







LIFE15 ENV/IT/000392

L'interazione tra Vegetazione e Atmosfera



La vegetazione è soggetta a intensi processi di scambio (energia, materia...)

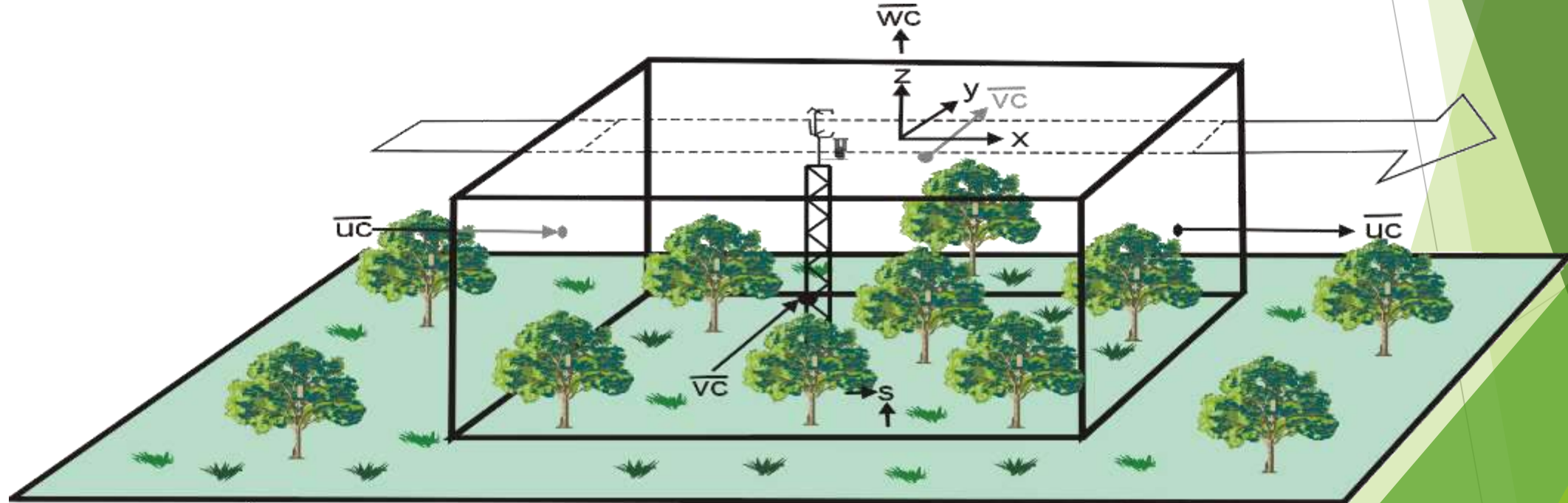
Lo strato di atmosfera che è arrivato ad essere stabilmente in equilibrio con la superficie sottostante è detto *internal boundary layer*

Il suo spessore cresce con la distanza percorsa su vegetazione omogenea



Agricoltura, Fisiologia vegetale & Fisica

$$\frac{\partial \bar{c}}{\partial t} = -\bar{u} \frac{\partial \bar{c}}{\partial x} - \bar{v} \frac{\partial \bar{c}}{\partial y} - \bar{w} \frac{\partial \bar{c}}{\partial z} - \frac{\partial \bar{u}'c'}{\partial x} - \frac{\partial \bar{v}'c'}{\partial y} - \frac{\partial \bar{w}'c'}{\partial z} + D + S$$



