Emisiones de carbono por los tejidos vivos de los robles – un aspecto relevante y descuidado del balance de carbono

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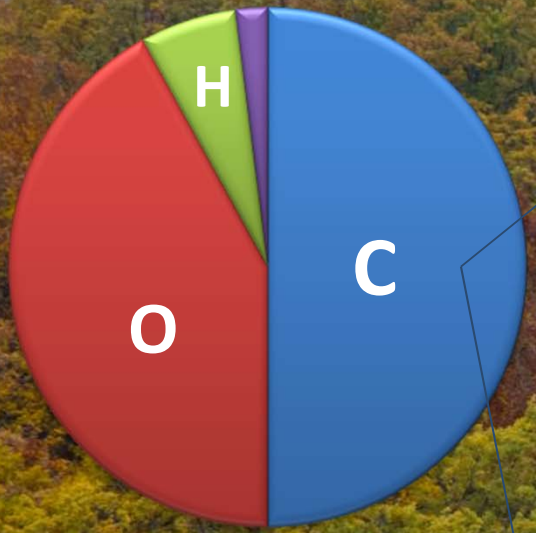
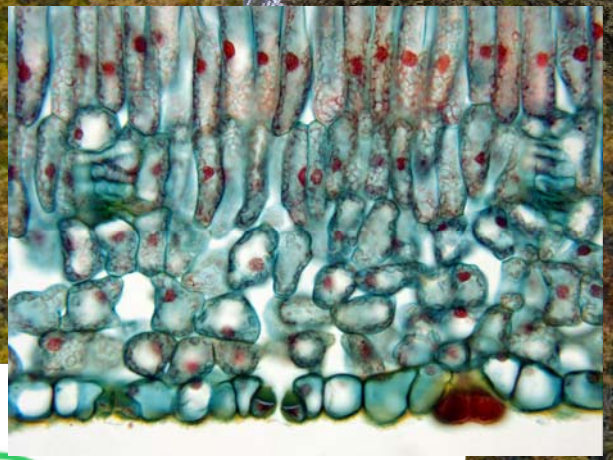
Oaks Physiological Ecology. Exploring the Functional Diversity of Genus *Quercus* L.

