Disentangling the main sources of evapotranspiration in a vineyard

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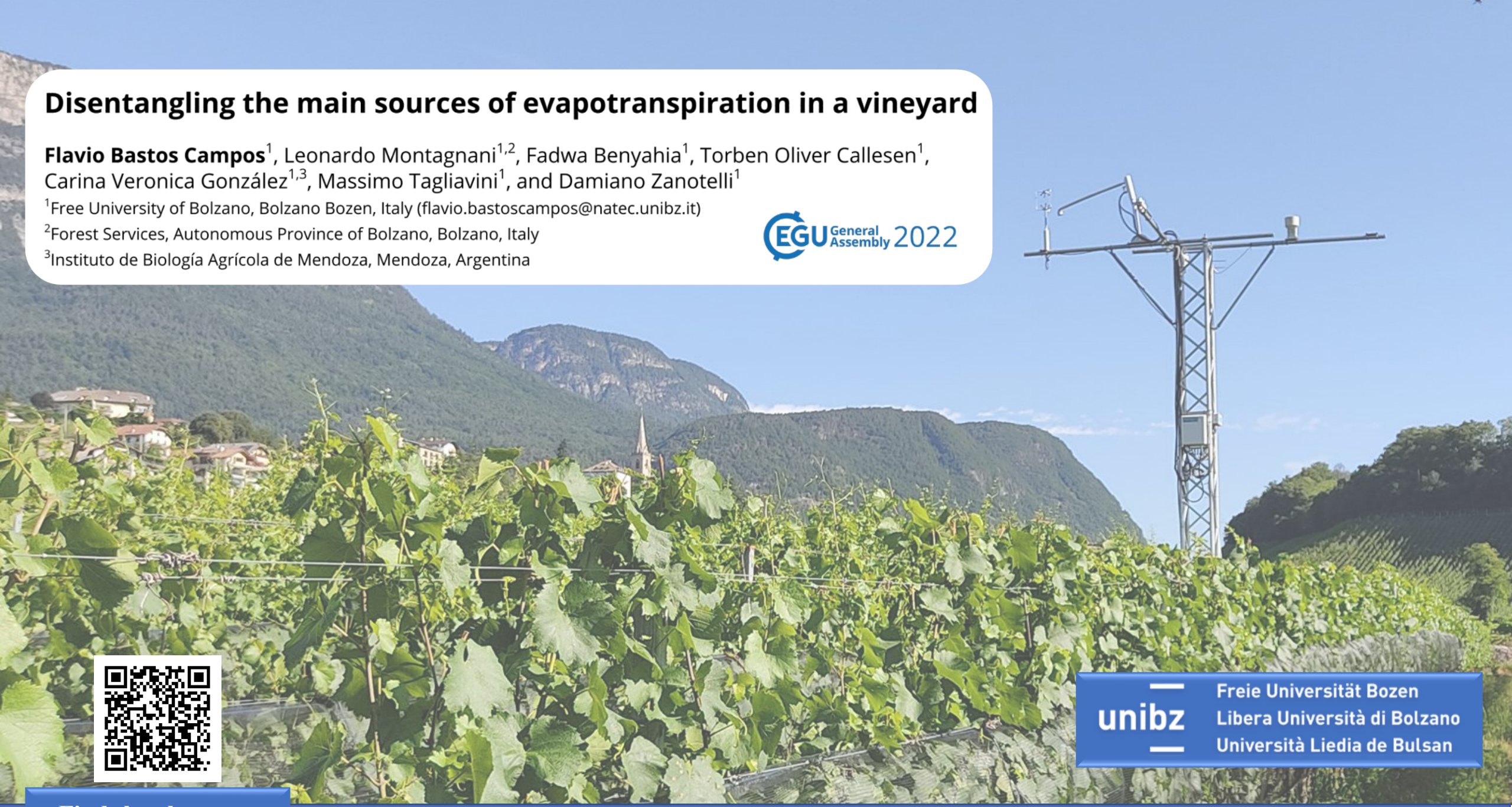

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Find the abstract

Acknowledgements: **WAVE Project**

Objective

- To separate experimentally the contribution of the **different sources** to the **ecosystem evapotranspiration**.

