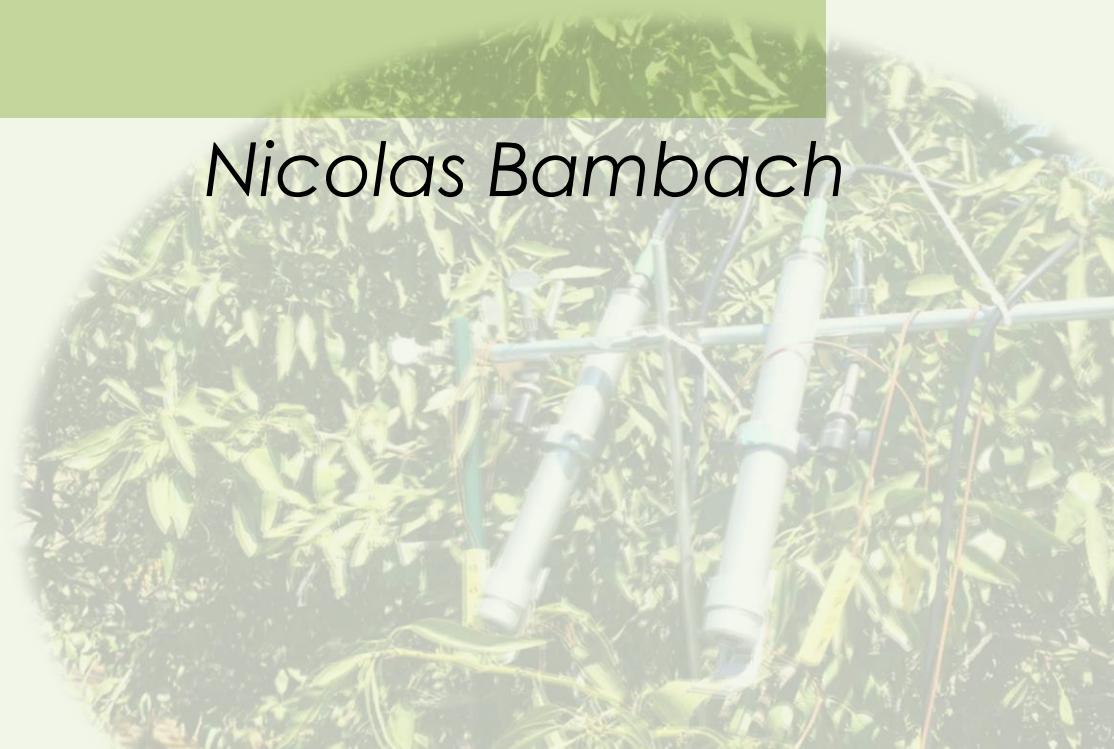




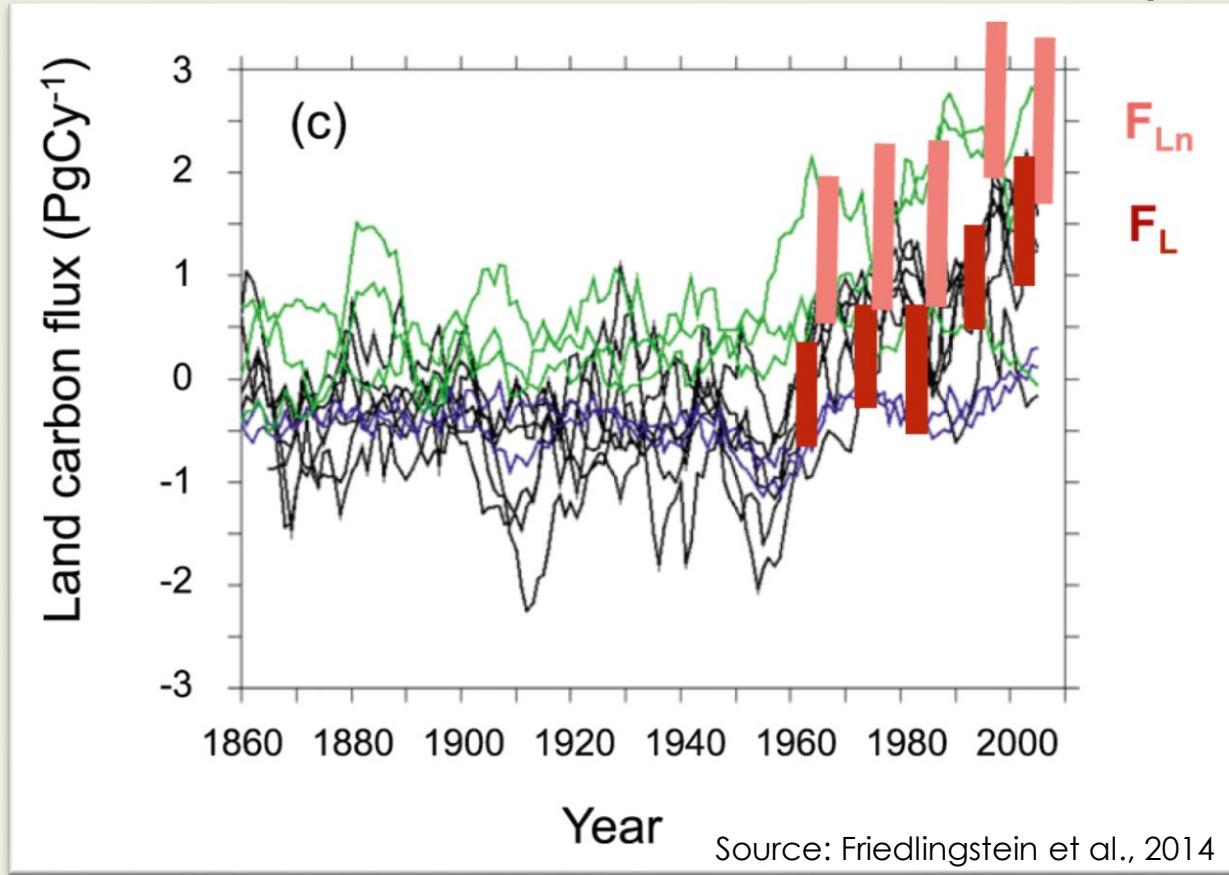
Cuanto importan las plantas en un clima que cambia?

Nicolas Bambach

Financiado por:

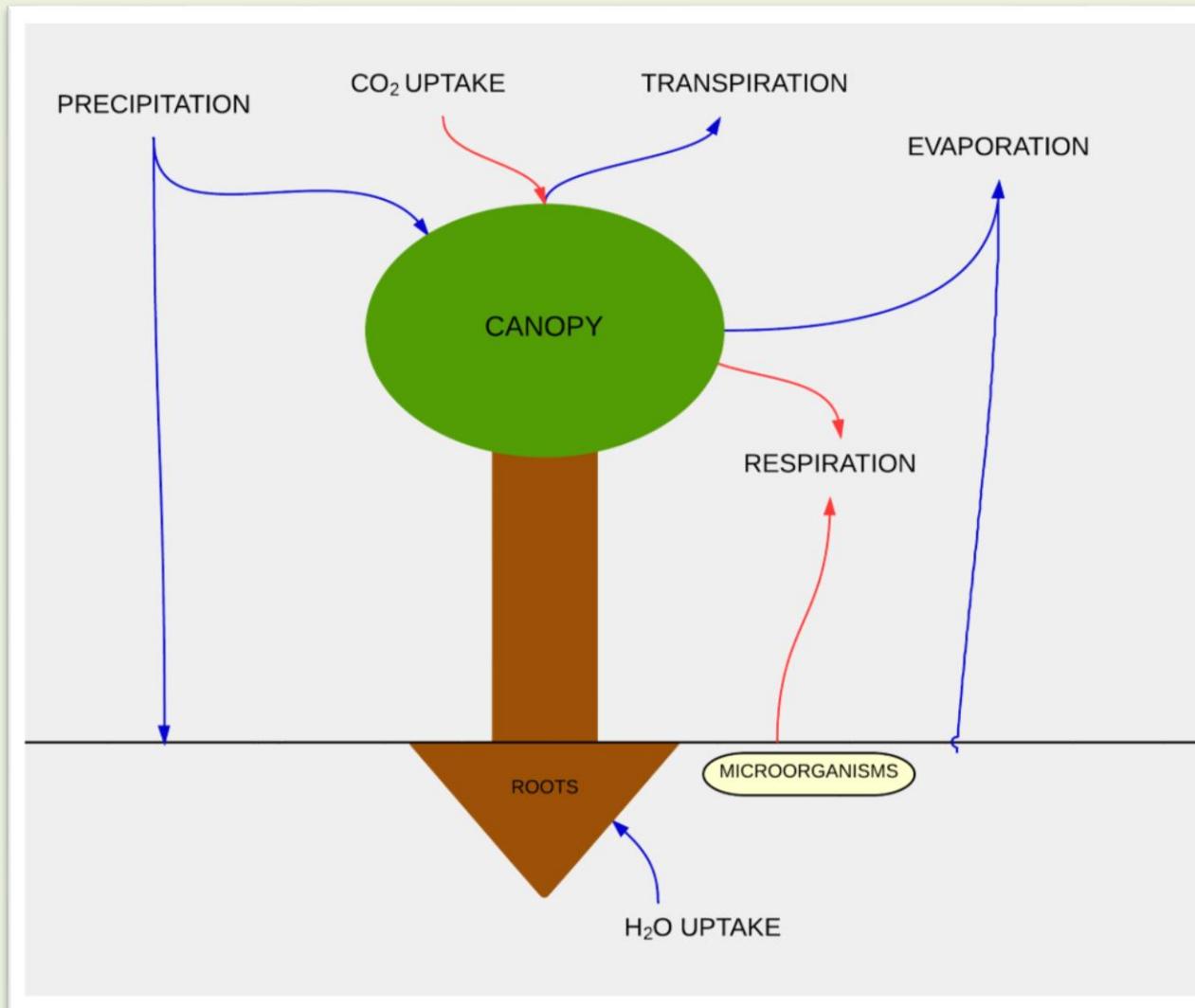


El problema...