N, Ca, P, Mg, Mn…



~ 70% ESTRUCTURAL



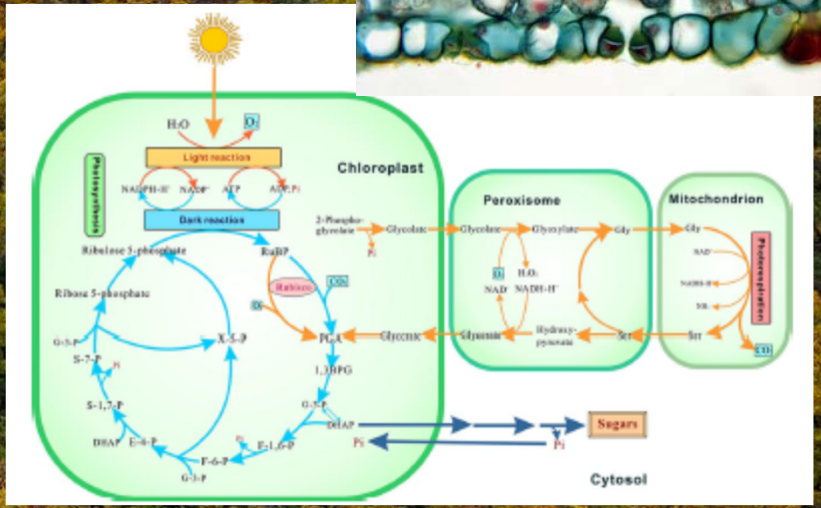
~ 30% NO ESTRUCTURAL

Azúcares solubles

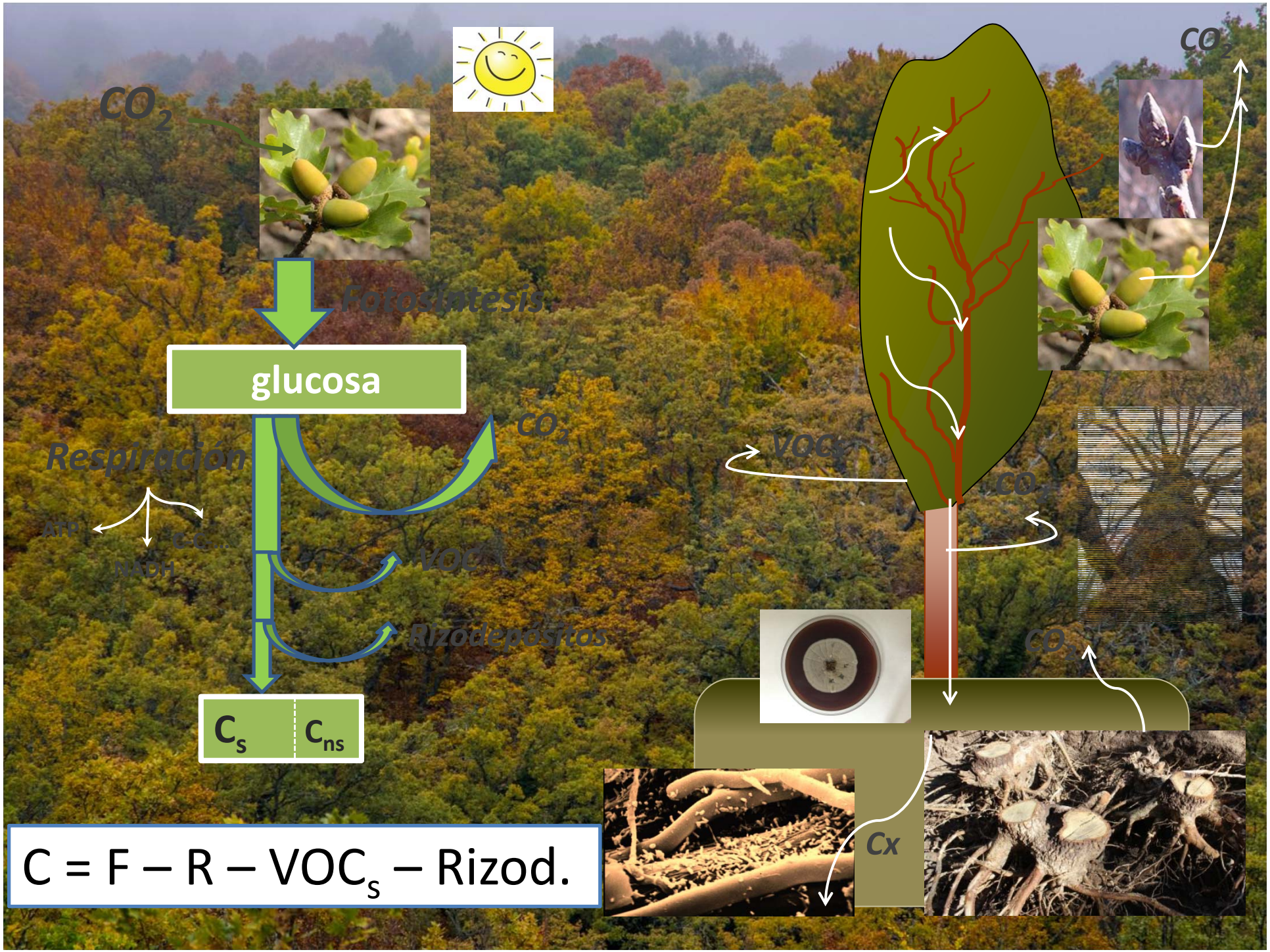
Almidón

Lípidos

VOCs…

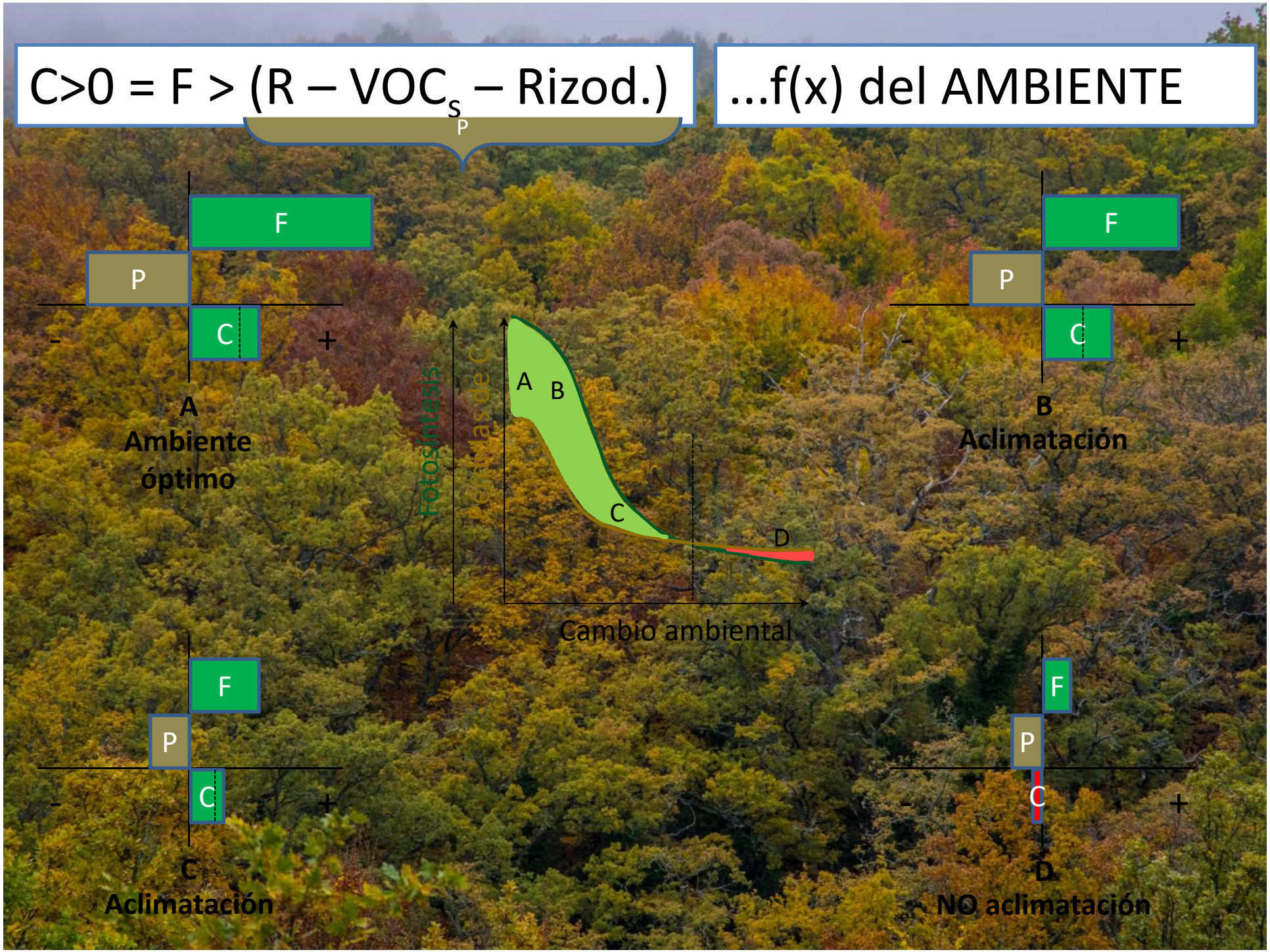


Crecer, florecer, atraer polinizadores, fructificar, evitar patógenos, curar heridas, …


CO_2
Fotosíntesis
glucosa
Respiración
ATP
NADH
C-C...
CO_2
VOC
Rizodepósitos
C_s
C_{ns}
CO_2
VOC_s
CO_2
CO_2
Cx
$C = F - R - VOC_s - Rizod.$

