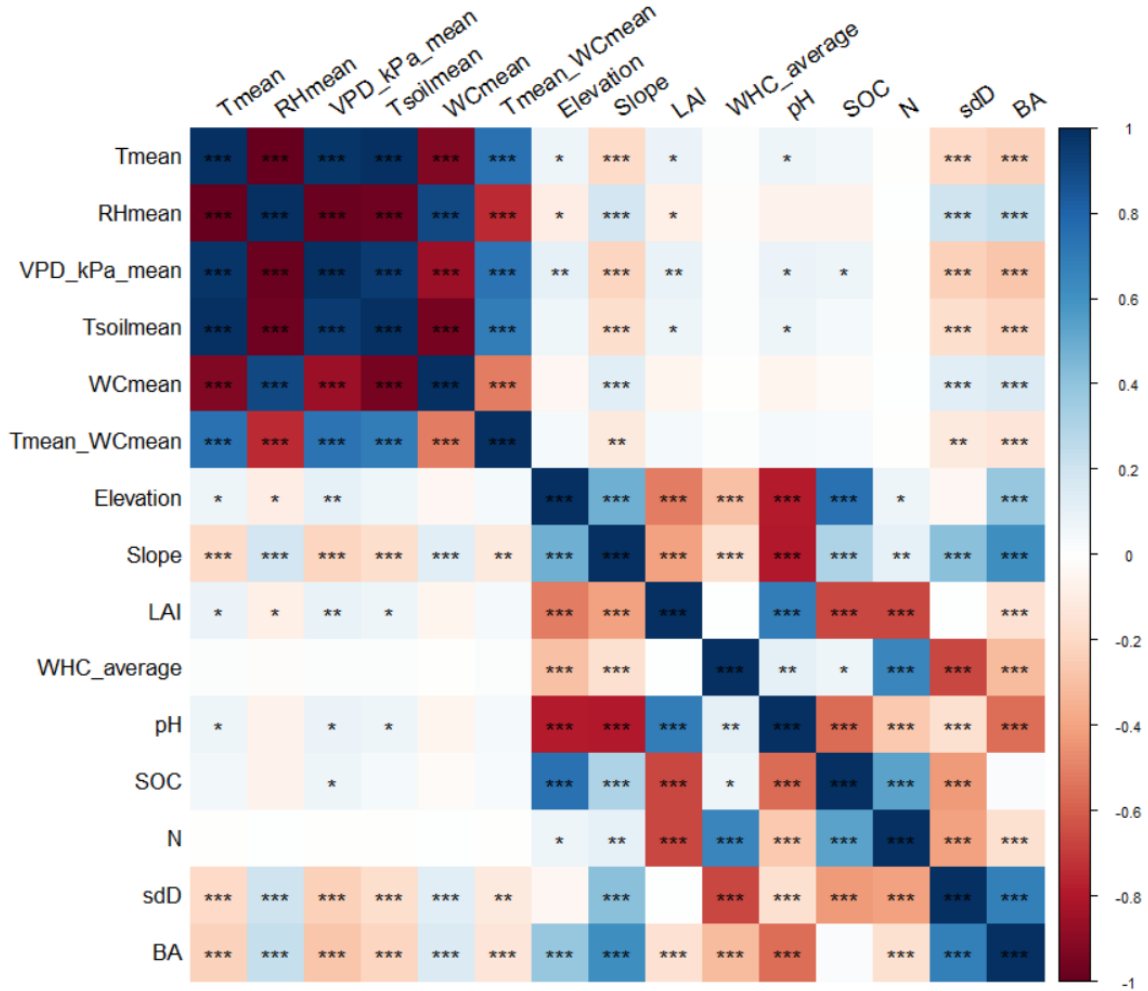
21 **Table S1:** Average (\pm standard error) decomposition rates k (day^{-1}) per plot and site for all materials. Average
 22 decomposition rates per plot were estimated after fitting a generic Olson decay $M(t) = M_0 e^{-k \cdot t}$ model for each plot,
 23 using incubation time (t - days) and species as predictors.