  (Ongoing project)

Experimental context and strategy

~Dual crop environment

① $ET_{ec} = T_{vineyard} + E_{vineyard}$

$T_{vineyard} = T_v + T_u$ $\quad E_{vineyard} = E_v + E_u + E_{soil}$

(vineyard = vines + understory veg.)

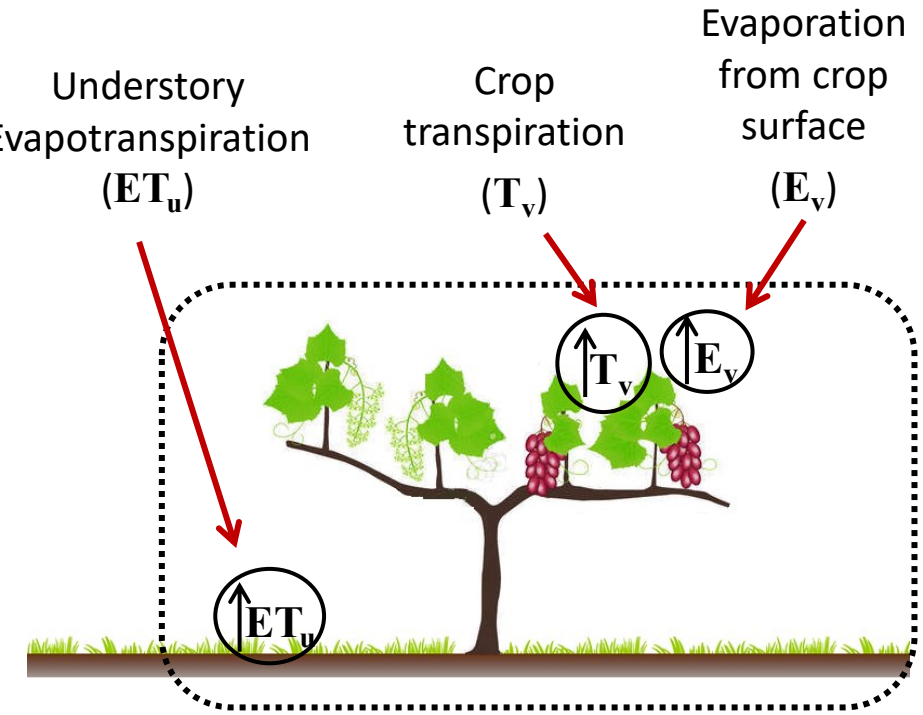
LW ($= E_v$)

SF ($= T_v$)