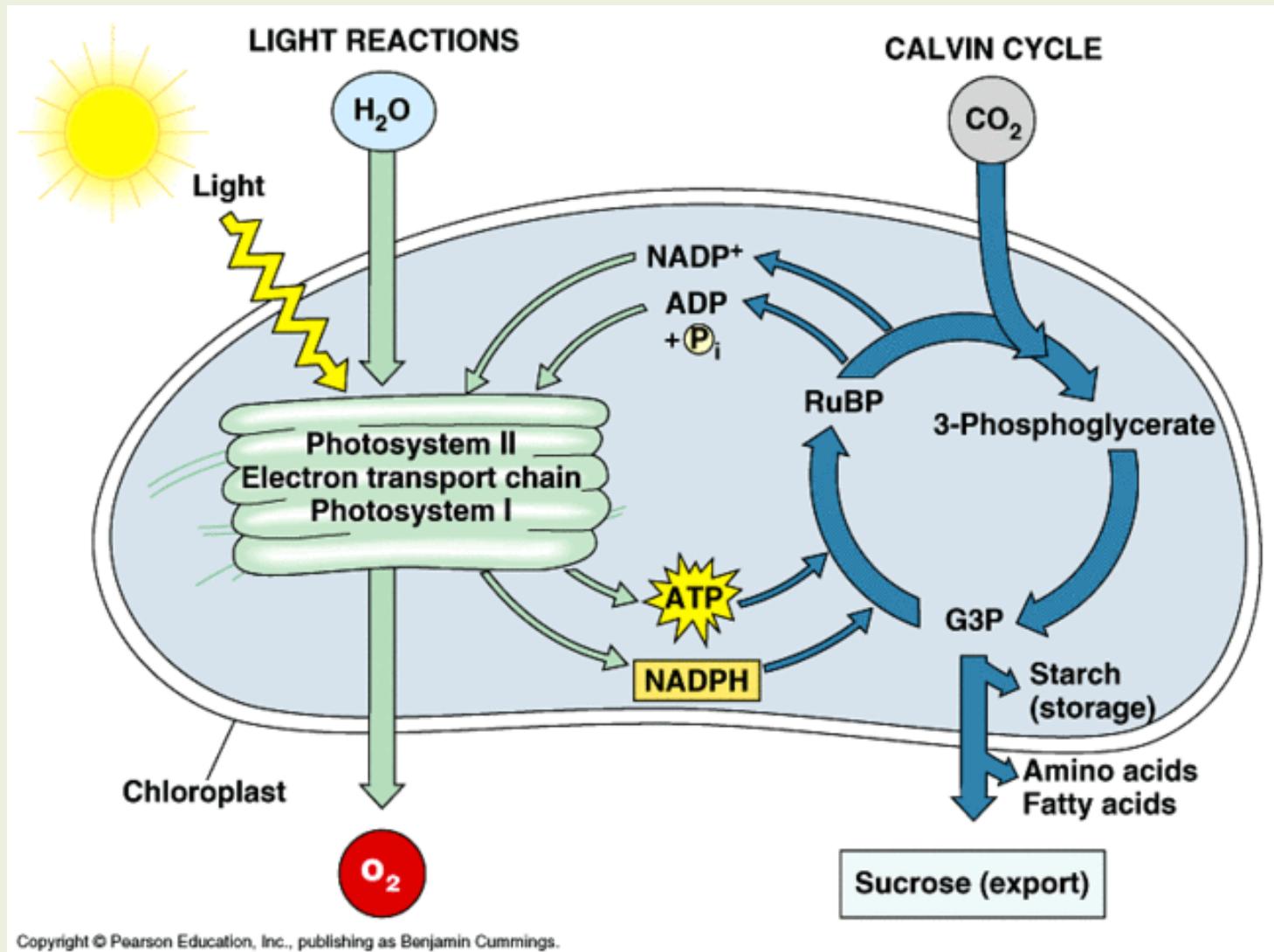


- En las ultimas decadas, se estima que en promedio, los ecosistemas terrestres han capturado cerca de un 25-30% de las emisiones de CO_2
- En proyecciones del clima futuro, el ciclo del carbono es la segunda fuerte mas importante de incertidumbre.

Modelo conceptual



Modelo conceptual



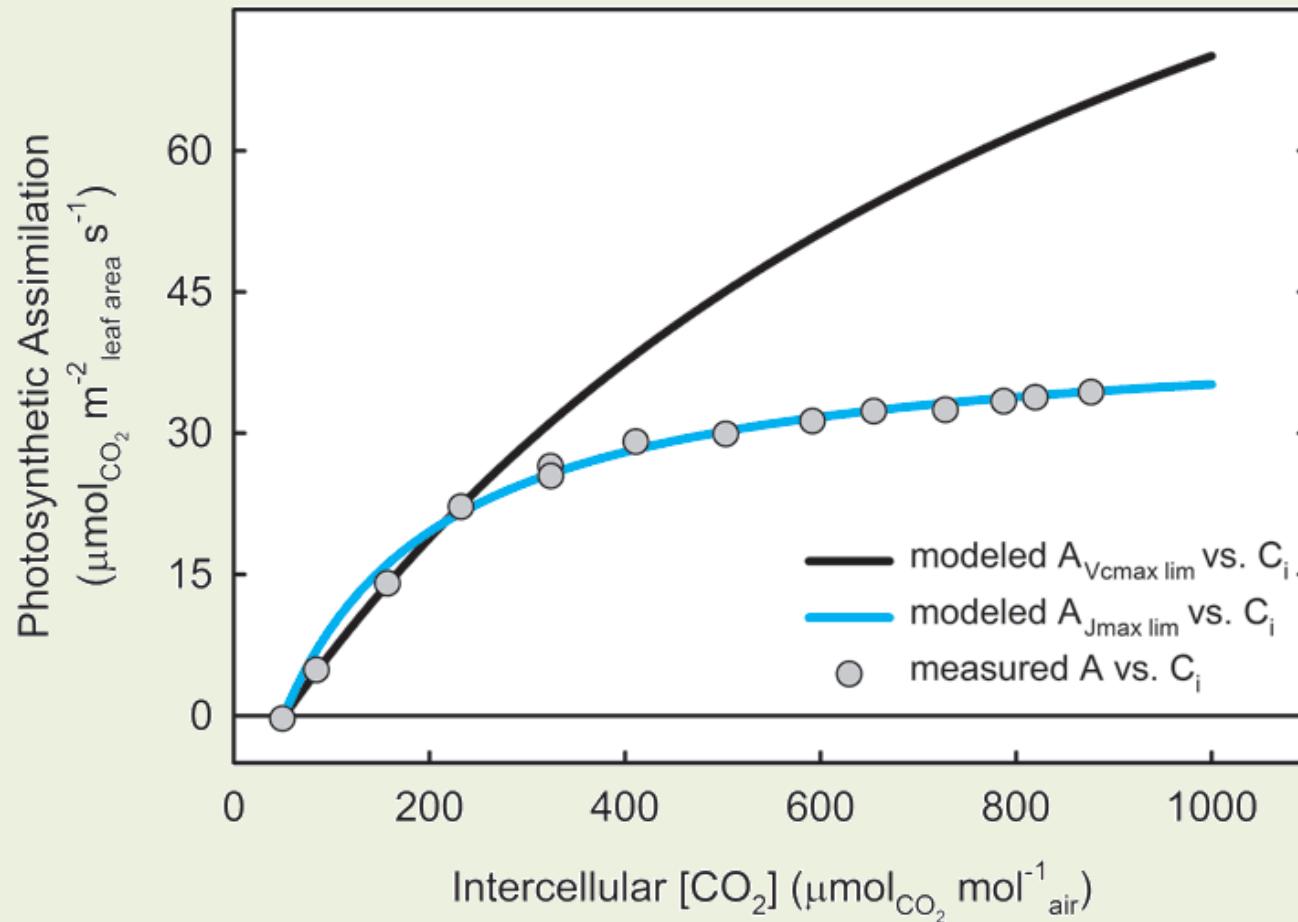
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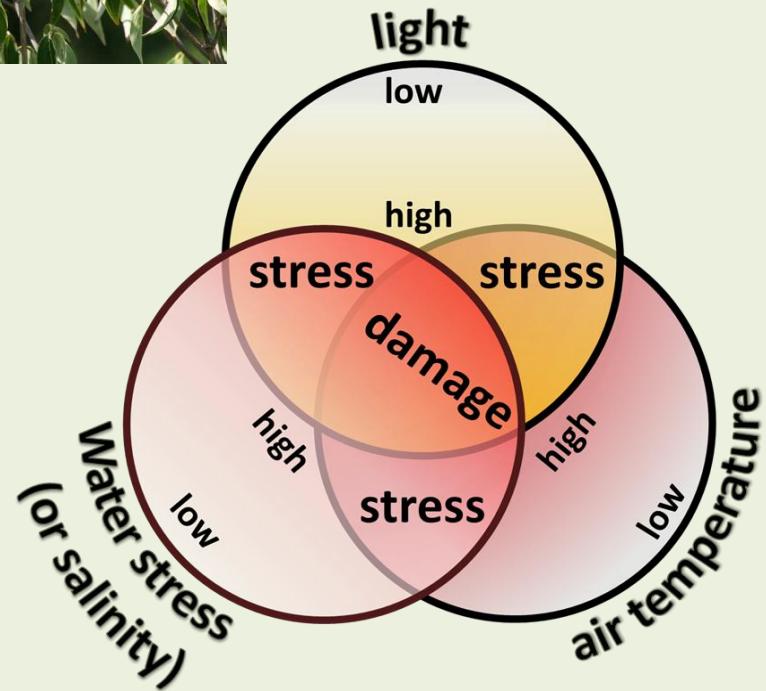
Modelo conceptual

$$V_{C_{max}} = 141.42 \pm 0.846 \quad r^2 = 0.9999 \quad J_{max} = 203.27 \pm 0.819 \quad r^2 = 0.9788$$