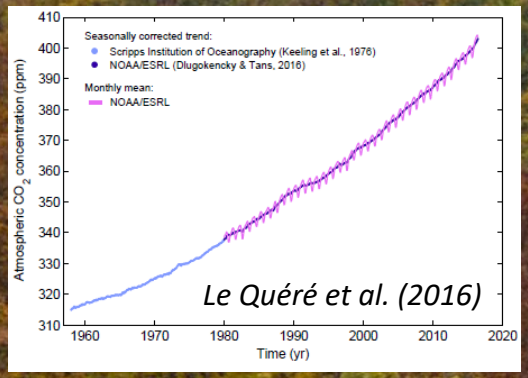
$C>0 = F > (R - VOC_s - Rizod.)$

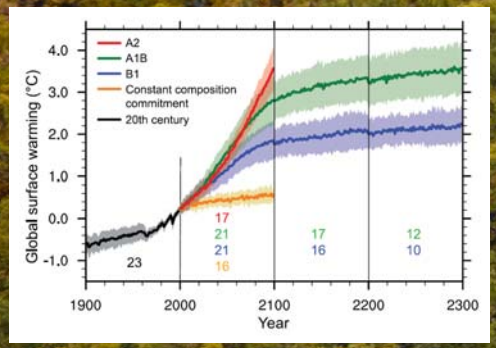
...f(x) del AMBIENTE

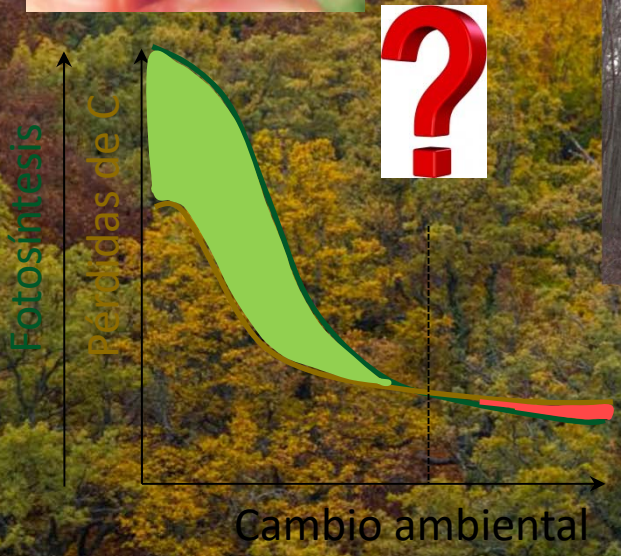


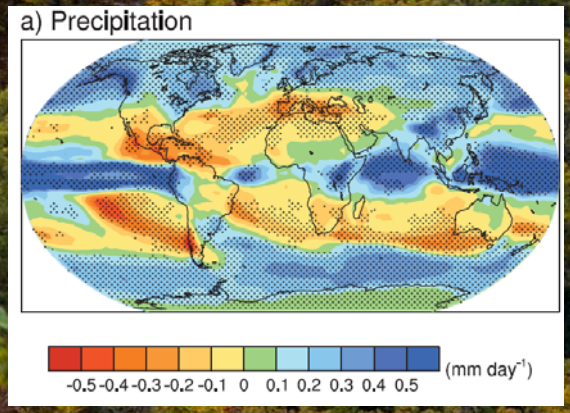
$C = F - R - VOC_s$ – Rizod.

...f(x) del Cambio Global





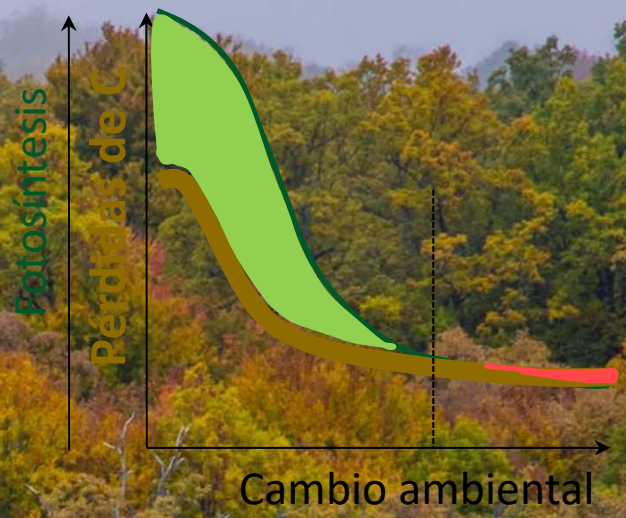




Chapter 10

Carbon Losses from Respiration and Emission of Volatile Organic Compounds—The Overlooked Side of Tree Carbon Budgets

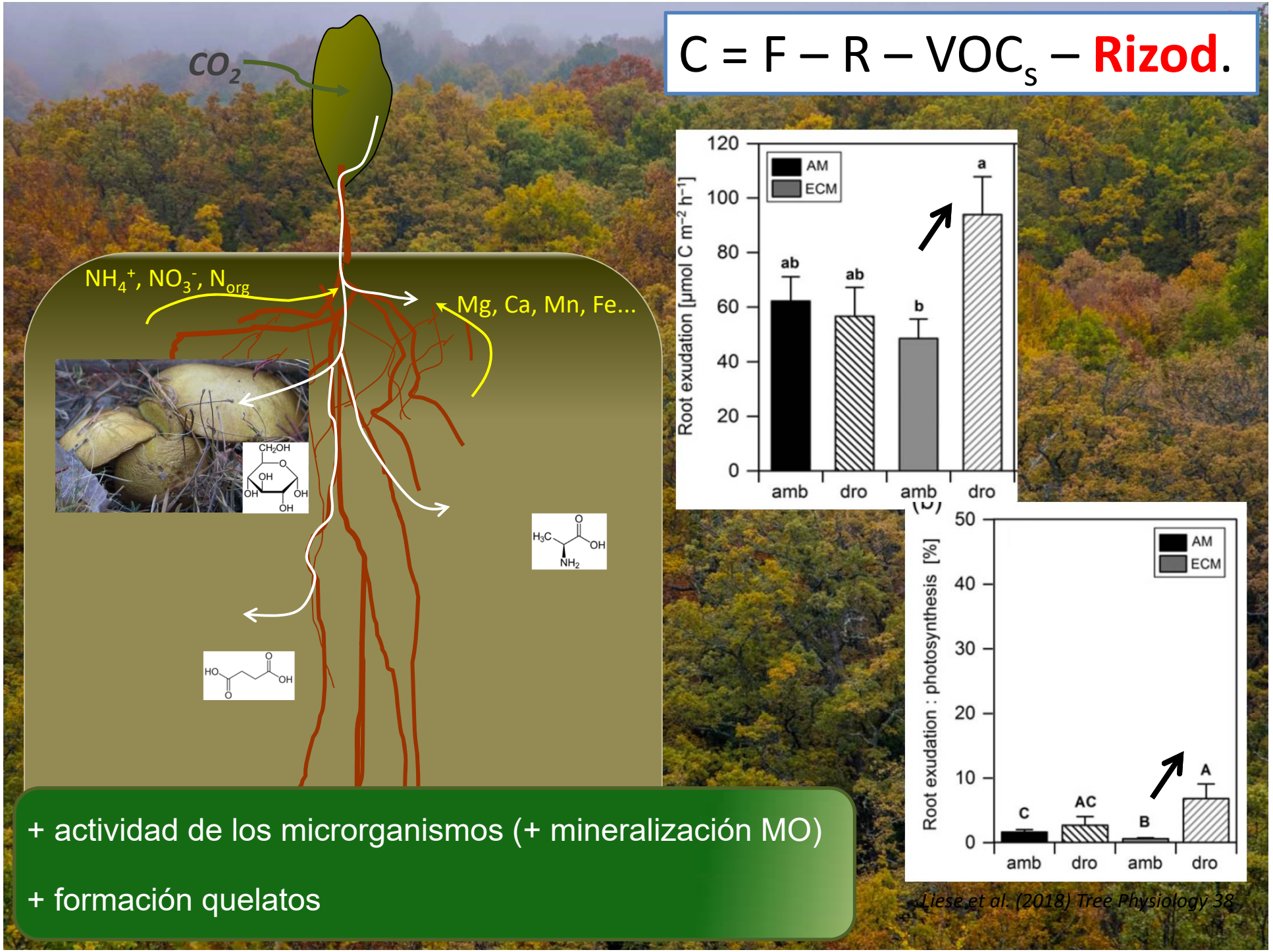
Roberto L. Salomón, Jesús Rodríguez-Calcerrada and Michael Staudt



- ✓ Tasas de emisión de C por R, VOCs, y rizodeposición.
- ✓ Respuesta a los cambios ambientales
  - ✓ Temperatura y agua
  - ✓ Escalas de tiempo
- ✓ Importancia respecto a F y Rtotal

Oaks Physiological Ecology. Exploring the Functional Diversity of Genus *Quercus* L.