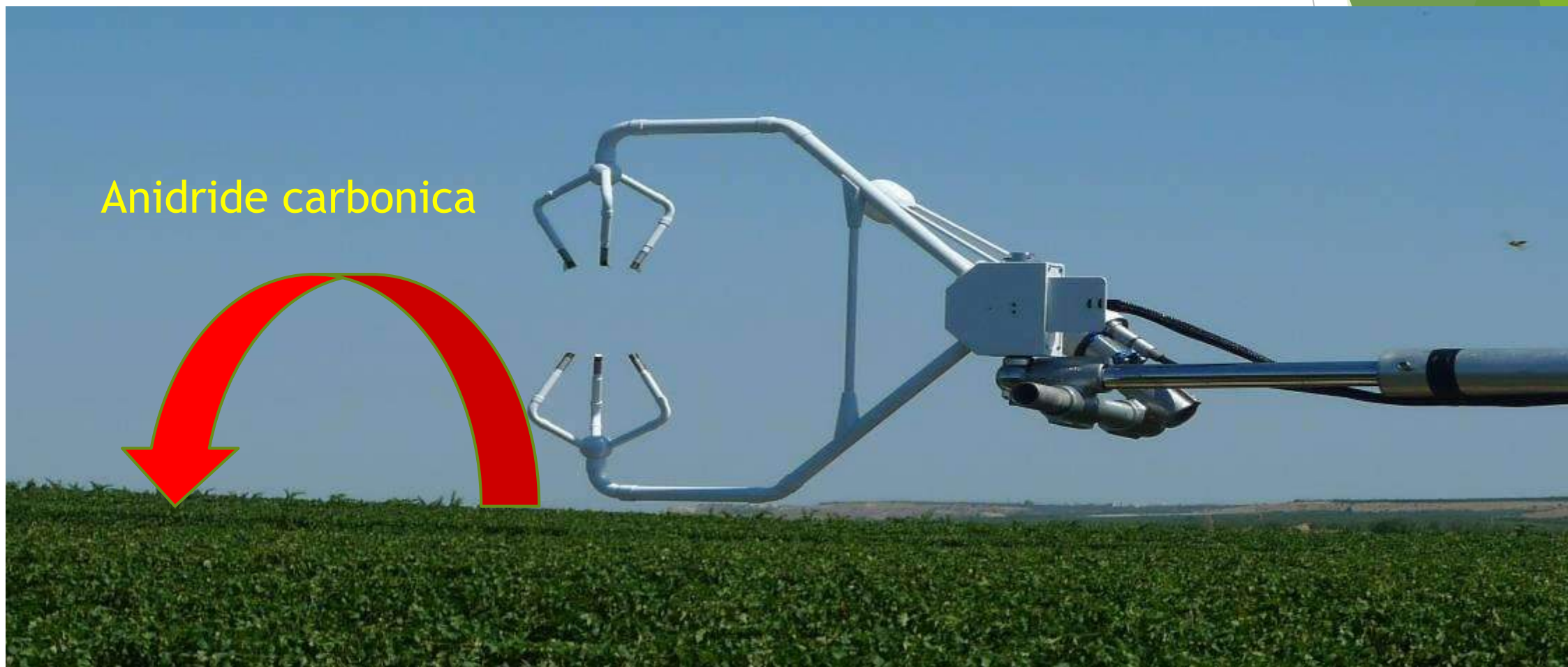
$$F = -\bar{\rho} \bar{w}'c'$$



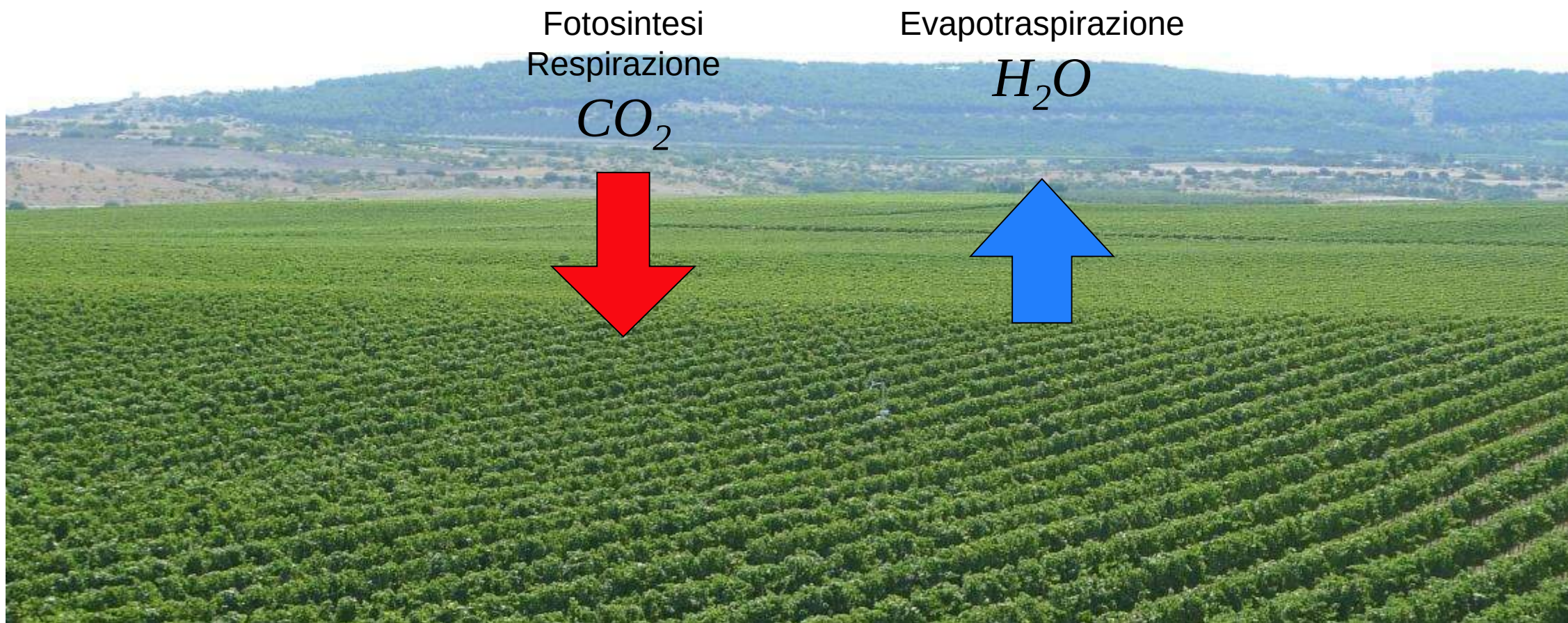
La misura dei flussi di materia (H_2O , CO_2)