<i>Plot</i>	<i>k_{litter}</i>	<i>k_{paper}</i>	<i>k_{wood}</i>
<i>LES1</i>	0.000694 \pm 0.000052	0.000659 \pm 0.000432	0.000340 \pm 0.000079
<i>LES2</i>	0.000545 \pm 0.000052	0.000329 \pm 0.000432	0.000435 \pm 0.000079
<i>LES3</i>	0.000584 \pm 0.000052	0.000429 \pm 0.000432	0.000388 \pm 0.000079
<i>LES4</i>	0.000621 \pm 0.000052	0.000628 \pm 0.000432	0.000443 \pm 0.000079
<i>SAN1</i>	0.001855 \pm 0.000159	0.004072 \pm 0.001225	0.001963 \pm 0.000232
<i>SAN2</i>	0.001696 \pm 0.000159	0.000937 \pm 0.001225	0.001444 \pm 0.000232
<i>SAN3</i>	0.001649 \pm 0.000159	0.002581 \pm 0.001225	0.001616 \pm 0.000232
<i>XAN1</i>	0.000705 \pm 0.000052	0.002642 \pm 0.000432	0.000650 \pm 0.000232
<i>XAN2</i>	0.000604 \pm 0.000052	0.002874 \pm 0.000432	0.000754 \pm 0.000232
<i>XAN3</i>	0.000565 \pm 0.000052	0.002263 \pm 0.000432	0.000695 \pm 0.000232

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25 **B. Correlation among micro-climatic parameters**

26 Correlation matrix was produced to identify the correlated variables and avoid them during the
 27 exploration of the main drivers for all decomposition materials (pine litter, paper and woods). It
 28 was produced using the “ggcorrplot” and “car” packages in R.



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30 **Figure S1:** Correlation matrix showing correlation among the various micro-environmental factors. Color gradient
 31 (blue to red) represents high positive correlation to high negative correlation. (*): $p < 0.05$, (**): $p < 0.01$, (***) : $p < 0.001$

32 **C. Stepwise elimination of micro-climatic parameters**

33 *Pine litter*

34 **Table S2:** Stepwise elimination of micro-climatic factors in pine litter decomposition. All predictors were scaled on each sub-set, and the scaled values are presented here.

35 Coefficient of relation R_{pseudo}^2 was calculated using Pearsons' correlation between observed and simulated values (from both fixed and random effects) of remaining mass

	<i>Intercept</i>	T_{air}	T_{soil}	<i>SWC</i>	<i>Elevation</i>	<i>LAI</i>	<i>pH</i>	<i>SOC</i>	<i>N</i>	<i>BA</i>	<i>AIC</i>	<i>Marginal R²</i>	<i>Conditional R²</i>	R_{pseudo}^2
1	k_{fe}	0.000071	0.000101	0.000127	-	-0.000279	0.000229	0.000129	-0.000234	0.000089	-282.969	76.75%	81.50%	82.06
	VIF	0.000985	11.337	7.089	2.479	9.929	3.941	6.048	6.993	4.013	2.237			
	<i>p</i>		0.568	0.421	0.006	0.008	0.046	0.173	0.460	0.091	0.346			
2	k_{fe}	0.000070	0.000102	0.000126		-0.000301	0.000503	-0.000259	0.000003	0.000079	-278.9	72.20%	82.23%	82.21%
	VIF	0.000984	9.867	6.548	2.377		3.941	3.880	2.234	2.167				
	<i>p</i>		0.570	0.415	0.005		0.101	0.006	0.061	0.985	0.531			
3	k_{fe}	0.000070	0.000102	0.000126		-0.000303	0.000504	-0.000258		0.000079	-280.9	72.20%	82.22%	82.22%
	VIF	0.000984	9.866	6.548	2.377		2.731	3.687		2.143				
	<i>p</i>		0.568	0.413	0.005		0.044	0.004		0.528				
4	k_{fe}	0.000068	0.000102	0.000125		-0.000280	0.000431	-0.000285			-282.476	71.66%	82.38%	82.22%
	VIF	0.000982	8.787	6.148	2.308		2.490	1.945	2.036					
	<i>p</i>		0.580	0.410	0.005		0.058	0.001	0.029					
5	k_{fe}	0.000071	0.000102	0.000127			0.000306	-0.000170						
	VIF	0.000984	8.486	6.032	2.289			1.526	1.536		-281.179	67.36%	83.16%	82.29%
	<i>p</i>		0.557	0.408	0.005			0.024	0.206					
6	k_{fe}	0.000071	0.000102	0.000127			0.000402							
	VIF	0.000984	8.223	5.931	2.271			1.006			-281.59	64.93%	83.16%	82.30%
	<i>p</i>		0.556	0.409	0.004			0.001						

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37 *Cellulose papers*

38 **Table S3:** Stepwise elimination of micro-climatic factors in paper sheets decomposition. All predictors were scaled on each sub-set, and the scaled values are presented here.