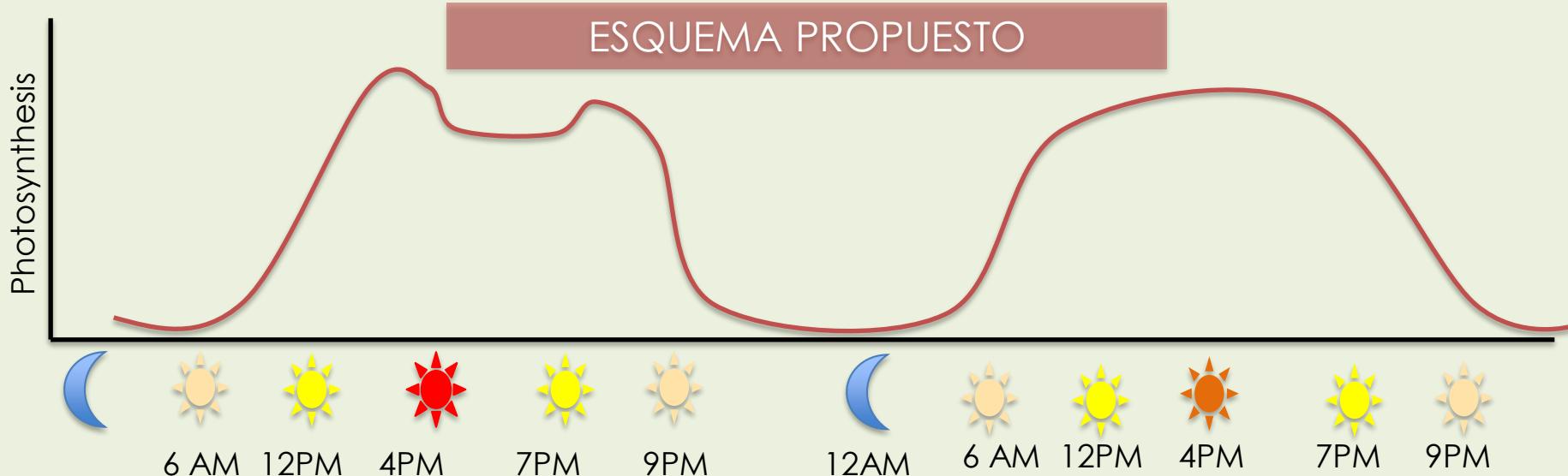
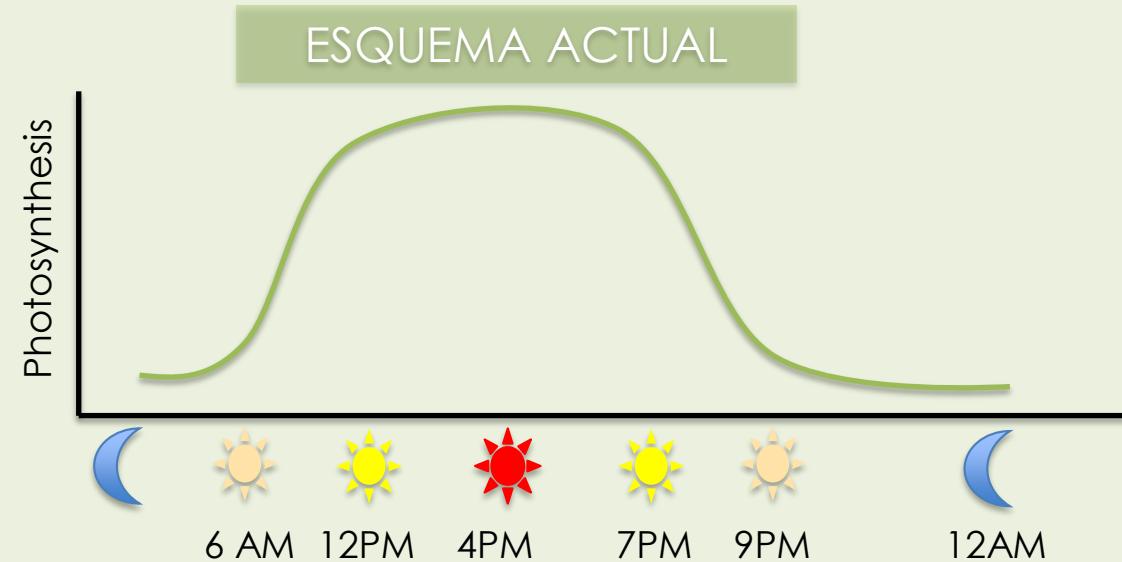
C_i @ inflection = 216 I @ growth $[CO_2]$ = 0.05



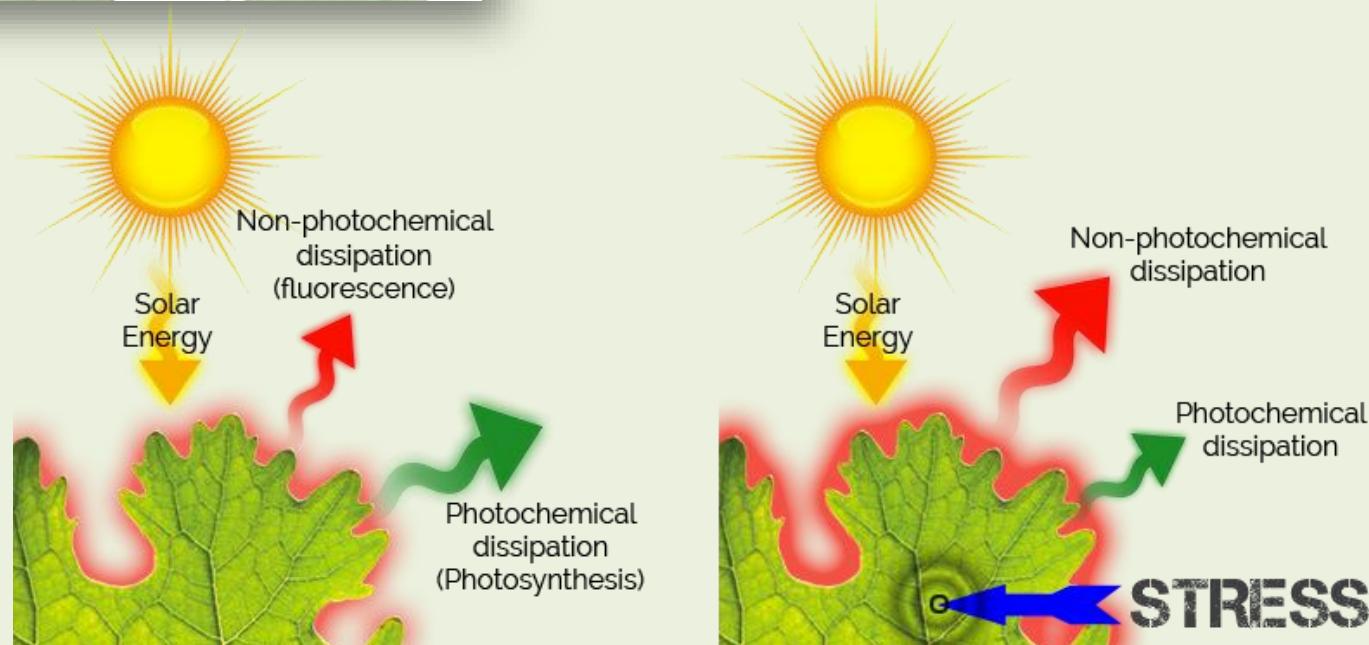
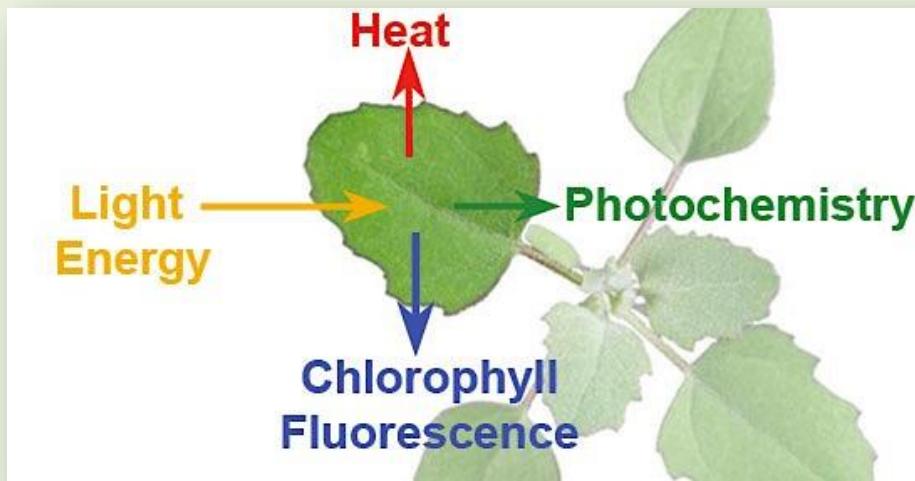
Sin embargo...