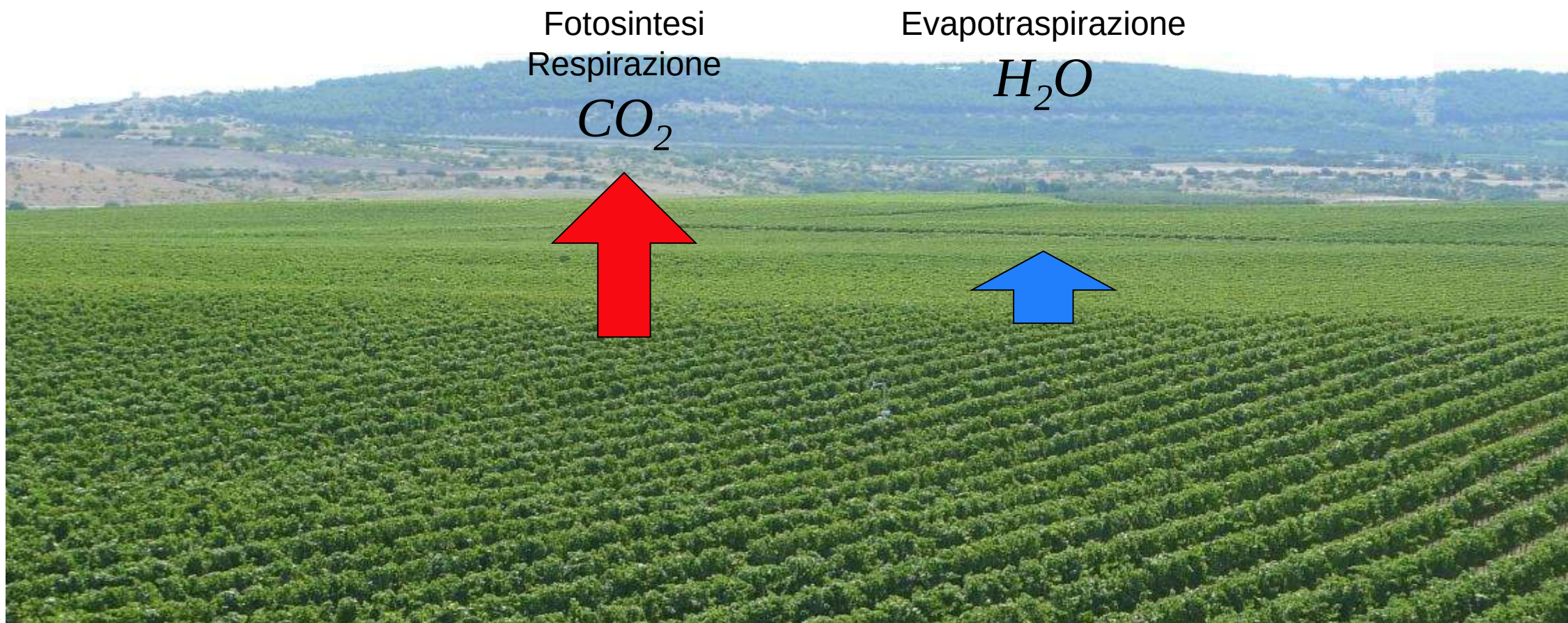
La misura dei flussi di materia (H_2O , CO_2)



