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## Comparison of ecosystem and soil CO<sub>2</sub> efflux in a beech (*Fagus Sylvatica* L.) forest

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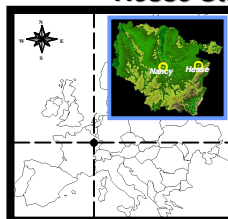
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## 1. CONTEXT

- ✓ Soil CO<sub>2</sub> efflux ( $S_R$ ) : a major component of forest carbon balance
- ✓ Partitioning the ecosystem CO<sub>2</sub> 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)**



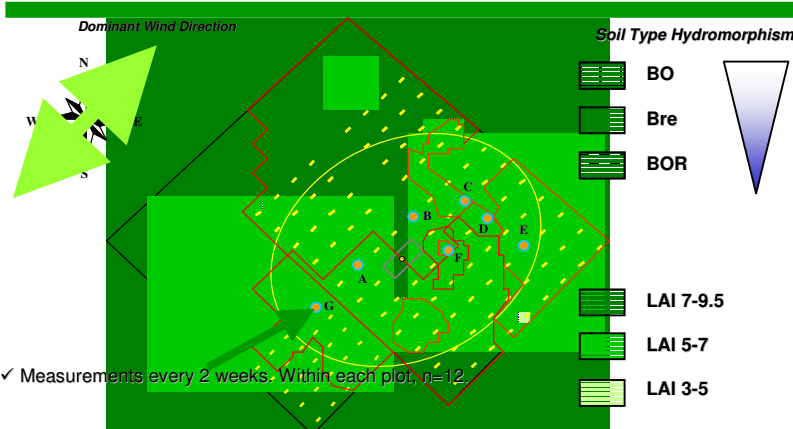
- ✓ Location : 48°40', 7°05'E
- ✓ Mean annual rainfall : 820 mm
- ✓ Mean annual temperature : 9.2°C
- ✓ Soil Type : Stagnic luvisol
- ✓ Species : 90% Beech (*F. sylvatica* L.)
- ✓ Age : 35 years Mean LAI : 7.3

## 3. MEASUREMENT SYSTEMS

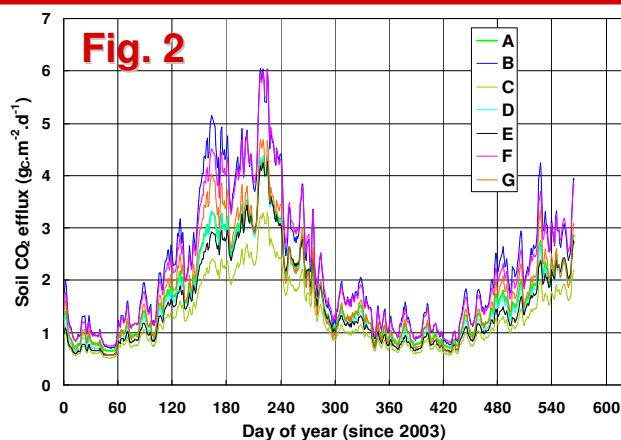
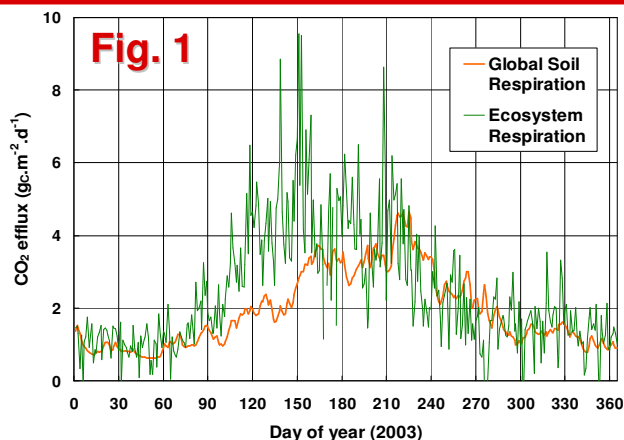


- ✓  $R_{eco}$  measured continuously with the EC method (Photo 1). Averaged every 30 minutes.
- ✓  $S_R$  measured with the CDC (Licor 6200 system, Photo 2) in 7 plots (from A to G, Map)

## 4. MAP OF FLUX MEASUREMENTS



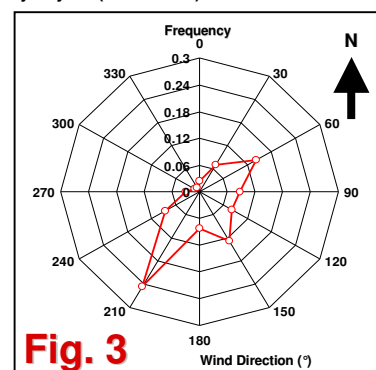
## 6. RESULTS



**2003**

	ECOSYSTEM	SOIL							
		Global	A	B	C	D	E	F	G
CO <sub>2</sub> Efflux (gC.m <sup>-2</sup> )	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<sub>2</sub> 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<sub>2</sub> 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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