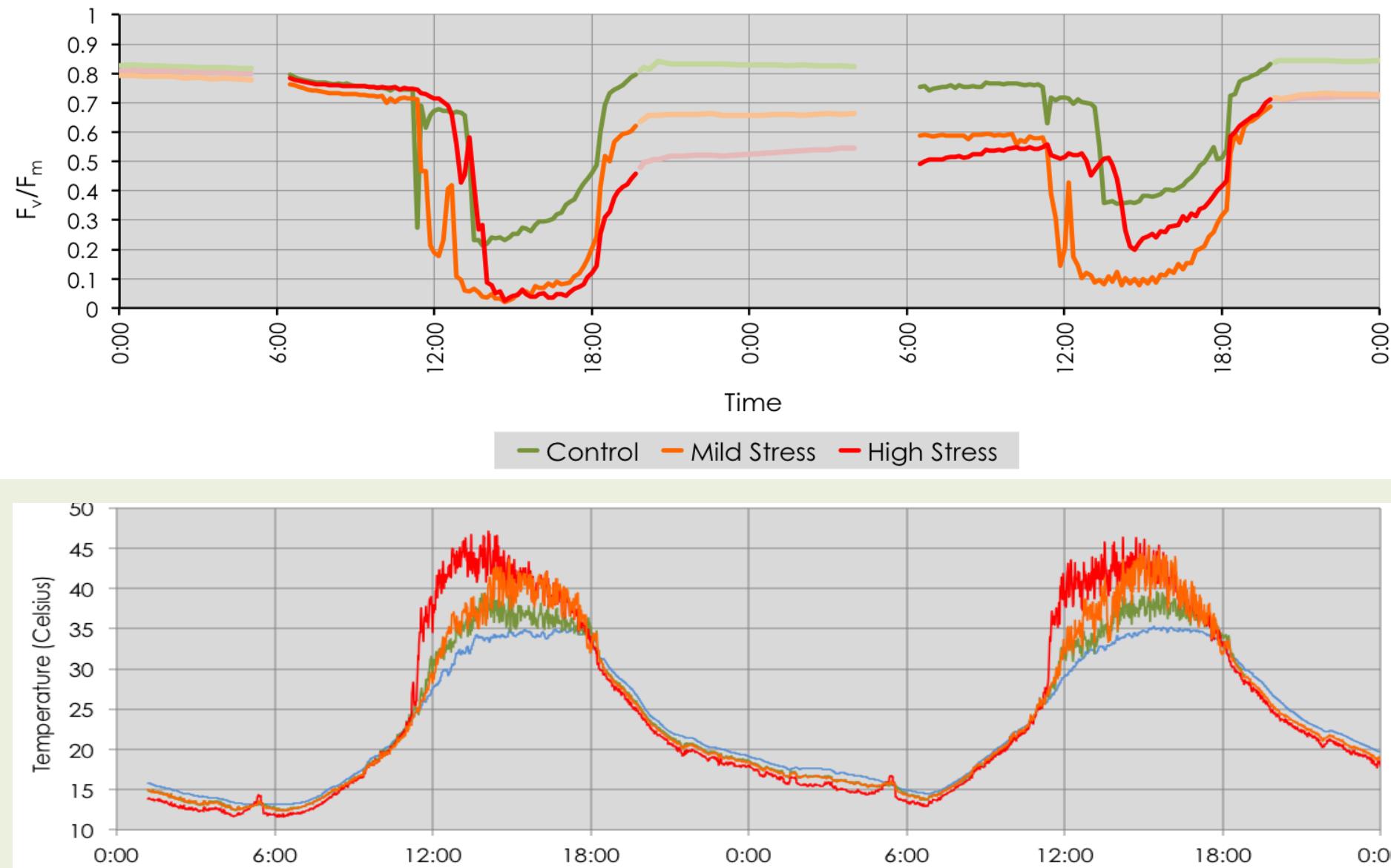
Qué se propone?