I flussi di materia: produttività potenziale



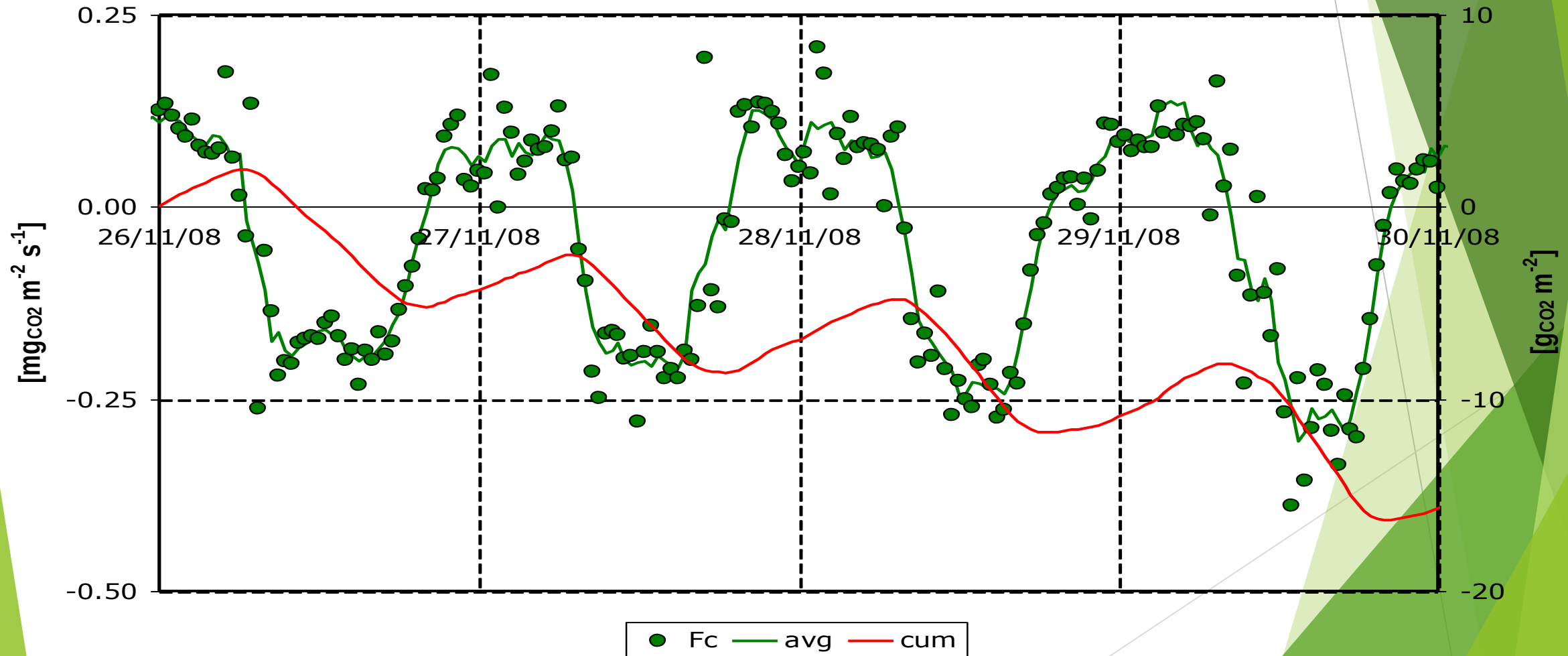
I flussi di materia: effetto dello stress