$C = F - R - VOC_s - \mathbf{Rizod.}$



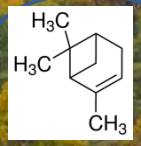
+ actividad de los microrganismos (+ mineralización MO)

+ formación quelatos

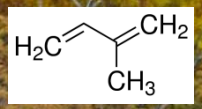
Liese et al. (2018) Tree Physiology 38

$C = F - R - \mathbf{VOC_s} - Rizod.$

30-120 Tg año^{-1}



Isoprenoides (>75%)



410-600 Tg año^{-1}

CO_2

VOC_s constitutivos

Verdú et al. (2007) Animal Behaviour 74

✓ Protección frente al estrés oxidativo

✓ Dispersión secundaria

C = F – R – **VOC_s** – Rizod.

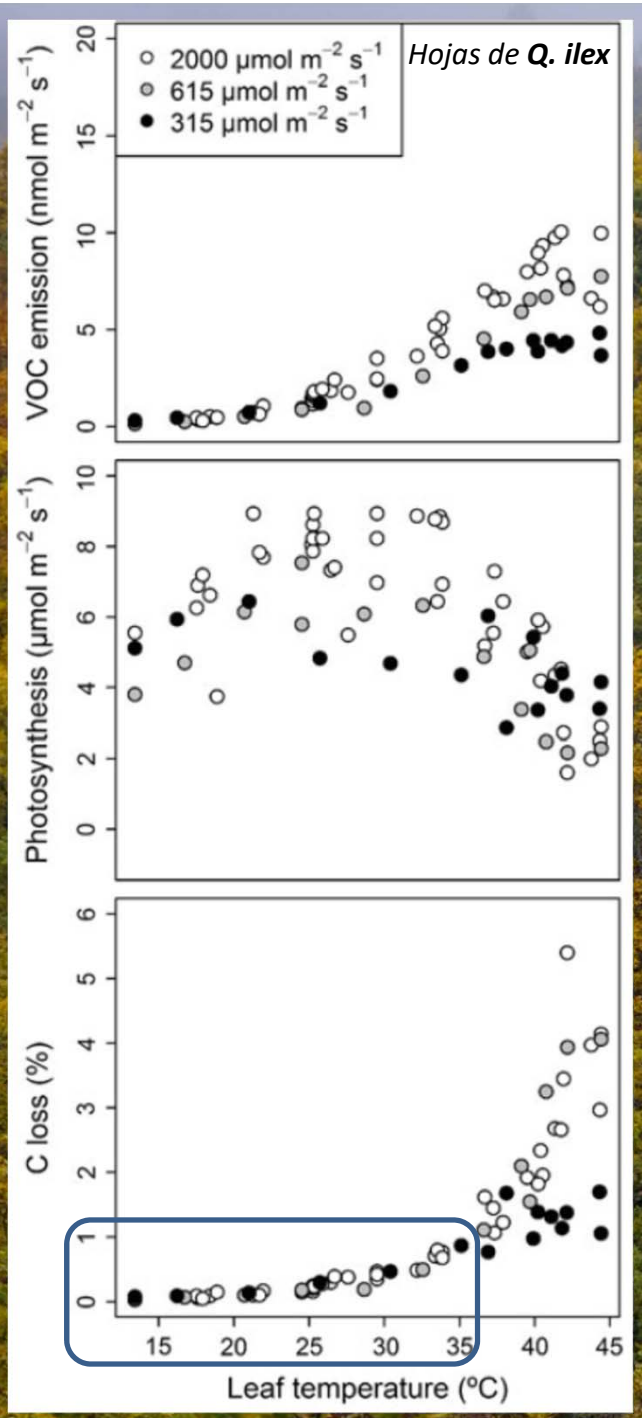
GLVs

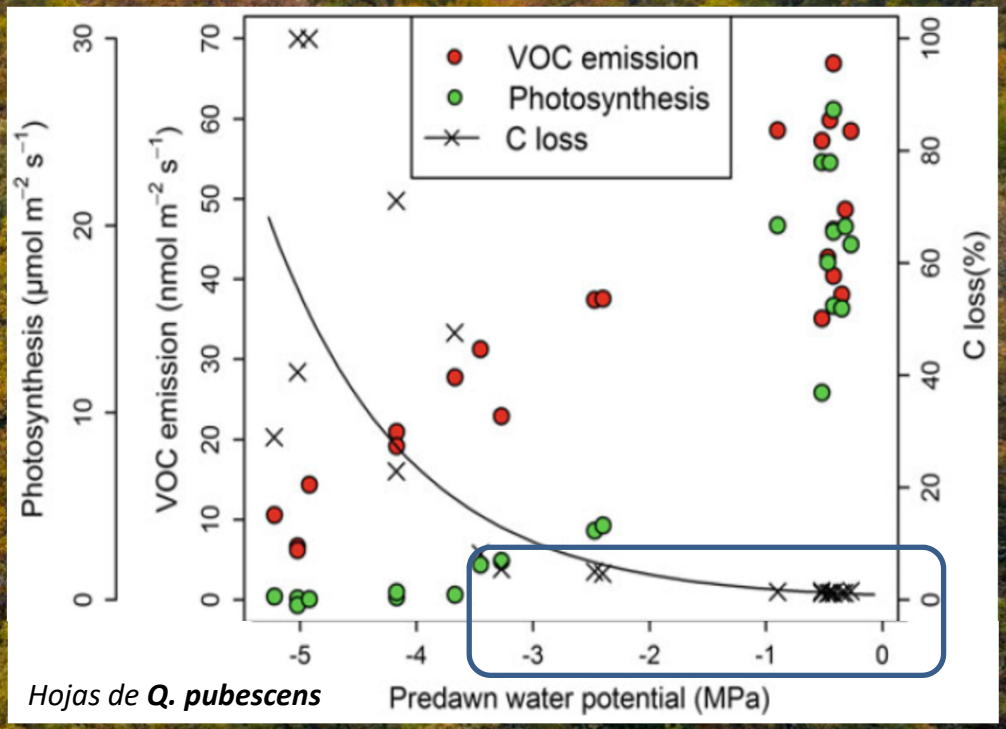
(10% constitutivos)

VOC_s por estrés

- ✓ Repeler herbívoros o atraer a sus enemigos
- ✓ Propiedades antibacterianas y antifúngicas
- ✓ Activar sistema de defensa
- ✓ Activar genes estrés abiótico

C = F – R – VOC_s – Rizod.