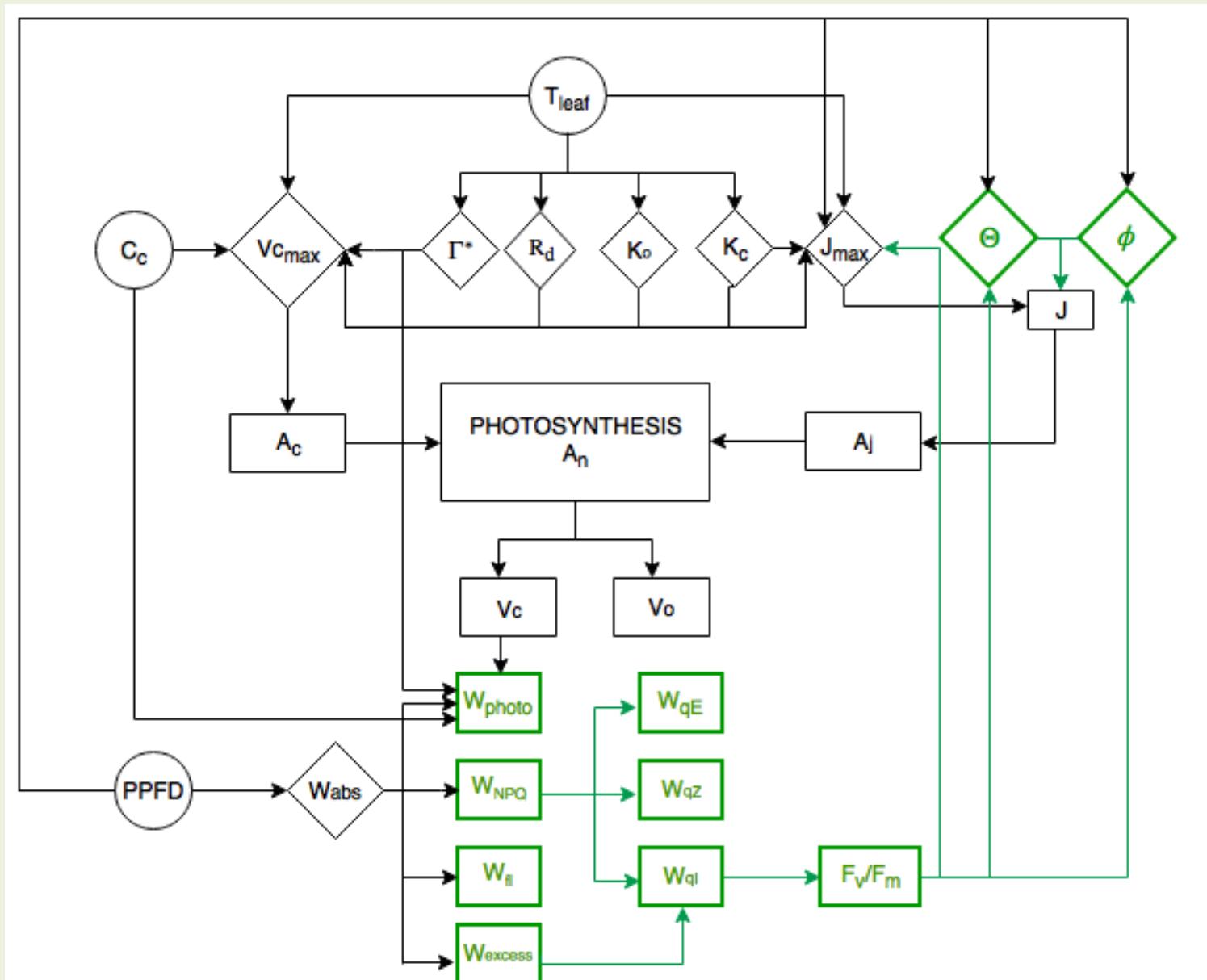
Aproximación metodológica



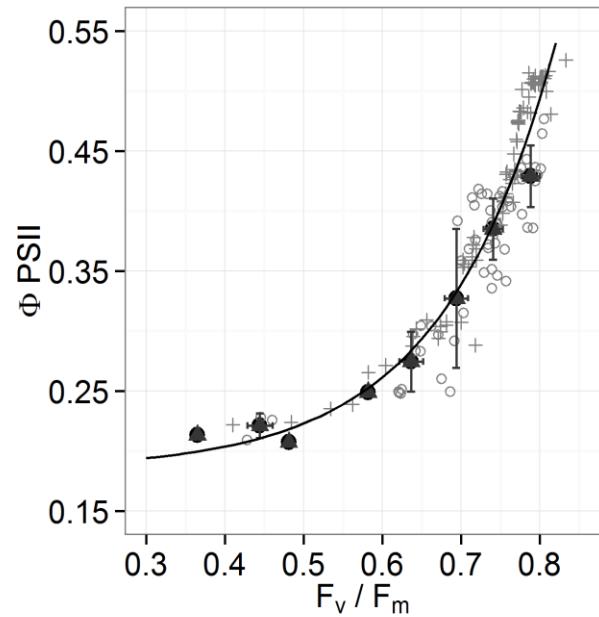
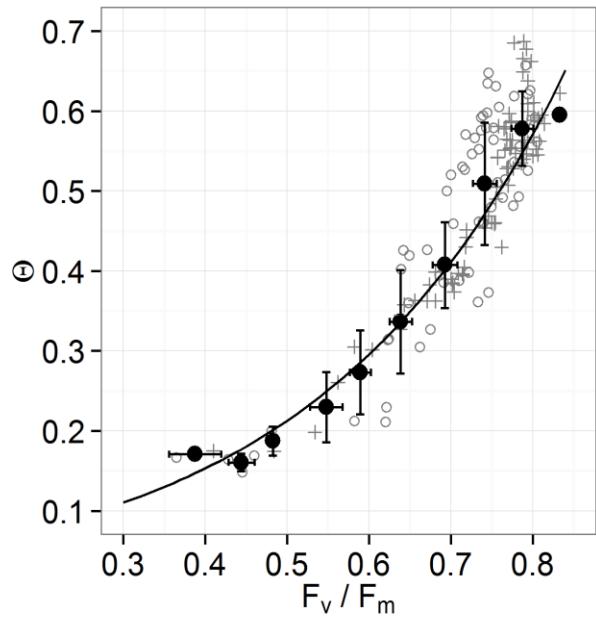
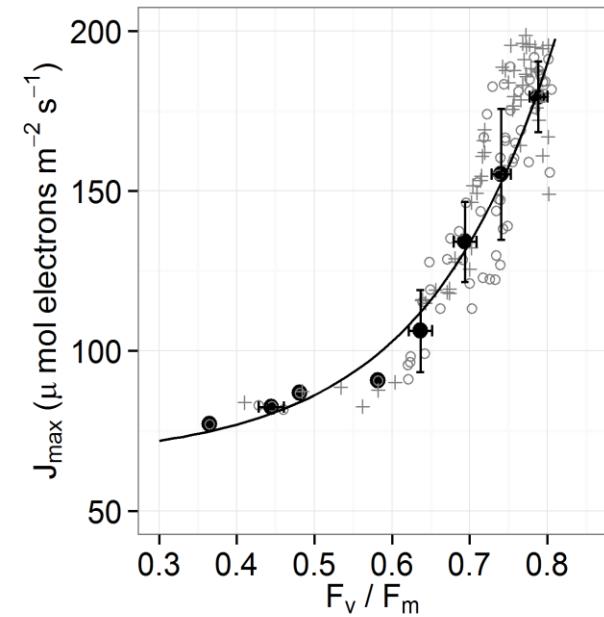
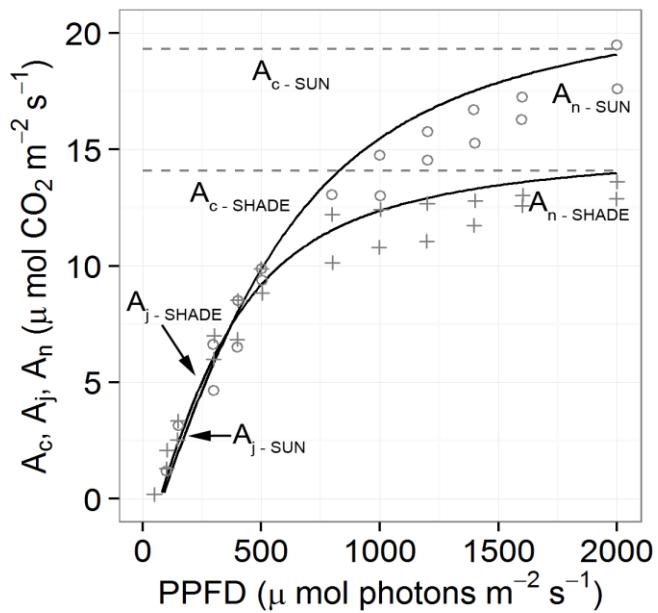
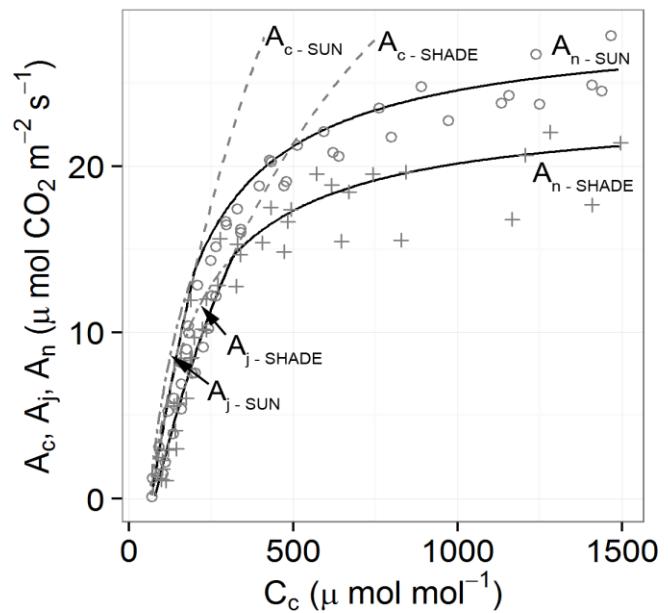
Primeros Resultados