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Net Ecosystem Exchange



Vineyard CO₂ fluxes

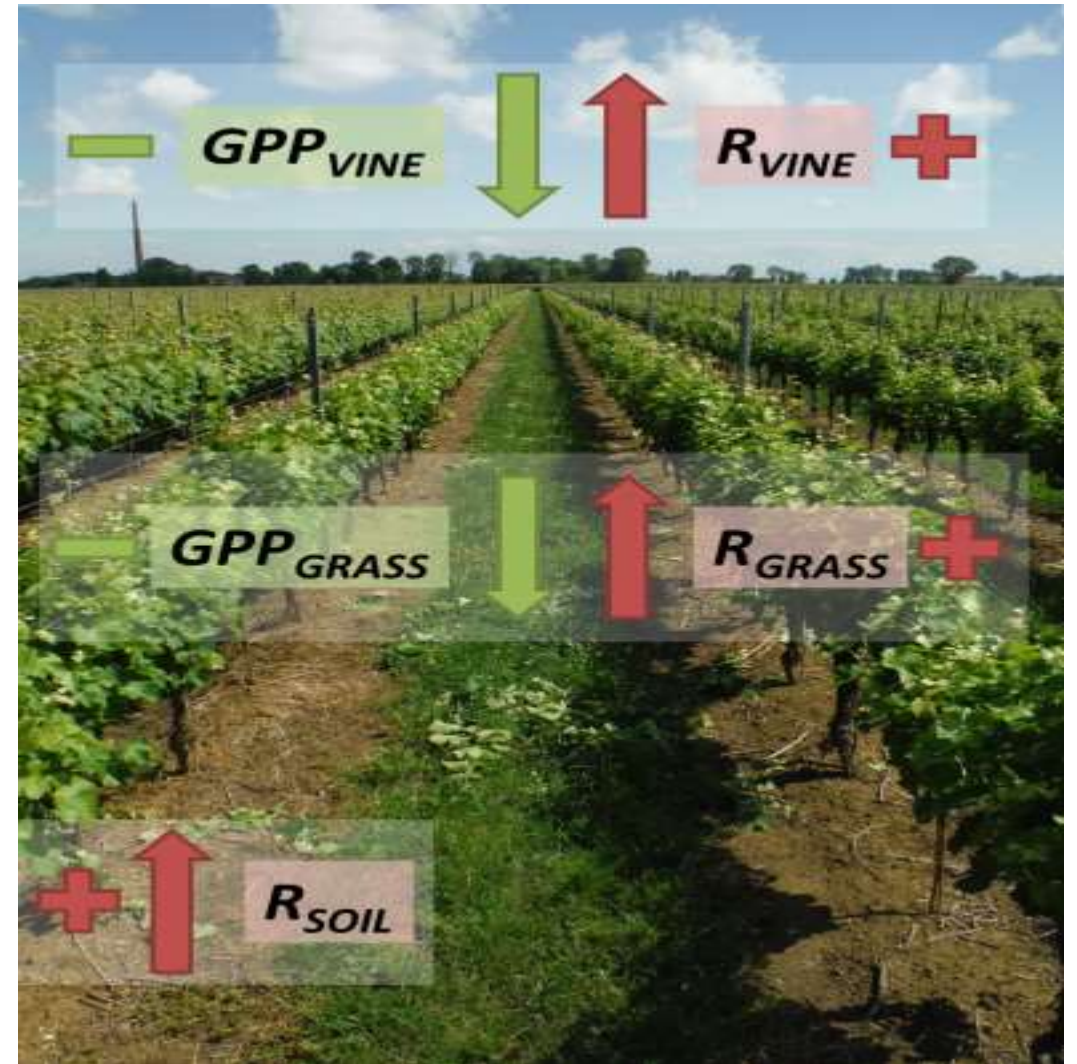
$$F_c = NEE = GPP_{ECO} - R_{ECO}$$

SPRING AND SUMMER

$$GPP_{ECO} = GPP_{GRASS} + GPP_{VINE}$$
$$R_{ECO} = R_{SOIL} + R_{GRASS} + R_{VINE}$$

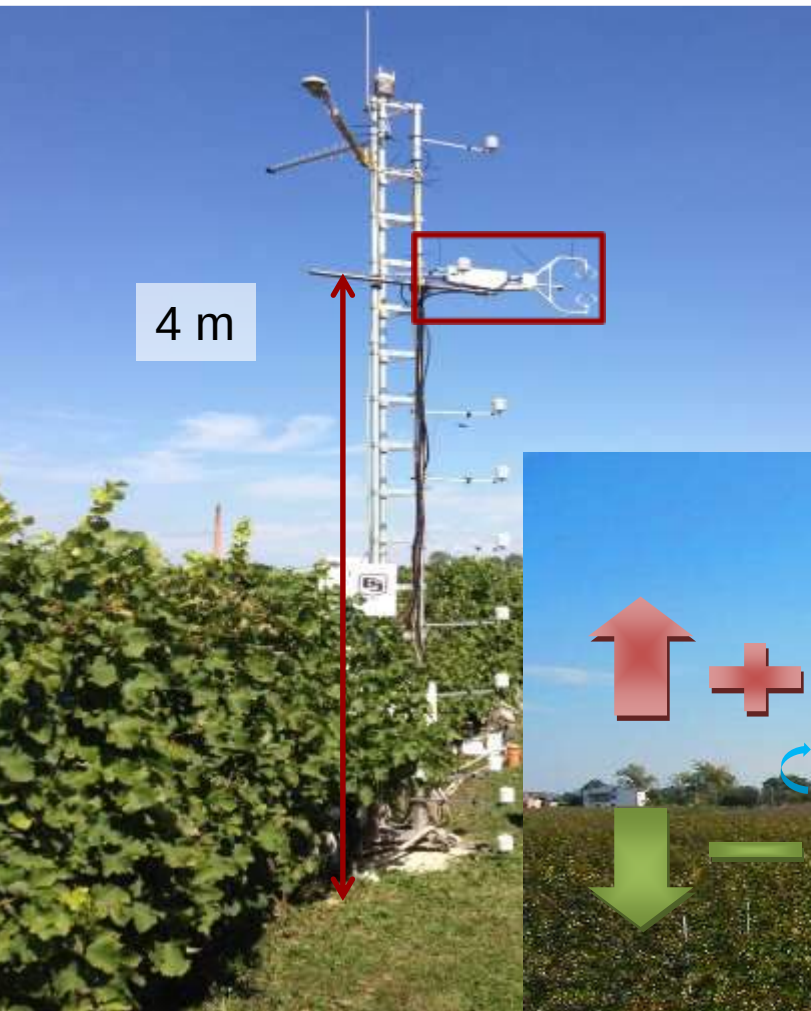
AUTUMN AND WINTER

$$GPP_{ECO} = GPP_{GRASS}$$
$$R_{ECO} = R_{SOIL} + R_{GRASS} + R_{VINE} \text{ (low)}$$



Ecosystem fluxes

The eddy covariance method

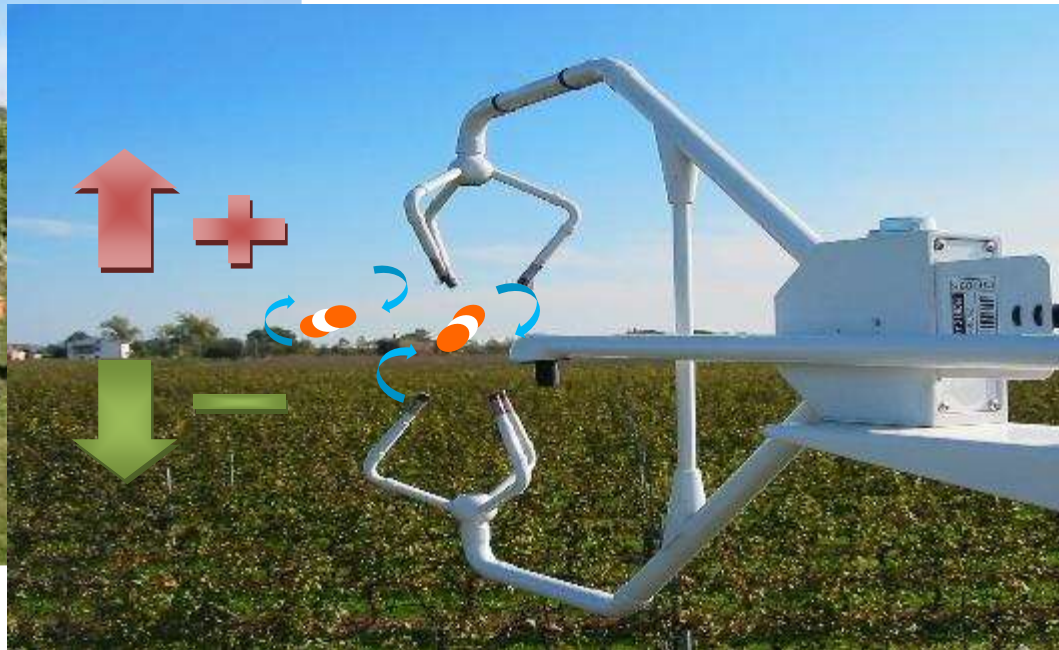