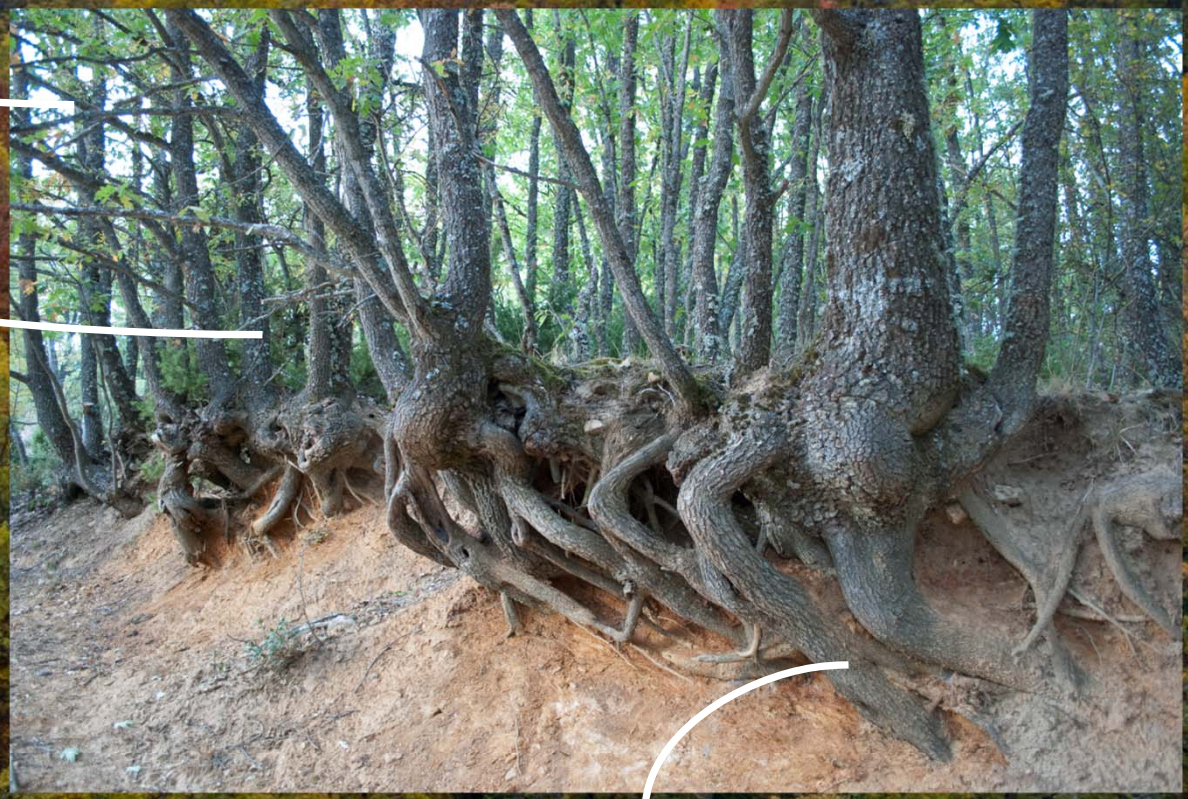


$C = F - \mathbf{R} - \mathbf{VOC_s} - Rizod.$

4 nmol CO_2 g^{-1} s^{-1}

28 % de GPP

26 nmol CO_2 g^{-1} s^{-1}



0.08 nmol CO_2 g^{-1} s^{-1}

8 % de GPP

1-6 nmol CO_2 g^{-1} s^{-1}

18 % de GPP

Respuestas a la temperatura

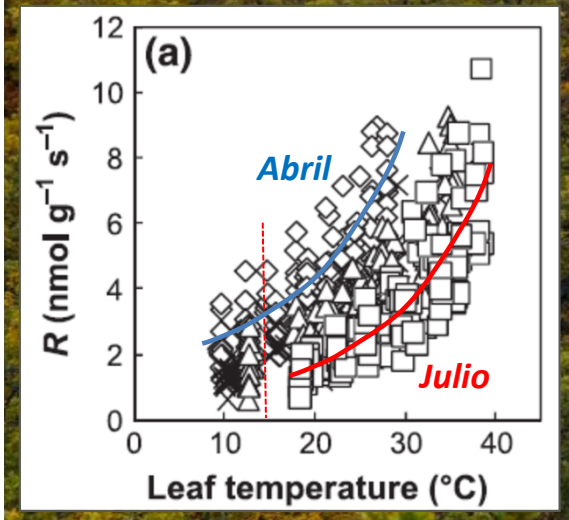
R foliar

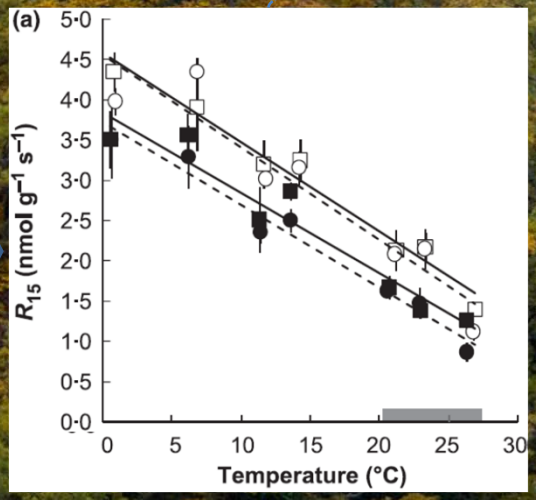
24h

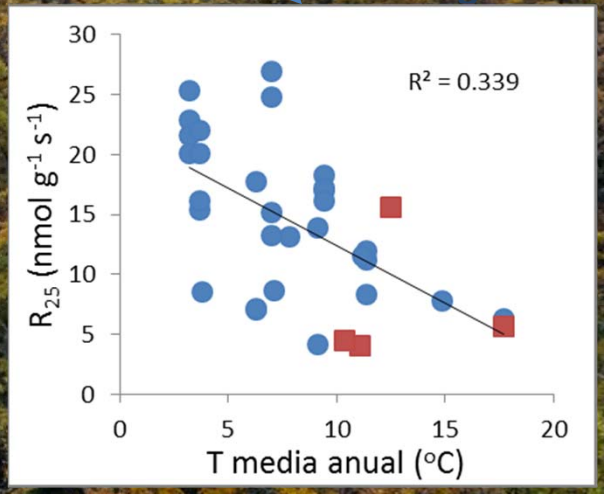
Meses

Años

Siglos



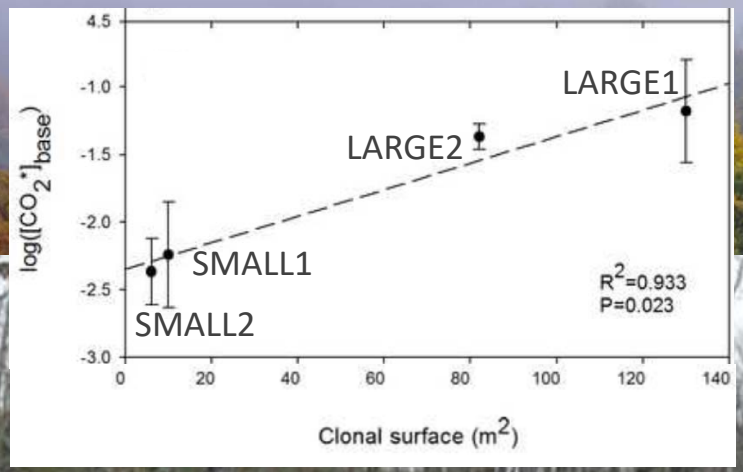




Rodríguez-Calcerrada et al. (2011) Functional Ecology 25

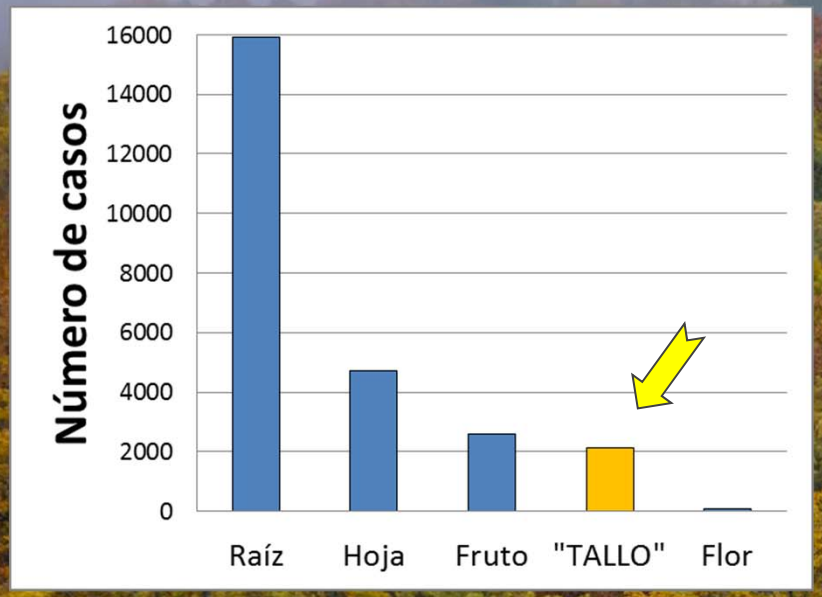
Datos de TRY Kattge et al. (2011) Global Change Biol. 17