ET_u

② $ET_{epa} = ET_v + ET_u$

$ET_{epa} = (T_v + E_v) + (T_u + E_u + E_{soil})$



Trends and correlations

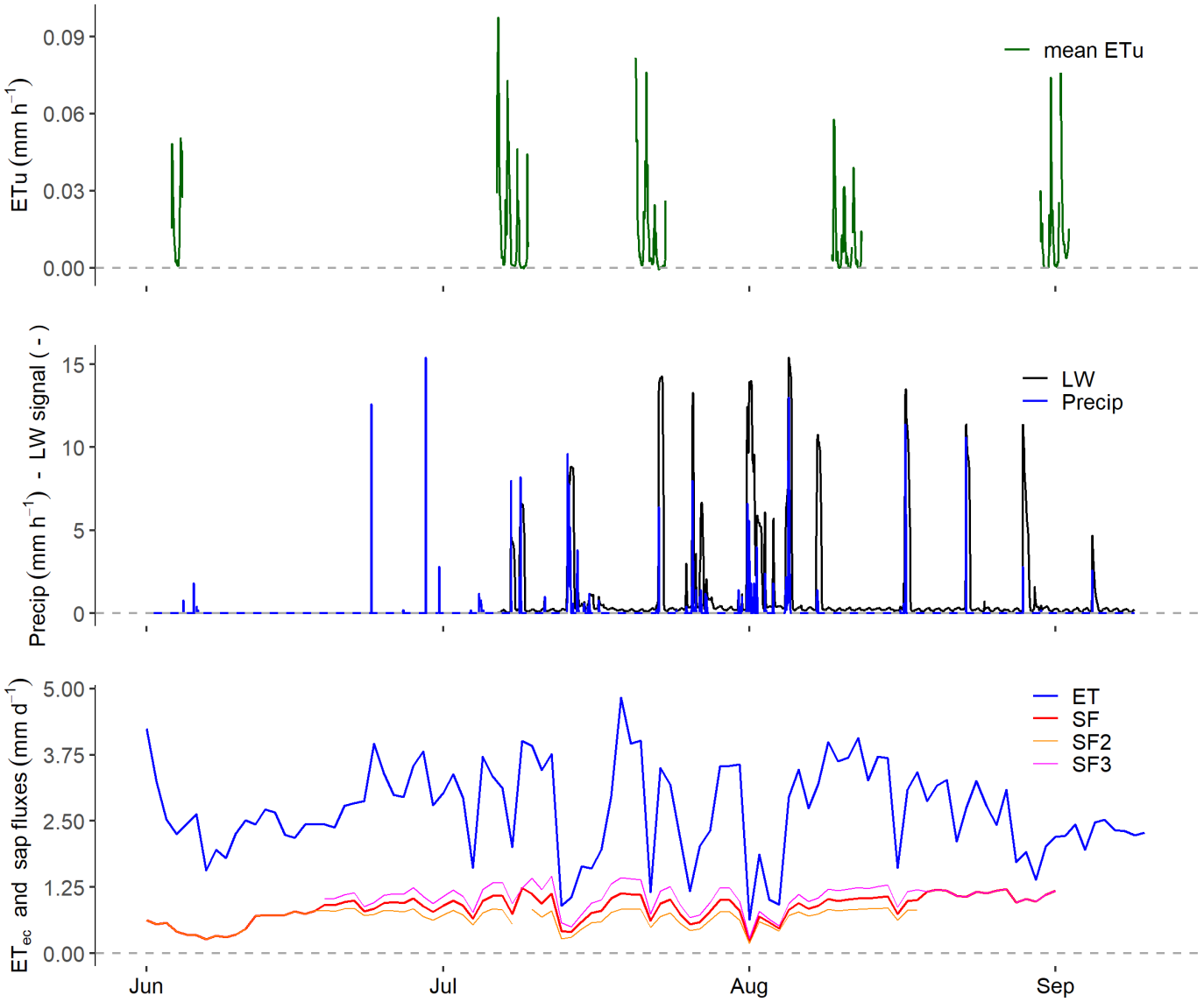


Table 1: Correlation coefficients. **Black R^2:** among fluxes in mm h^{-1}; **Red R^2:** among the high frequency of the fluxes.

R^2	ET_{EC}	SF	SF2	SF3	ETu
ET_{EC}	-	0.63	0.62	0.70	0.47
SF	0.74	-	0.93	0.96	0.36
SF2	0.69	0.94	-	0.82	0.31
SF3	0.77	0.97	0.84	-	0.37
ETu	0.57	0.47	0.38	0.46	-