$$Fc = \overline{w'c'}$$

10 Hz sampling frequency
30 min averaging interval

CO₂, H₂O and sensible heat fluxes

Measurement period: May 2014 – September 2016



NET CO₂ FLUX: sum of
photosynthesis and respiration

+ Vineyard is respiring, releasing
CO₂

- Vineyard is photosynthesizing,
absorbing CO₂

Soil fluxes – Soil chamber method

Li-Cor Li-8100 automatic dynamic chamber system



**In row Dark
chamber**
 R_{SOIL}

$$Fc_sc = NPP * A_{\text{InterRow}} + R_{\text{SOIL}} * A_{\text{Row}}$$

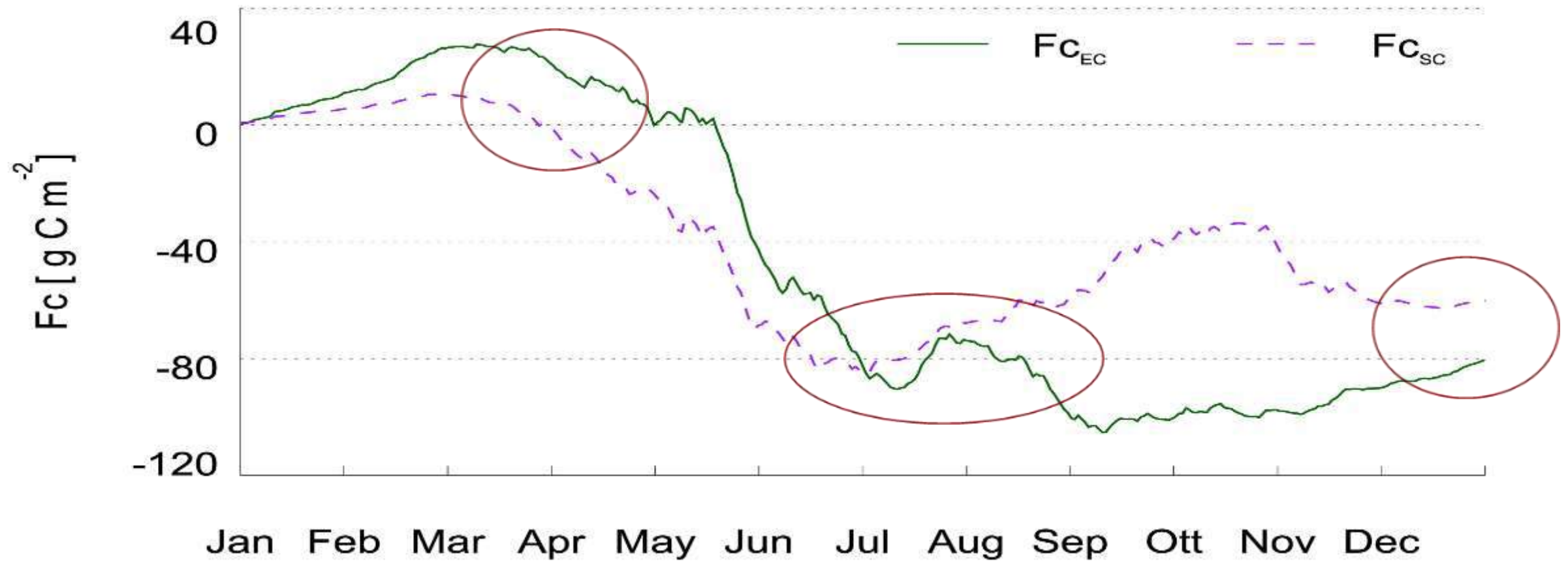
(0.66)