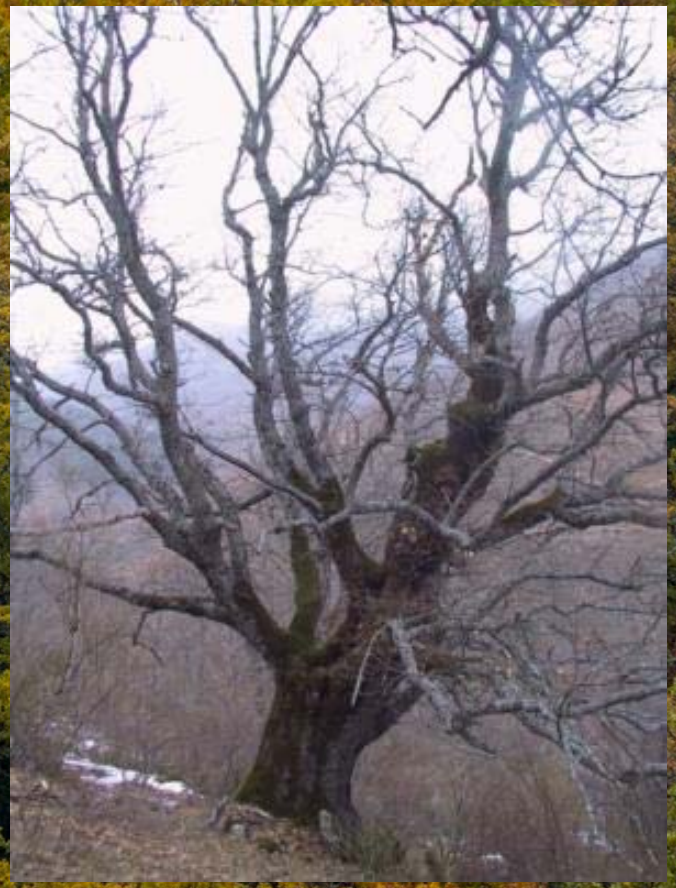
R raíces



Salomón et al. (2016) Forest Ecol. Manage. 363

R troncos





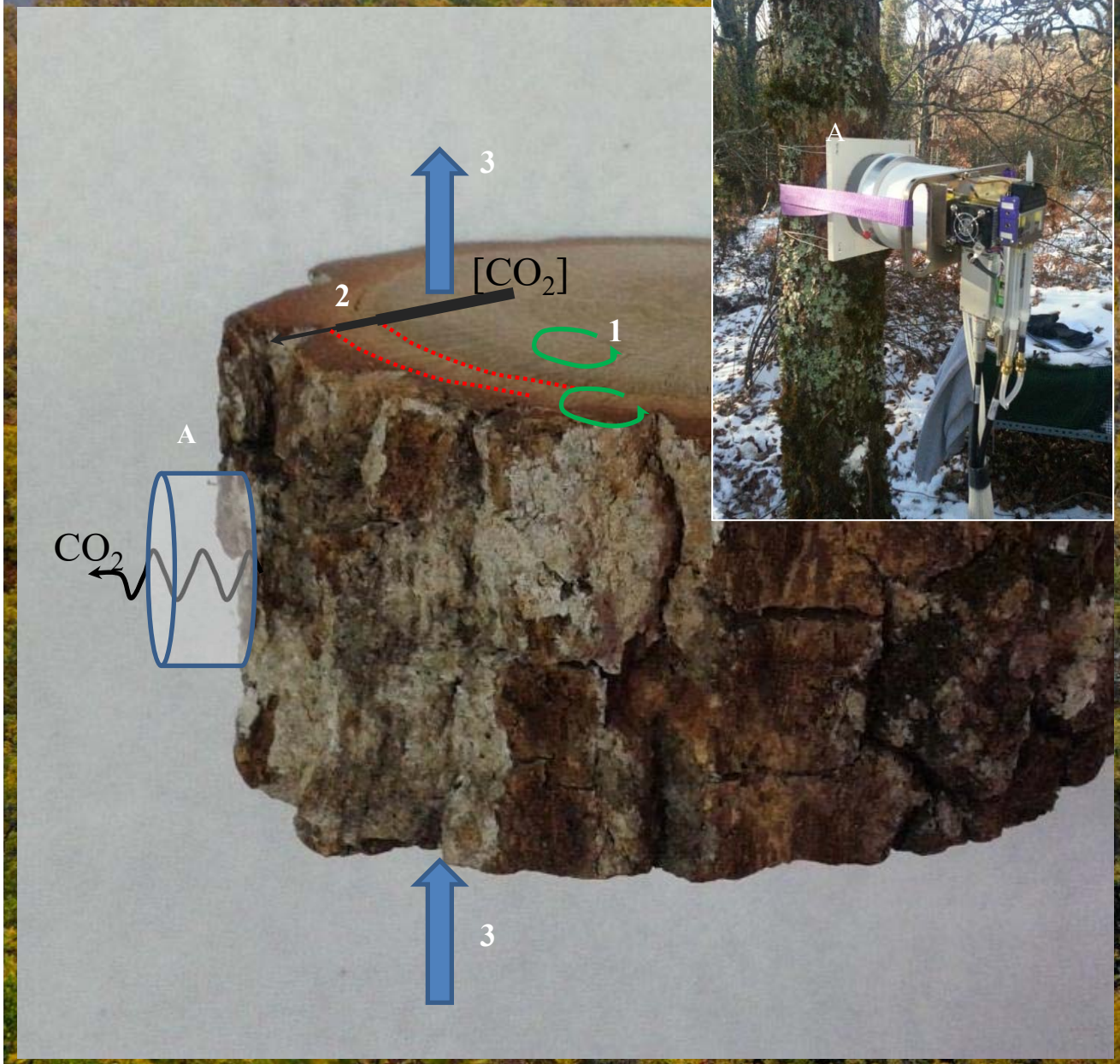
50-350 g C m^{-2} suelo $año^{-1}$

5-20% de R_{eco}

7-30% de $R_{árbol}$

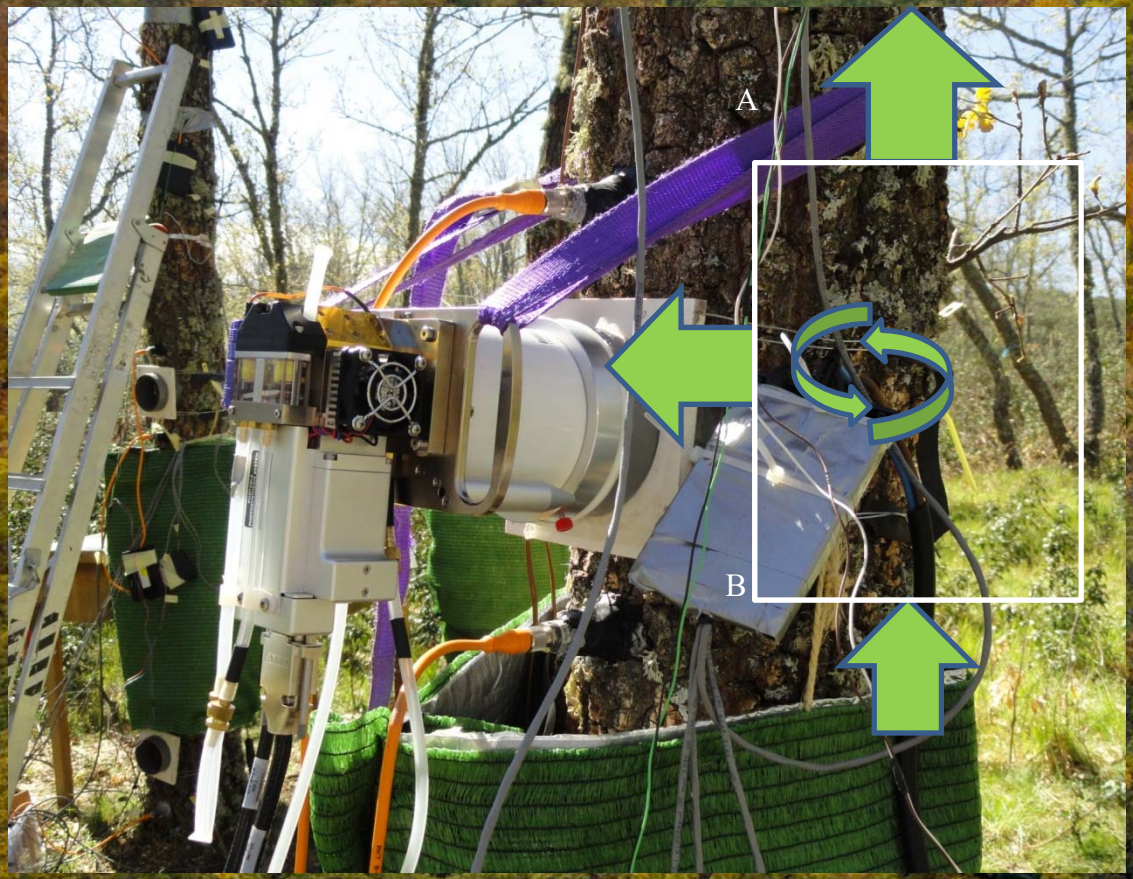
4-15% de F_b

¿Por qué tan poco interés?