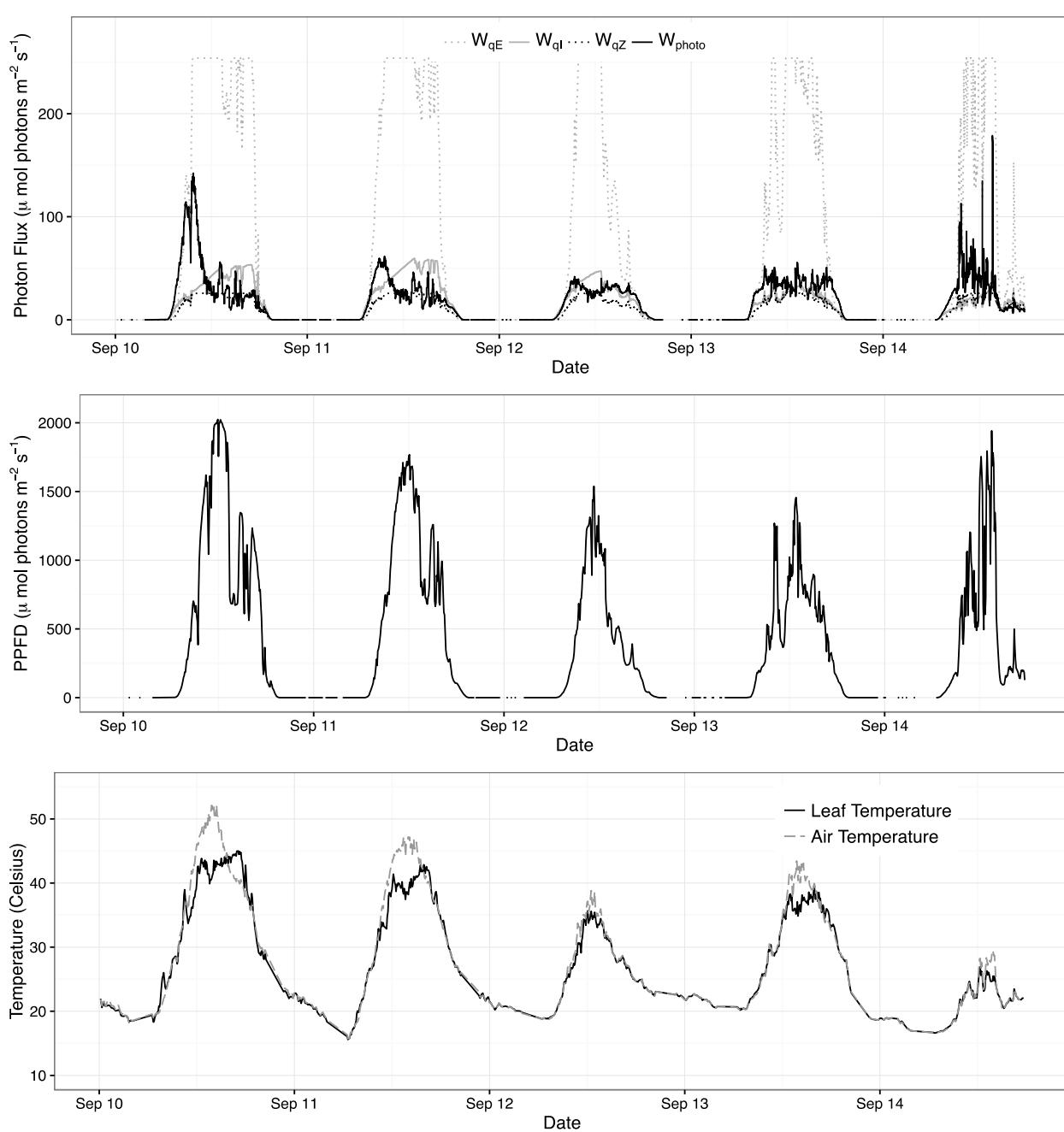


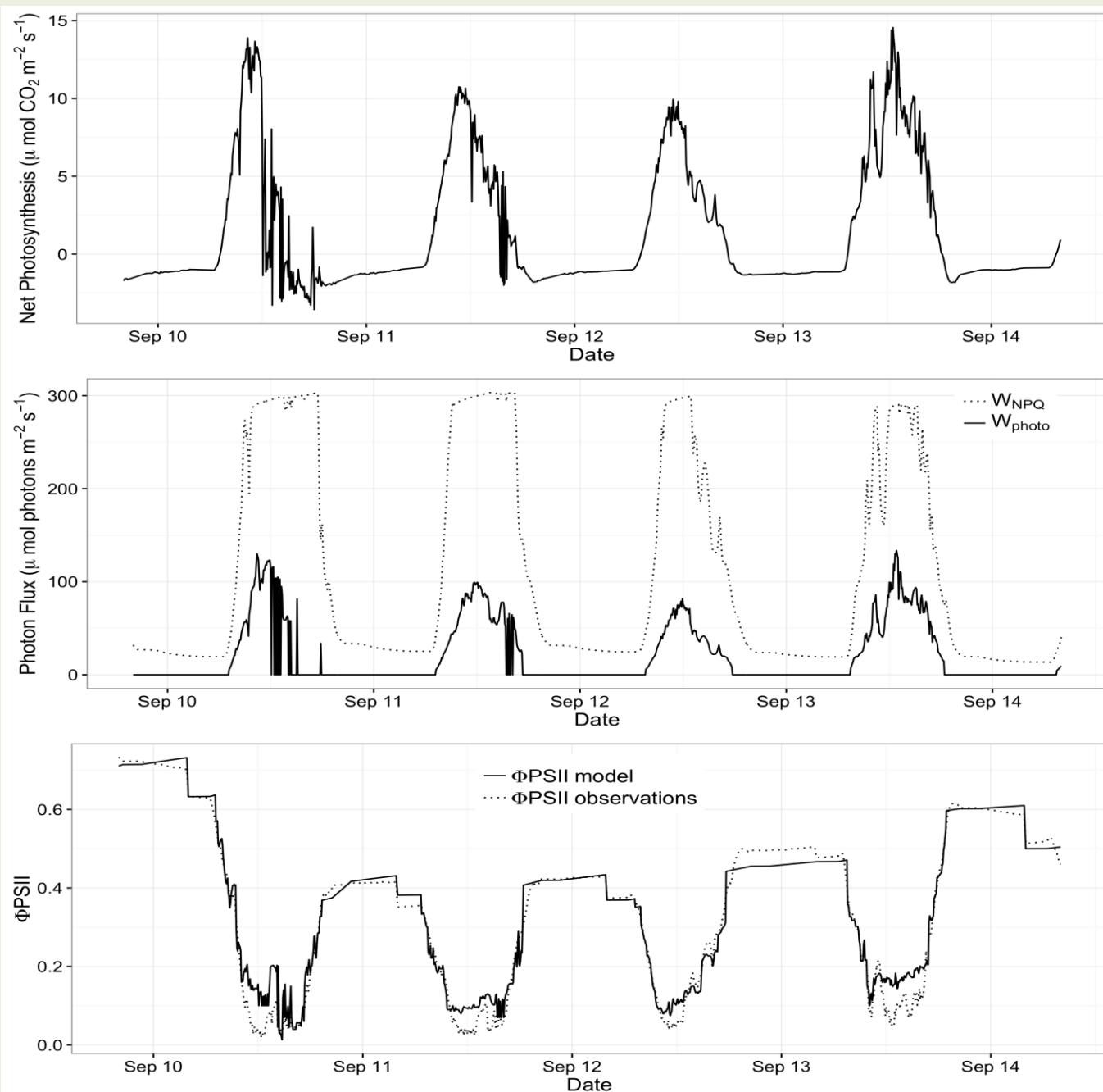
Modelo Propuesto



Resultados







Qué aprendimos?

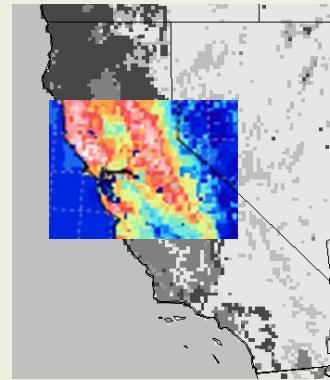
- Altas temperaturas y estres hidrico afectan la actividad fotosintetica de las plantas.
- Los parametros de la curva de respuesta de la fotosintesis a la luz se ven afectados por estres.
- Es posible construir un modelo dinamico de fotosisntesis que considere estres.

Measurements

OR

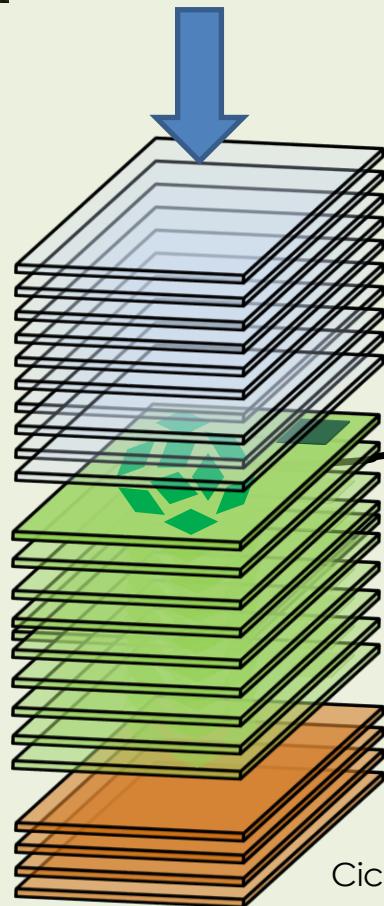


Air Temperature
Humidity
Wind Speed
Shortwave Radiation
CO₂ Concentration
Barometric Pressure



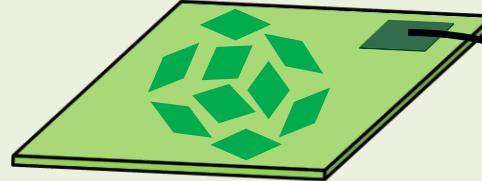
ACASA

10+ layers
above-canopy

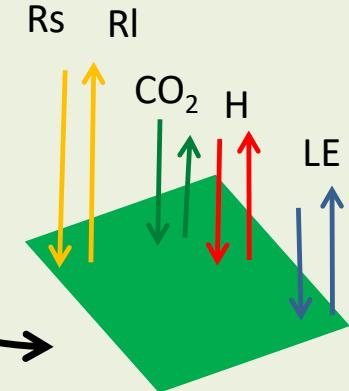


10+ layers
within-canopy

3+
soil layers



9 sunlit leaf angle
classes
1 shaded leaf class
In each canopy layer

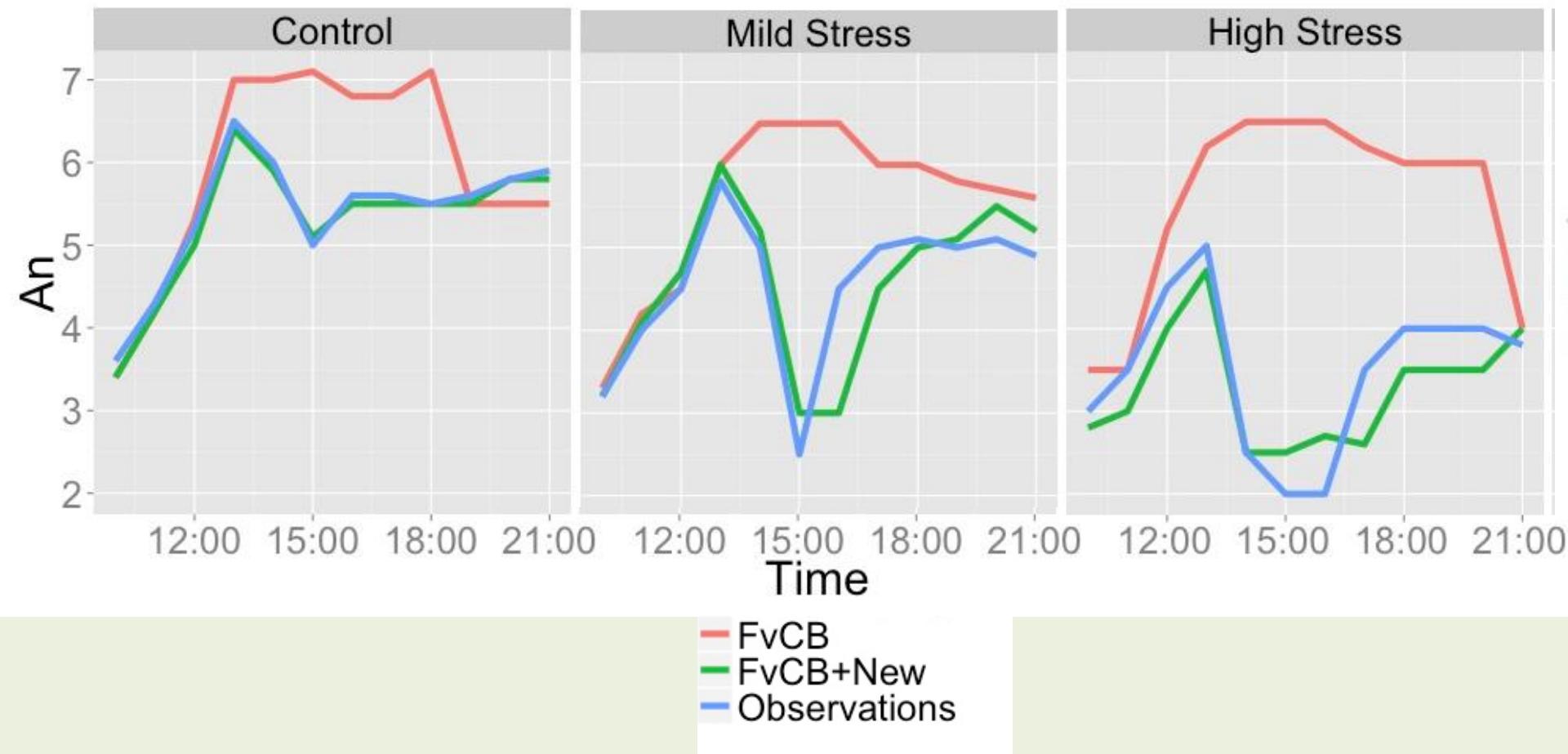


For each leaf angle class
in each canopy layer (100)
Calculate:

- Radiation intercepted
- Photosynthesis &
stomatal conductance
- Leaf temperature &
energy balance