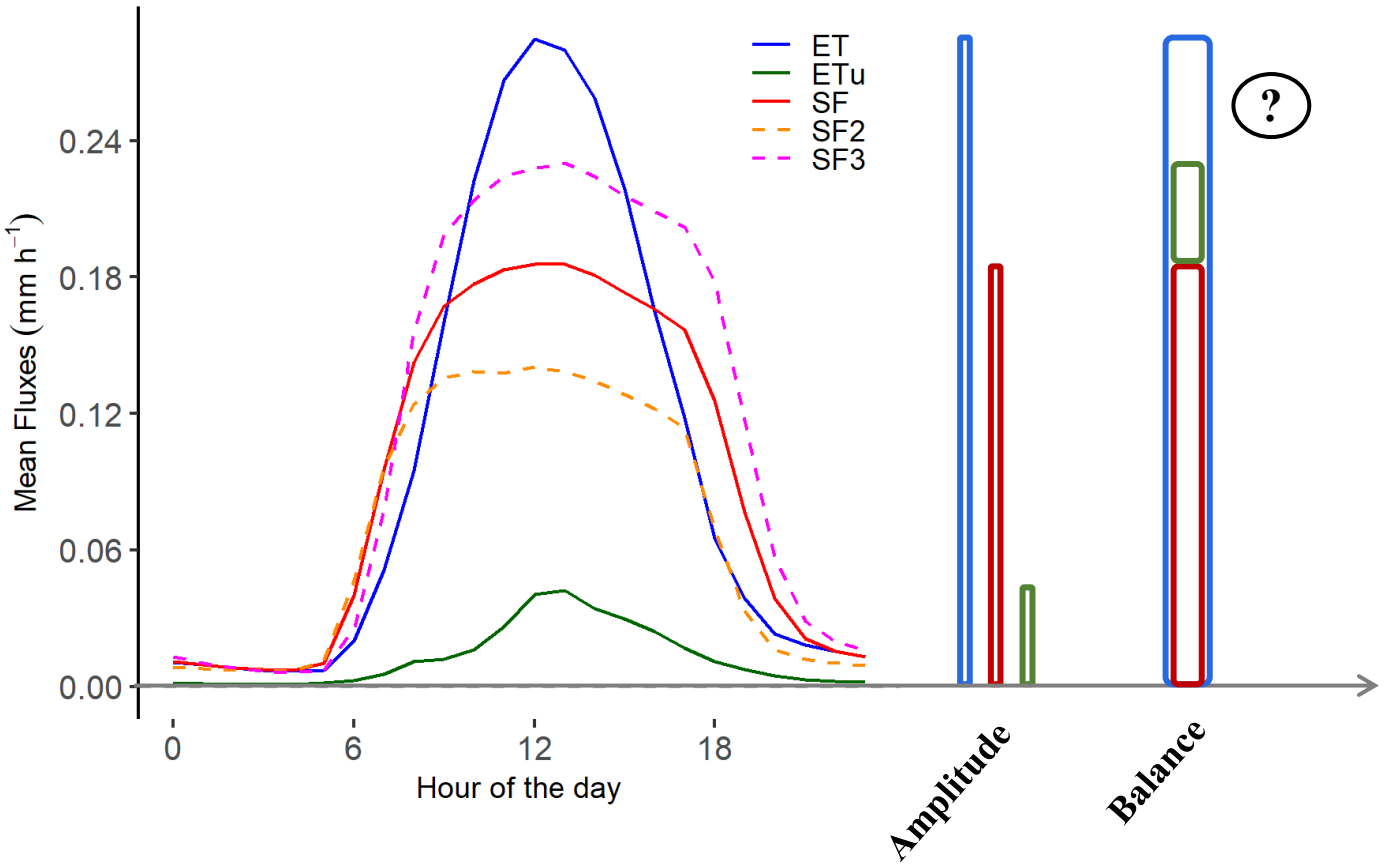
- **ET_{EC} (vineyard-scale ET)**= ET from Eddy Covariance;
- **SF (vines' sap flux, T_v)**= mean of SF2 and SF3;
- **ET_u (understory ET)**= mean of ET_u fluxes;

- **high frequency** fluxes: $F_{(hf)} = F - F_{\_MA}$,

where F is the flux, $F_{(hf)}$ is the high frequency of F and, $F_{\_MA}$ the smoothed F obtained with a moving average of 32h.

Uncertainties from the sap flux measurements

Magnitude of (mean) hourly fluxes over the day:



(left): The **heat ratio method - HR** (Burgess et al., 2001)

(right): SFM1 sensor installed in the vineyard in Italy.

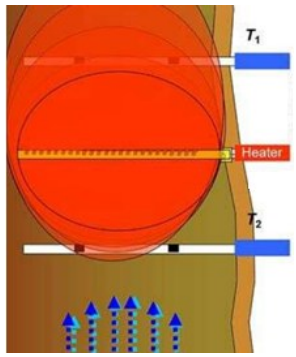


Table 2: **Potential sources** of error and use **adequacy** for each method (x= is sensitive to the source of error; adapted from Flo et al., 2019).

TD	SHB	HFD	HR	T-max	CHP	*Method*	*Potential source of measure error*
x		x	x	x	x	*Wounding*	
x		x	x	x	x	*Radial velocity profile*	
x			x	x	x	*Wood properties*	
x	x	x			x	*Natural thermal gradients*	
		x	x	x	x	*Sensor installation*	

Conclusions

(A): The **experimental setup** makes possible to assess the sources' water fluxes, however with large uncertainties.

(B): The analysis of the sensors' **signals** show that the datasets are reliable, the **trends** of the fluxes are consistent

(C): The **magnitude** of the fluxes is a problem to be solved.

Next steps

(1): Benchmarking the SF sensors against other method (in-situ) for a **plant-specific calibration** (e.g. stem Heat Balance - SBH)

(2): Re-calibrate **soil-ground-flux-chambers system** for a more accurate water balance.

Thank you