1. Reciclaje de CO_2
2. Barreras radiales al flujo de CO_2
3. Transporte de CO_2 en la savia

…solución 1



$$R_S = E_A + F_T + \Delta S$$

$$F_T = \left(\frac{F_{H_2O}}{V}\right)\Delta[CO_2^*]$$

$$\Delta S = ([CO_2^*]_{T1} - [CO_2^*]_{T0})\frac{L}{T}$$

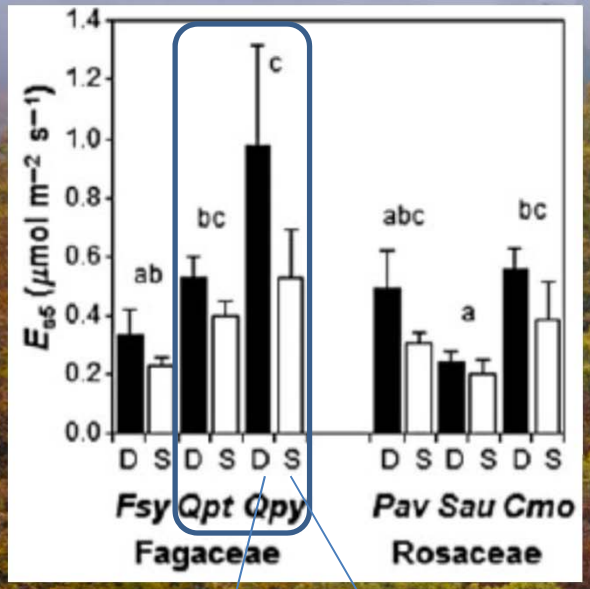
"Mass balance approach"