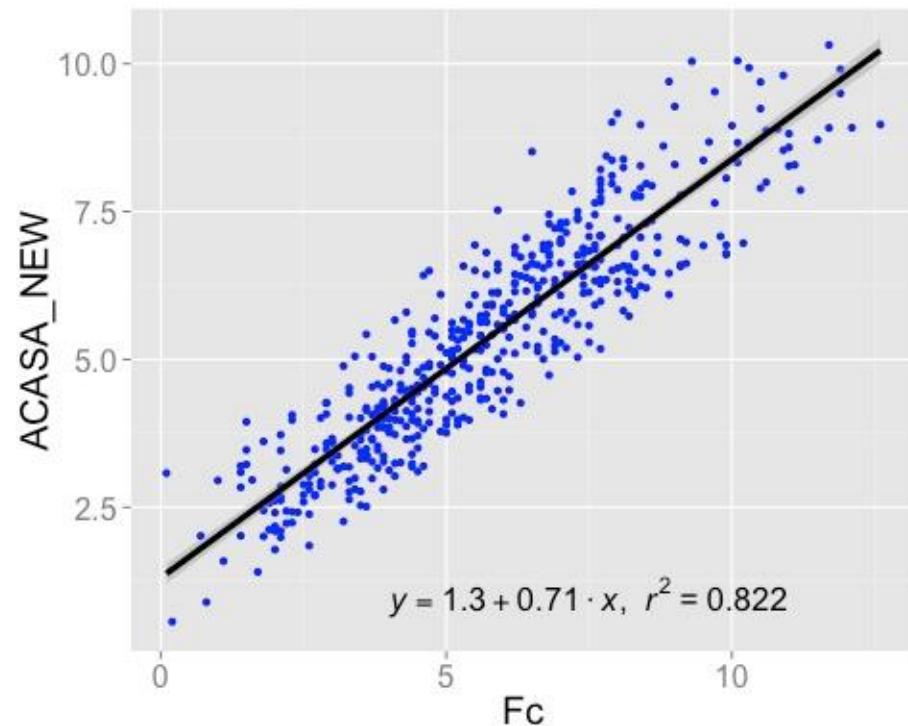
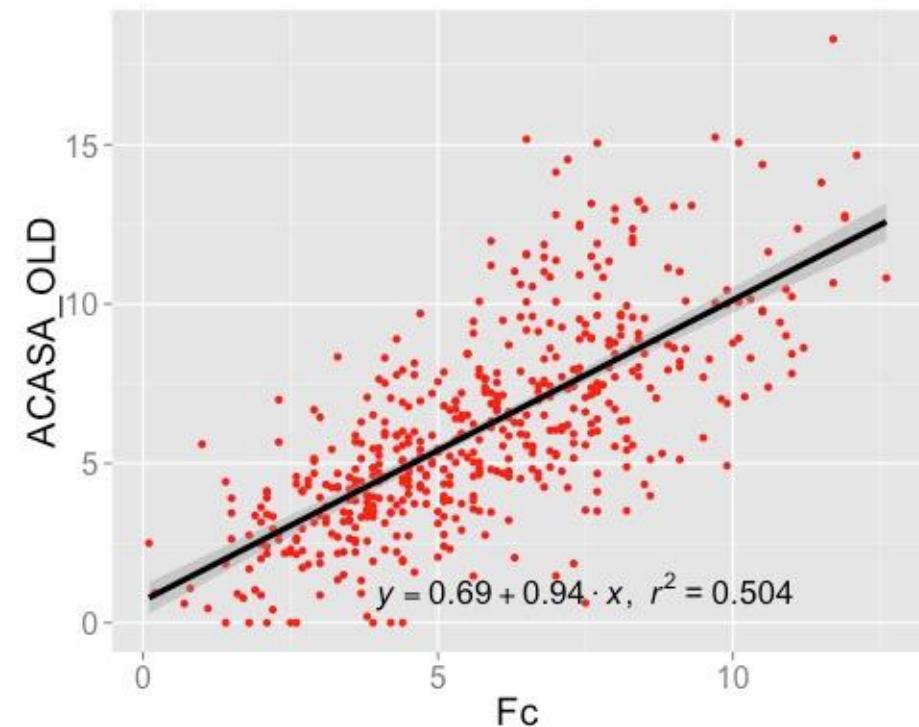
Resultados

Net Photosynthesis ($\mu\text{mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$)



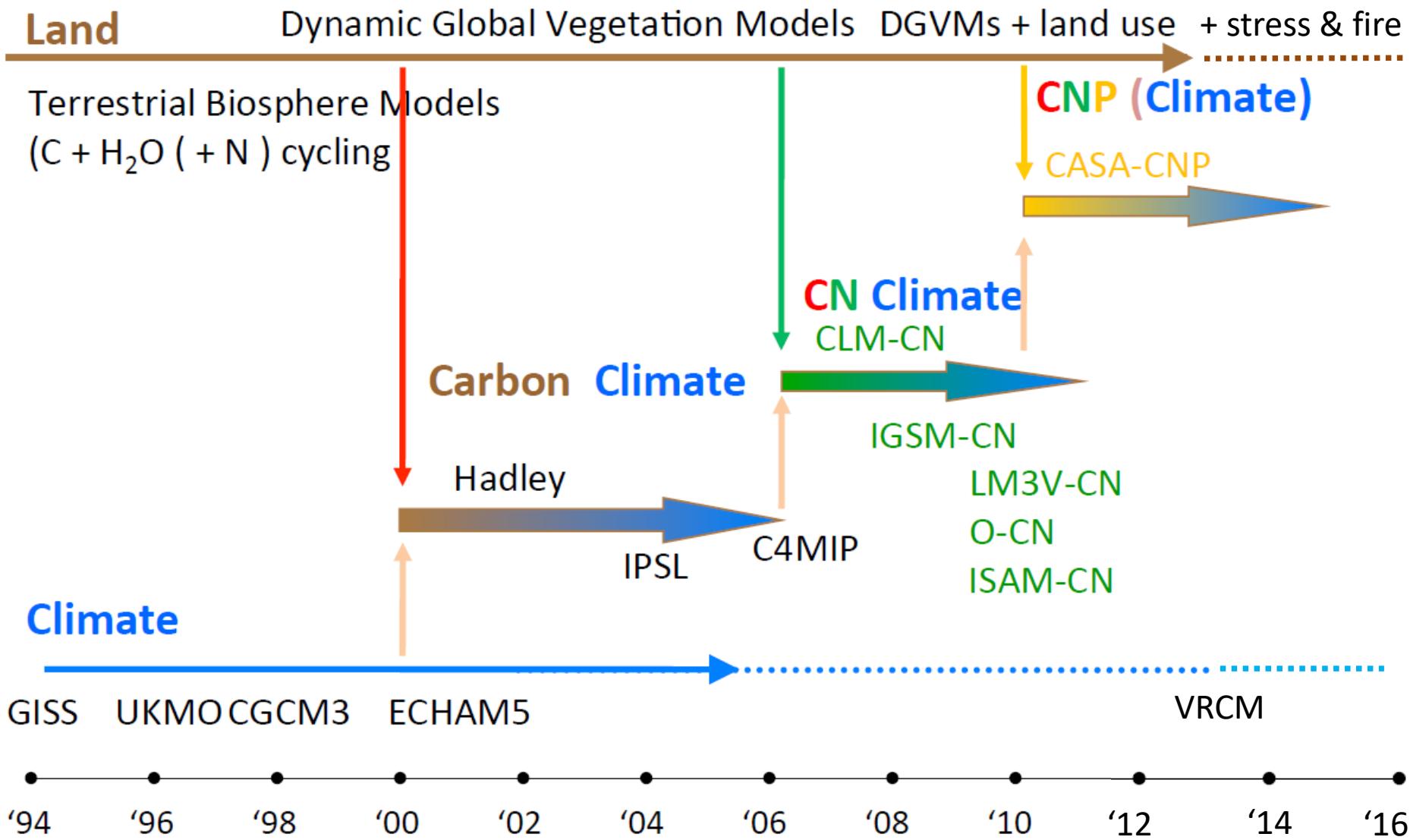
Resultados

CO₂ Exchange (μmol CO₂ m⁻² s⁻¹)



