Salomon RL, Rodriguez-Calcerrada J, Gil L, Valbuena-Carabaña M (2018).
Respiratory costs of woody tissues in a *Quercus pyrenaica* coppice
iForest – Biogeosciences and Forestry – doi: 10.3832/ifor2599-011

Supplementary Material

Tab. S1 - Stand density, leaf area index (LAI) and partitioning of annual ecosystem respiration into soil (E_S), stem (E_A) and leaf ($E_{A\text{-}LEAF}$) CO_2 efflux to the atmosphere across different forest stands.

Dominant species	Site	Stand density (stem ha^{-1})	E_S [a]	E_A [b]	$E_{A\text{-}LEAF}$	LAI	Reference
			g C m^{-2} year^{-1}			m^2 m^{-2}	
Pinus canariensis	Morro de Isarda, Tenerife, Spain	829	722	103	113	3.4	[1]
Pinus halepensis	Yatir Forest, Israel	300	404	66	257	1.5	[2]
Tsuga canadensis	Ottawa National Forest, MI, USA	566	645	203	74	3.8	[3]
Fagus sylvatica	Collelongo, Italy	825	428	61	275	6.5	[4]
Fagus sylvatica	Hesse, France	3480	663	325 [c]		5.6	[5]
Quercus ilex	Puéchabon, France	4900	517	131	329	2.3	[6]
Oak mixed stand (control)	Missouri Ozark Forest, MO, USA	997	1193	251	164	NA	[7]
Temperate mixed stand	Changbai Natural Reserve, China	1556	595	260	384	6.0	[8]
Hardwood mixed stand	Ottawa National Forest, MI, USA	439	770	132	111	4.1	[3]
Hardwood mixed stand	UMBS, MI, USA	2214	1012	157	257	3.5	[9]
Hardwood mixed stand	ChequamegonNational Forest, WI, USA	NA	883	235	59	4.2	[10]
Mature aspen stand			1117	152	110	4.8	[10]
Intermediate aspen stand			890	20	101	3.5	[10]
Populus spp.	Prince Albert National Park, SK, Canada	980	833	167	190	4.4	[11]
P. tremuloides		830	960	158	197	5.1	[12]
Mean from 15 sites (Min-Max)			776 (404-1196)	162 (20-325)	188 (59-384)	4.2 (1.5-6.5)	
Quercus pyrenaica [d]	Valsaín, Spain	781	1663	479	NA	3.8	
Quercus pyrenaica [e]			1164	297			

Components of ecosystem respiration were estimated based on up-scaled chamber CO_2 transport was neglected for comparison. To use consistent terminology, the so-called soil, stem and foliage respiration are re-named as soil efflux (E_S), and stem and foliage efflux to the atmosphere (E_A and $E_{A\text{-}LEAF}$, respectively), since CO_2 efflux rates does not exactly reflect respiration rates [13]. In cases of multi-year studies, values were averaged over the monitored period.

[a] Autotrophic and heterotrophic components of E_S are not discriminated in most cases.

[b] Branch E_A is commonly included in stem E_A. When E_A from branches was measured separately, it was added to stem E_A for comparison.

[c] In this case, aboveground CO_2 efflux (E_A + $E_{A\text{-}LEAF}$) was calculated as the difference between ecosystem respiration (from eddy flux measurements) and E_S.

[d] Measurements performed during the growing season (Table 1) were averaged and extrapolated over the year.

[e] To reduce overestimation of annual E_S and E_A due to enhanced respiration during the growing season, estimates of the growing and the dormant season were averaged (with equal weights) to provide annual values. To estimate respiratory fluxes during the dormant season, reductions in E_S and E_A observed in *Quercus* species during dormant periods were applied to this study. E_A in *Quercus pyrenaica* decreased to 0.47 µmol CO_2 m^{-2} s^{-1} during winter, 24% of E_A averaged over the growing season [14, 15]. E_S in *Q. cerris* decreased to 1.35 µmol CO_2 m^{-2} s^{-1} during winter, 40% of E_S averaged over the growing season [16].

Supplementary references

1. Wieser G, Gruber A, Bahn M, Catalá E, Carrillo E, et al. (2009). Respiratory fluxes in a Canary Islands pine forest. Tree Physiology 29: 457–466.
2. Maseyk K, Grünzweig JM, Rotenberg E, Yakir D (2008). Respiration acclimation contributes to high carbon-use efficiency in a seasonally dry pine forest. Global Change Biology 14: 1553–1567.
3. Tang J, Bolstad P V., Desai AR, Martin JG, Cook BD, et al. (2008). Ecosystem respiration and its components in an old-growth forest in the Great Lakes region of the United States. Agricultural and Forest Meteorology 148: 171–185.
4. Guidolotti G, Rey A, D'Andrea E, Matteucci G, De Angelis P (2013). Effect of environmental variables and stand structure on ecosystem respiration components in a Mediterranean beech forest. Tree Physiology 33: 960–972.
5. Granier A, Ceschia E, Damesin C, Dufrene E, Epron D, et al. (2000). The carbon balance of a young beech forest. Functional Ecology 14: 312–325.
6. Rambal S, Lempereur M, Limousin JM, Martin-StPaul NK, Ourcival JM, et al. (2014). How drought severity constrains gross primary production (GPP) and its partitioning among carbon pools in a Quercus ilex coppice? Biogeosciences 11: 6855–6869.
7. Li Q, Chen J, Moorhead DL (2012). Respiratory carbon losses in a managed oak forest ecosystem. Forest

Ecology Management 279: 1–10.

8. Wang M, Guan D-X, Han S-J, Wu J-L (2010). Comparison of eddy covariance and chamber-based methods for measuring CO_2 flux in a temperate mixed forest. Tree Physiology 30: 149–163.

9. Curtis PS, Vogel CS, Gough CM, Schmid HP, Su H-B, et al. (2005). Respiratory carbon losses and the carbon-use efficiency of a northern hardwood forest, 1999 – 2003. New Phytologist 167: 437–456.

10. Bolstad P, Davis KJ, Martin J, Cook BD, Wang W (2004). Component and whole-system respiration fluxes in northern deciduous forests. Tree Physiology 24: 493–504.

11. Griffis TJ, Black TA, Gaumont-Guay D, Drewitt GB, Nesic Z, et al. (2004). Seasonal variation and partitioning of ecosystem respiration in a southern boreal aspen forest. Agricultural and Forest Meteorology 125: 207–223.

12. Gaumont-Guay D, Black TA, Griffis TJ, Barr AG, Morgenstern K, et al. (2006). Influence of temperature and drought on seasonal and interannual variations of soil, bole and ecosystem respiration in a boreal aspen stand. Agricultural and Forest Meteorology 140: 203–219.

13. Teskey RO, Saveyn A, Steppe K, McGuire MA (2008). Origin, fate and significance of CO_2 in tree stems. New Phytologist 177: 17–32.

14. Rodríguez-Calcerrada J, López R, Salomón R, Gordaliza G, Valbuena-Carabaña M, et al. (2015.) Stem CO_2 efflux in six co-occurring tree species: underlying factors and ecological implications. Plant, Cell and Environment 38: 1104–1115.

15. Salomón RL, Valbuena-Carabaña M, Gil L, McGuire MA, Teskey RO, et al. (2016). Temporal and spatial patterns of internal and external stem CO_2 fluxes in a sub-Mediterranean oak. Tree Physiology 36: 1409-1421.

16. Rey A, Pegoraro E, Tedeschi V, De Parri I, Jarvis PG, et al. (2002). Annual variation in soil respiration and its components in a coppice oak forest in Central Italy. Global Change Biology 8: 851–866.