39 Coefficient of relation R_{pseudo}^2 was calculated using Pearsons' correlation between observed and simulated values (from both fixed and random effects) of remaining mass

	<i>Intercept</i>	<i>T_{air}</i>	<i>T_{soil}</i>	<i>SWC</i>	<i>Elevation</i>	<i>LAI</i>	<i>pH</i>	<i>SOC</i>	<i>N</i>	<i>BA</i>	<i>AIC</i>	<i>Marginal R²</i>	<i>Conditional R²</i>	<i>R²_{pseudo}</i>	
1	<i>k_{fe}</i>	0.001432	0.000211	0.000598	-	-	-0.001714	0.000789	0.000597	-	0.000888	-501.248	80.26%	83.96 %	84.41 %
	VIF	16.883	10.987	2.860	9.114	4.116	5.804	6.570	4.062	2.107					
	p	0.238	<0.001	0.008	<0.001	<0.001	<0.001	0.013	<0.001	<0.001					
2	<i>k_{fe}</i>	0.001434	0.000205	0.000595	-	-	-0.001771	0.001417	-0.000264	-	0.000878	-491.427	73.96 %	84.47 %	84.44 %
	VIF	15.569	10.448	2.796	2.796	4.116	3.800	2.190	2.278	2.070					
	p	0.251	<0.001	0.007	<0.001	<0.001	<0.001	0.281	0.028	<0.001					
3	<i>k_{fe}</i>	0.001436	0.000205	0.000595	-	-	-0.001710	0.001549	-	-	0.000953	-492.291	72.94 %	72.94 %	84.82 %
	VIF	15.414	10.376	2.790	2.790	3.955	3.351	2.198	1.947						
	p	0.249	<0.001	0.007	<0.001	<0.001	<0.001	0.020	<0.001						

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41 *Recalcitrant wood sticks*

42 **Table S4:** Stepwise elimination of micro-climatic factors in wood sticks decomposition. All predictors were scaled on each sub-set, and the scaled values are presented here.

43 Coefficient of relation R_{pseudo}^2 was calculated using Pearsons' correlation between observed and simulated values (from both fixed and random effects) of remaining mass

	<i>Intercept</i>	<i>T_{air}</i>	<i>T_{soil}</i>	<i>SWC</i>	<i>Elevation</i>	<i>LAI</i>	<i>pH</i>	<i>SOC</i>	<i>N</i>	<i>BA</i>	<i>AIC</i>	<i>Marginal R²</i>	<i>Conditional R²</i>	<i>R²_{pseudo}</i>		
1	<i>k_{fe}</i>	0.000730	0.000039	0.000139	-0.000172	-	0.000808	-0.000369	0.000137	0.000330	-	0.000180	-553.53	62.42%	64.69%	64.69%
	VIF	16.893	10.990	2.867	9.108	3.880	5.949	6.748	3.870	2.152						
	p	0.767	0.251	<0.001	<0.001	<0.001	0.203	0.004	<0.001	0.004						
2	<i>k_{fe}</i>	0.000740	0.000047	0.000137	-0.000167	-	-	-0.000394	0.000541	-0.000254	-	0.000169	-539.073	50.23%	65.08%	65.08%
	VIF	15.746	10.538	2.811	2.811	3.877	3.819	2.247	2.238	2.117						
	p	0.722	0.258	<0.001	<0.001	0.047	0.006	0.096	0.882	0.231						
3	<i>k_{fe}</i>	0.000738	0.000045	0.000137	-0.000168	-	-	-0.000364	0.000395	-0.000308	-	0.000044	-539.684	47.53%	65.10%	65.10%
	VIF	14.579	10.083	2.745	2.745	3.752	2.238	2.111	2.207							

	<i>p</i>		0.736	0.258	<0.001	0.083	0.017	0.049	0.785				
	<i>k_{fe}</i>		0.000045	0.000137	-0.000168	-0.000330	0.000378	-0.000319					
4	VIF	0.000738	14.573	10.083	2.744	2.452	1.935	1.980		-514.608	47.48%	65.10%	65.10%
	<i>p</i>		0.735	0.257	<0.001	0.051	0.013	0.036					
	<i>k_{fe}</i>		0.000046	0.000136	-0.000167		0.000332						
5	VIF	0.000742	14.036	9.881	2.712		1.007			-540.9996	39.25%	65.12%	65.12%
	<i>p</i>		0.728	0.259	<0.001		0.015						

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