Inter row Clear chamber
 $NPP = GPP_{\text{GRASS}} + R_{\text{GRASS}} + R_{\text{SOIL}}$

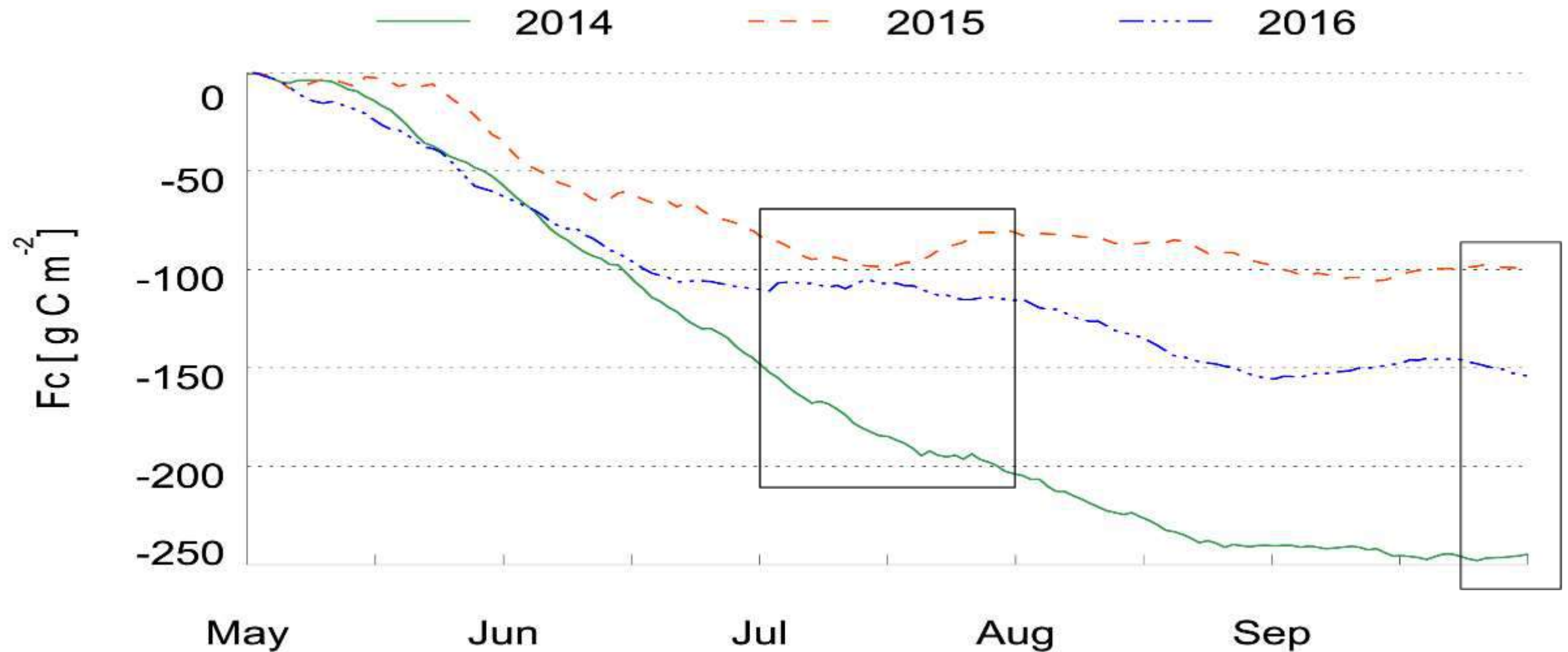


(0.34)