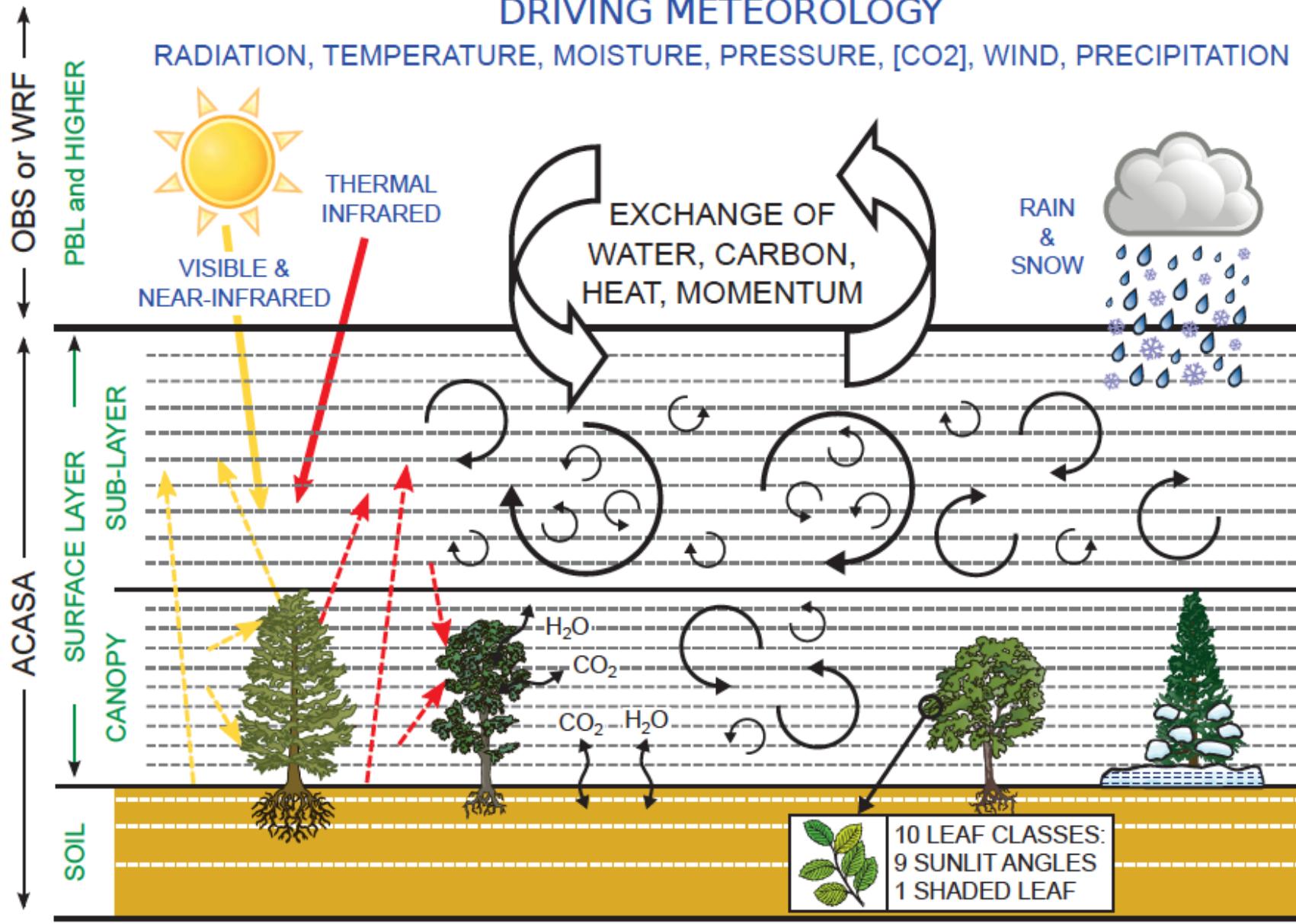
Principales ideas

- Integrando estrés hídrico, por altas temperaturas y fotoinhibición permite mejores estimaciones de flujos de CO₂.
- Los resultados son relativamente sensibles a la parametrización del modelo.
- El esquema de modelación propuesto podría mejorar estimaciones de flujos de masa y energía en latitudes medias, especialmente durante primavera-verano.

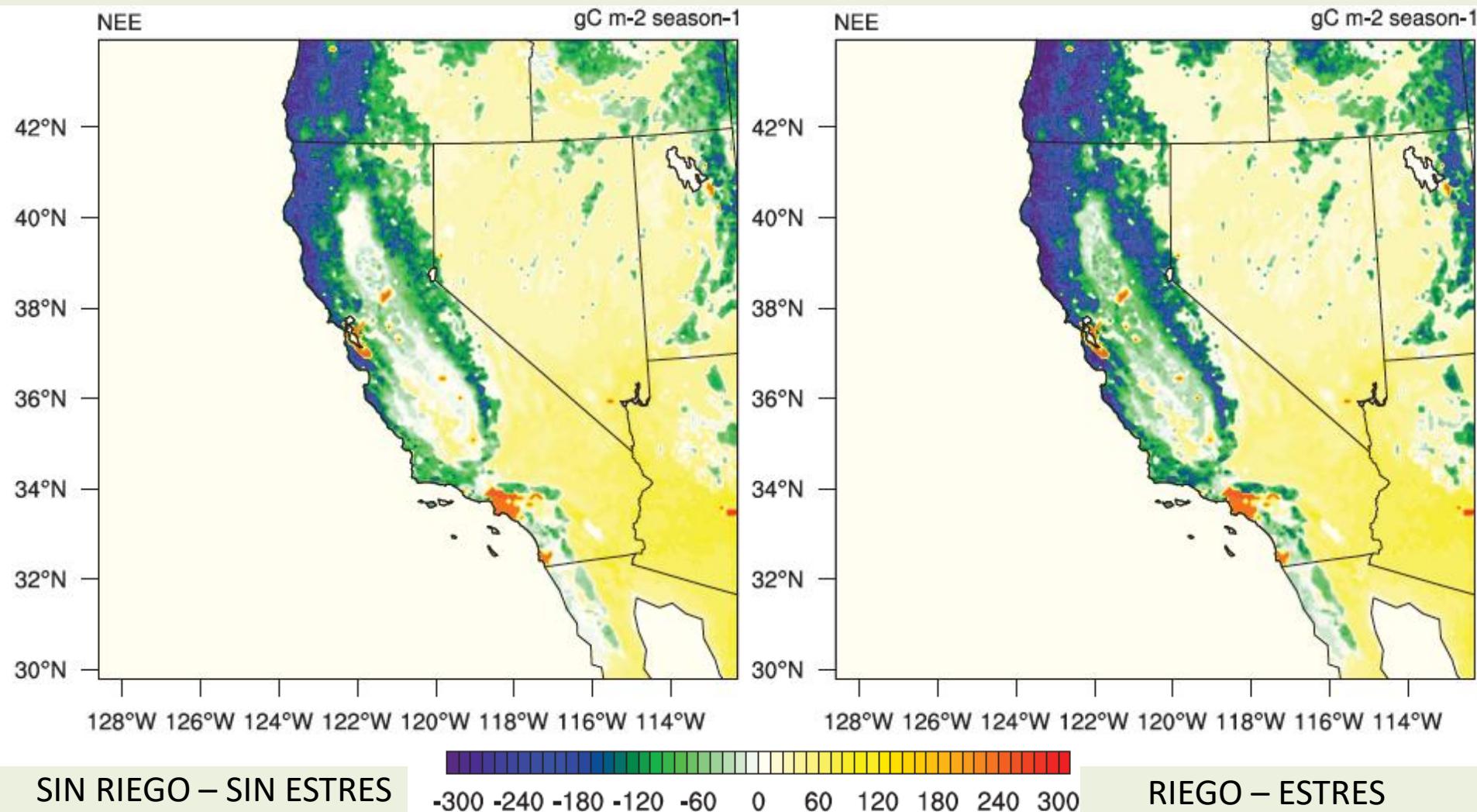


DRIVING METEOROLOGY

RADIATION, TEMPERATURE, MOISTURE, PRESSURE, [CO₂], WIND, PRECIPITATION

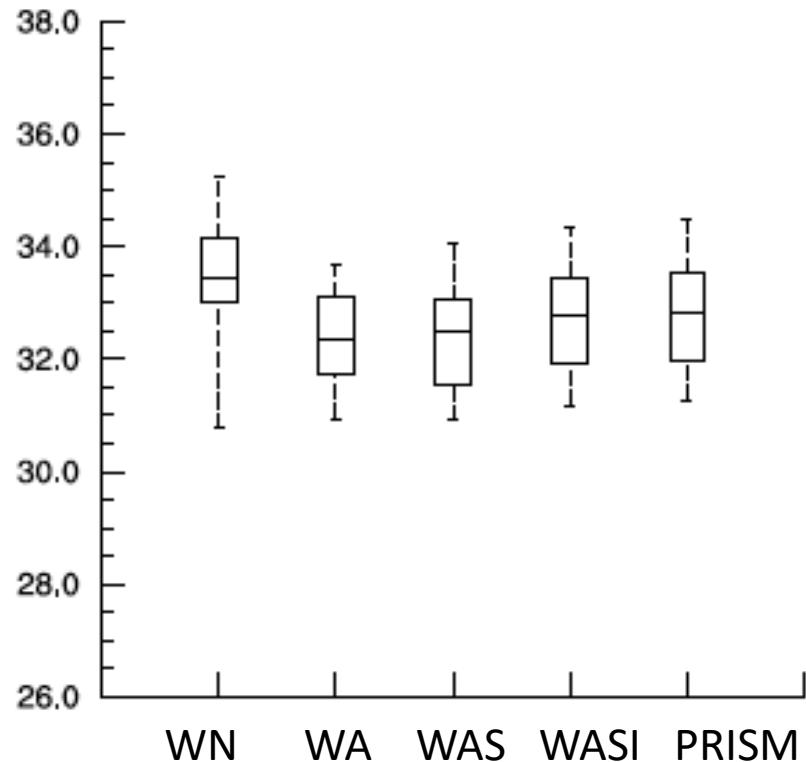


Resultados

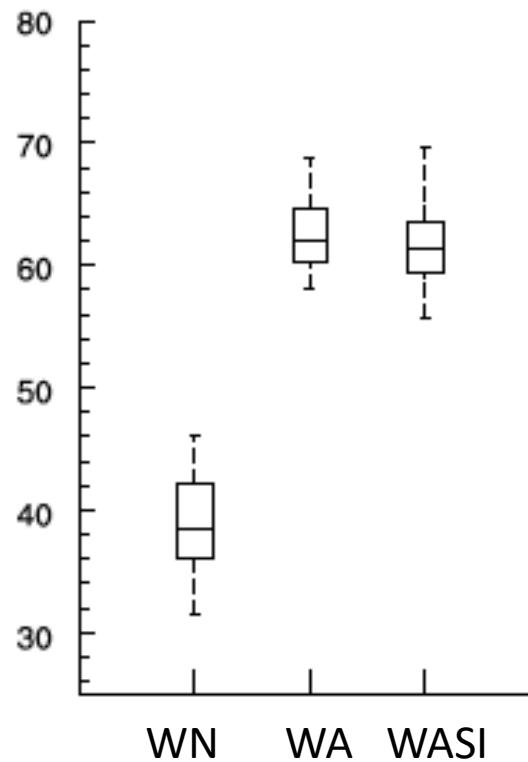


Resultados

(a) T_{max} (°C)



(b) Latent heat flux (W/m²)



Ideas Finales

- El modelo teórico de estrés funciona.
- Necesita validación y parametrización para un numero mayor de especies
- Relaciones de fluorescencia a escala de hoja son extrapoladas a nivel de canopia, y luego a escala regional.
 - Cuestionable? Tan cuestionable como cualquier otro LSM utilizando un modelo semiempírico de fotosíntesis.