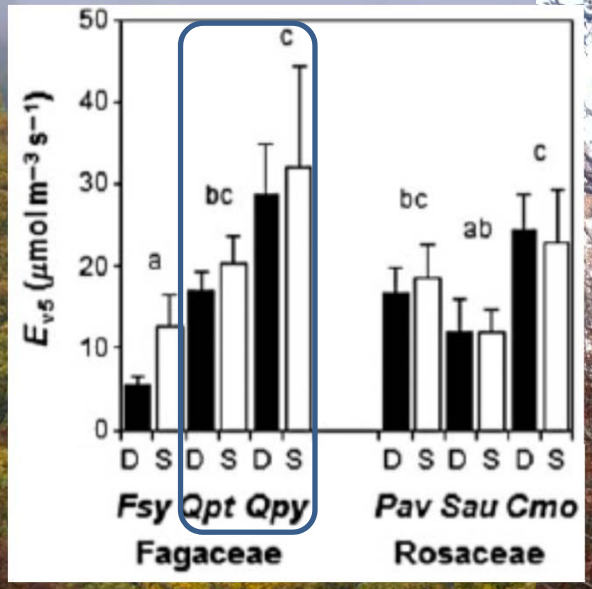
…solución 2

Salomón, Gordaliza, Jiménez et al…

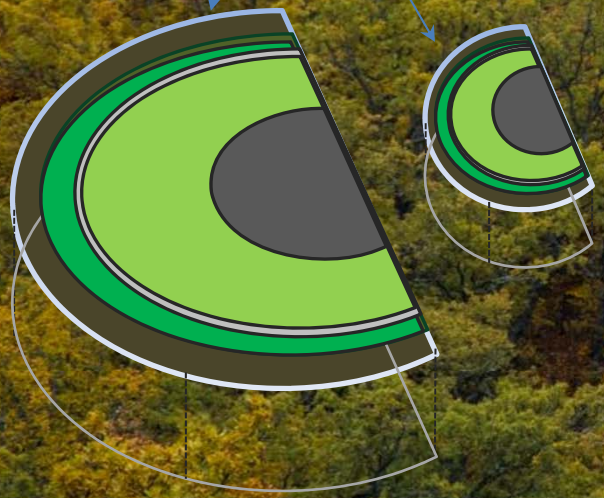
1. Reciclaje de CO_2
2. Barreras radiales al flujo de CO_2
3. Transporte de CO_2 en la savia

…medir por la noche



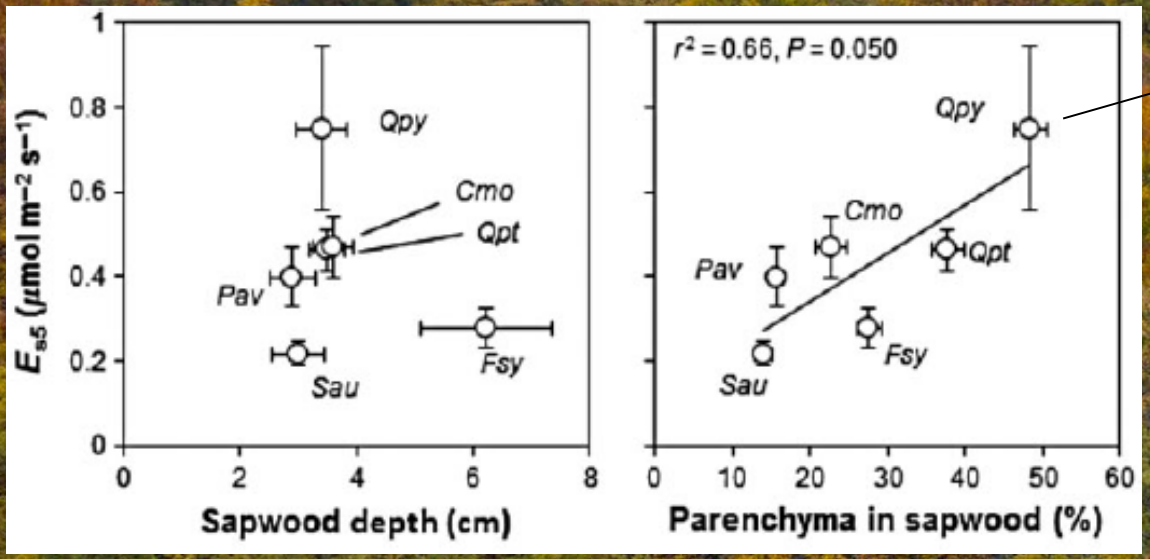


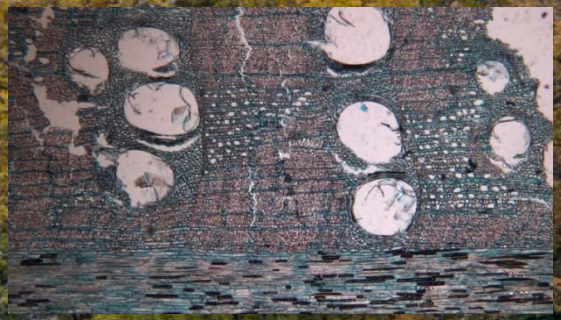
Rodríguez-Calcerrada et al. (2015) Plant, Cell & Environment 38



La mayor tasa de respiración por superficie de tronco de los árboles dominantes se debía a su mayor cantidad de albura

Quercus pyrenaica



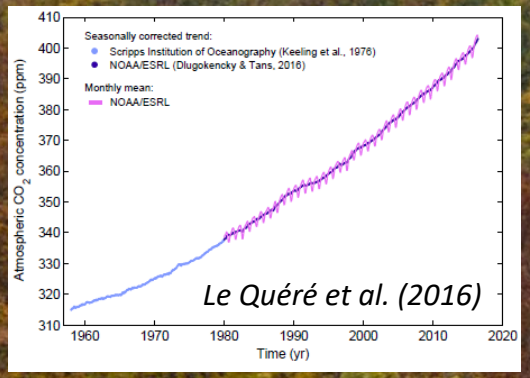


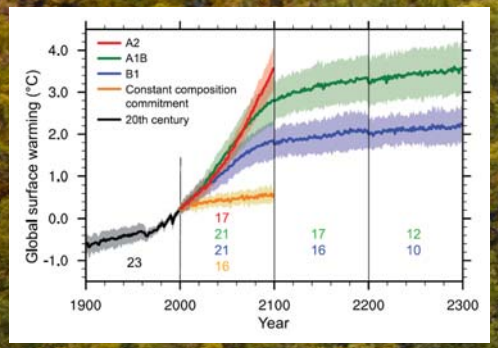
Rodríguez-Calcerrada et al. (2015) Plant, Cell & Environment 38

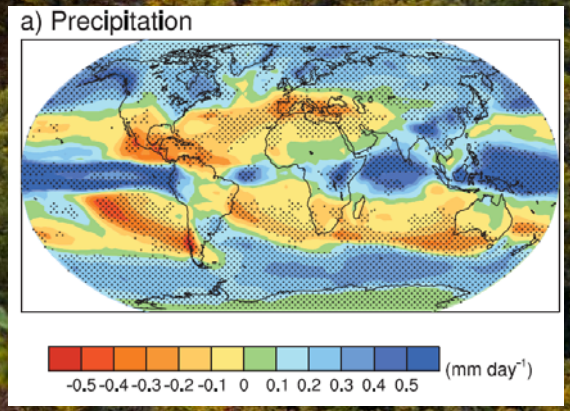
Las diferencias entre especies estaban gobernadas por la proporción de parénquima en la albura

$C = F - R - VOC_s$ – Rizod.

...f(x) del Cambio Global







¡GRACIAS!