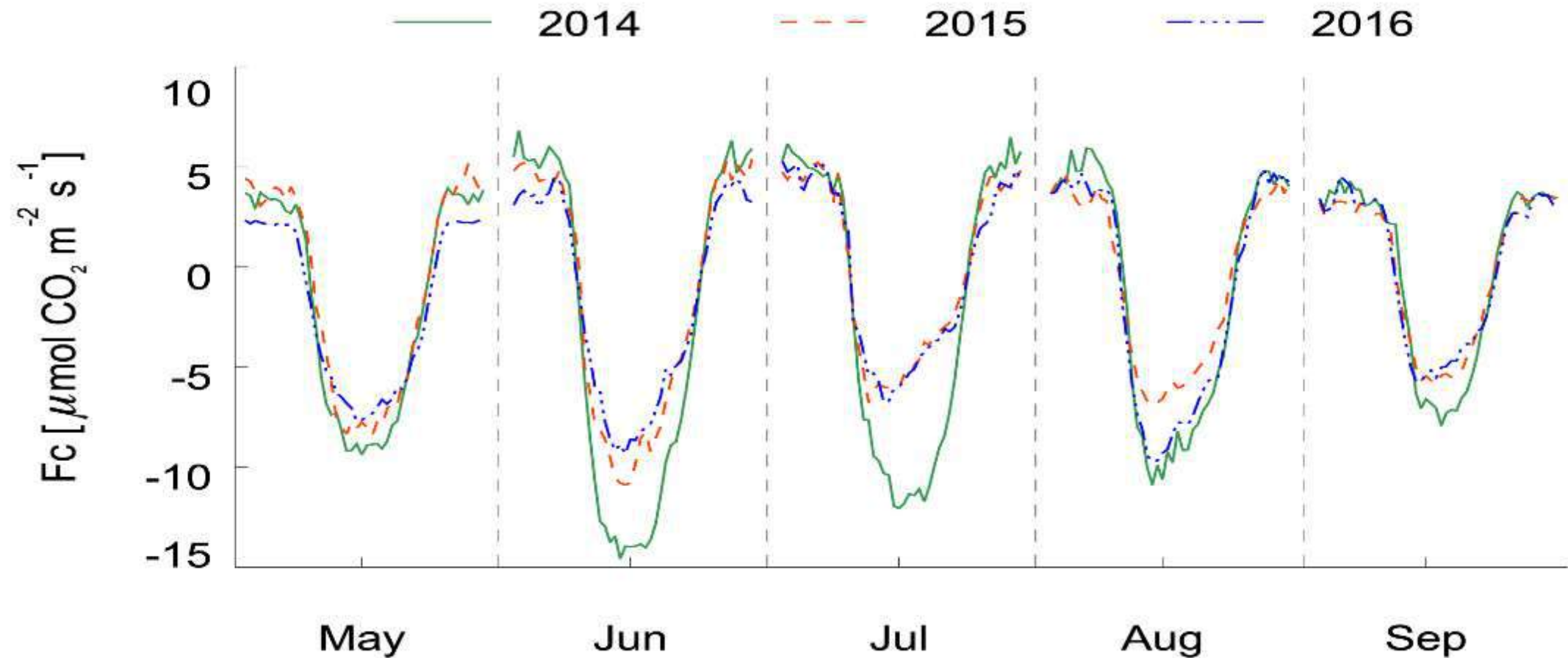
2015 Annual cumulated C fluxes - Partitioning



Interannual variability – Seasonal cumulated C flux



Interannual variability – Daily pattern of CO₂ fluxes



La COP21 e l'iniziativa del 4/1000




$$\frac{8.9}{2400} = 4\text{‰}$$

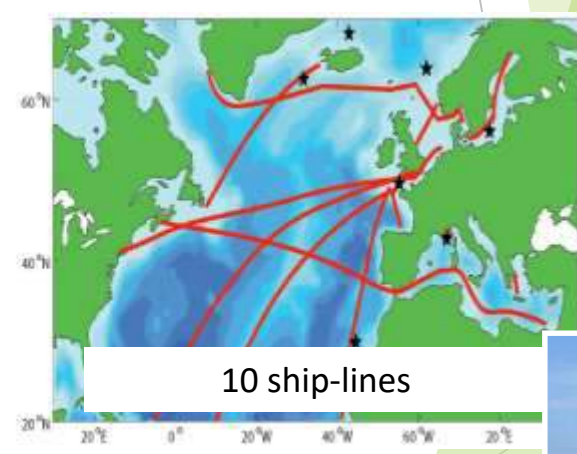


ICOS – Integrated Carbon Observing System

Una **Infrastruttura Strategica di Ricerca** per quantificare e monitorare il bilancio dei gas a effetto serra in Europa e nelle regioni limitrofe

ICOS integra **osservazioni terrestri, atmosferiche e marine** in diversi siti rappresentativi in un insieme coerente di misure di alta precisione, gestito da Centri Tematici dedicati.

Long-term network dedicati alla misura dei GHG:



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