Comparison of ecosystem and soil CO2 efflux in a beech (Fagus Sylvatica L.) forest

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COMPARISON OF ECOSYSTEM AND SOIL CO_2 EFFLUX IN A BEECH (*Fagus Sylvatica L.*) FOREST

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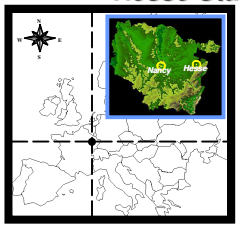
1. CONTEXT

- ✓ Soil CO_2 efflux (S_R) : a major component of forest carbon balance
- ✓ Partitioning the ecosystem CO_2 efflux (R_{eco}).
- ✓ Eddy covariance (**EC**) technique for S_R measurements instead of widely used closed dynamic chamber (**CDC**) technique typically limited by low turbulences in below-canopy situations.
- ✓ Difference between sampling areas S_R and R_{eco} measurements.
- ✓ Over- or underestimations of S_R contribution to R_{eco}.
- ✓ Aim of the study : (i) To compare R_{eco} and S_R fluxes measured at the Hesse state forest (57, France). (ii) Determinism of R_{eco} variations

2. SITE

Hesse State Forest (Northeast France)

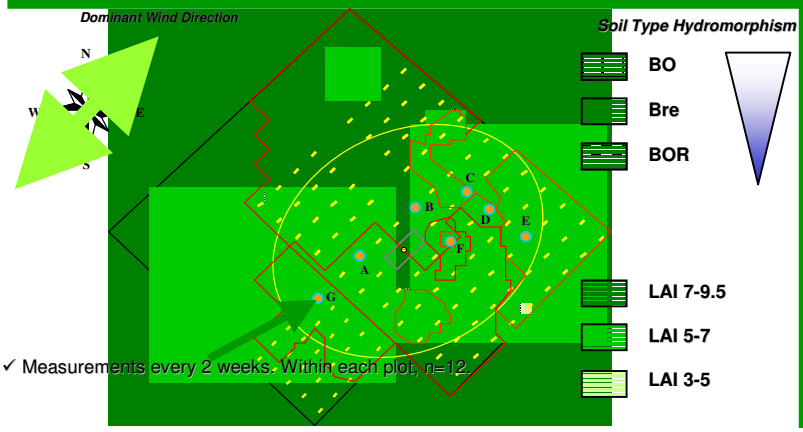


- ✓ Location : 48°40', 7°05'E
- ✓ Mean annual rainfall : 820 mm
- ✓ Mean annual temperature : 9.2°C
- ✓ Soil Type : Stagnic luvisol
- ✓ Species : 90% Beech (*F. sylvatica* L.)
- ✓ Age : 35 years Mean LAI : 7.3

3. MEASUREMENT SYSTEMS

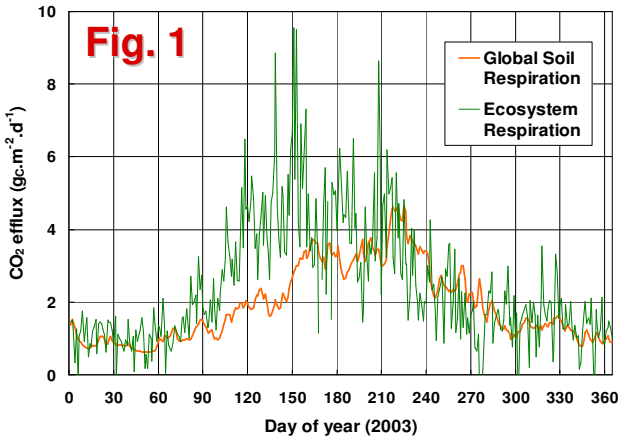
- ✓ R_{eco} measured continously with the EC method (Photo 1). Averaged every 30 minutes.
- ✓ S_R measured with the CDC (Licor 6200 system, Photo 2) in 7 plots (from A to G, Map)

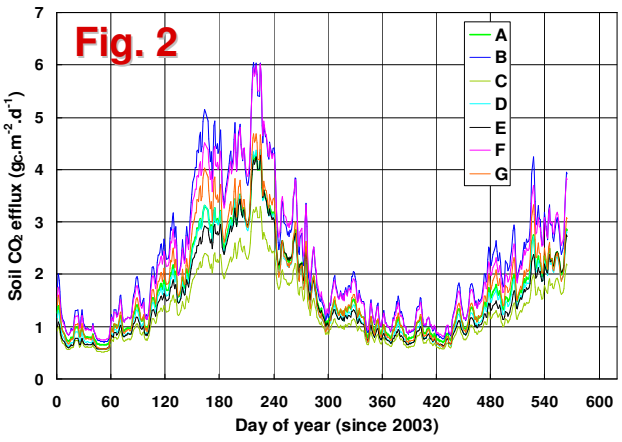
4. MAP OF FLUX MEASUREMENTS



- ✓ Measurements every 2 weeks. Within each plot, n=12

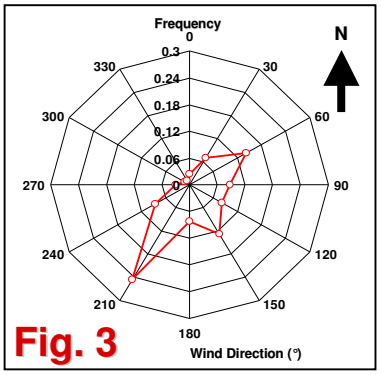
6. RESULTS





2003	ECOSYSTEM	SOIL							
		Global	A	B	C	D	E	F	G
CO_2 Efflux ($g_C.m^{-2}$)	884	704	668	890	532	662	621	867	700
Comparison with R_{eco} (%)	100.0	79.6	75.6	100.7	60.2	74.9	70.2	98.0	79.1

Tab. 1



7. CONCLUSIONS - PERSPECTIVES

- ✓ **Significant discrepancies between global mean S_R and R_{eco} (Fig. 1).**
- ✓ **Significant differences between plots on seasonal S_R flux evolution (Fig. 2) and annual CO_2 efflux values (Table 1): The contribution of S_R to R_{eco} may change with wind direction.**
- ✓ **Effect of LAI or soil type on S_R differences?**
- ✓ **Wind direction during the R_{eco} measurements (Fig. 3) highlights the potential CO_2 sources:**
  - ➢ **In progress : Footprint analysis for determination of relative flux contribution.**
  - ➢ **To compare R_{eco} with selected and weighted S_R values from the footprint analysis**

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