

DOC fluxes in precipitation, throughfall and overland flow in a riparian forest in Southwestern Amazonia (Rondônia, Brazil)



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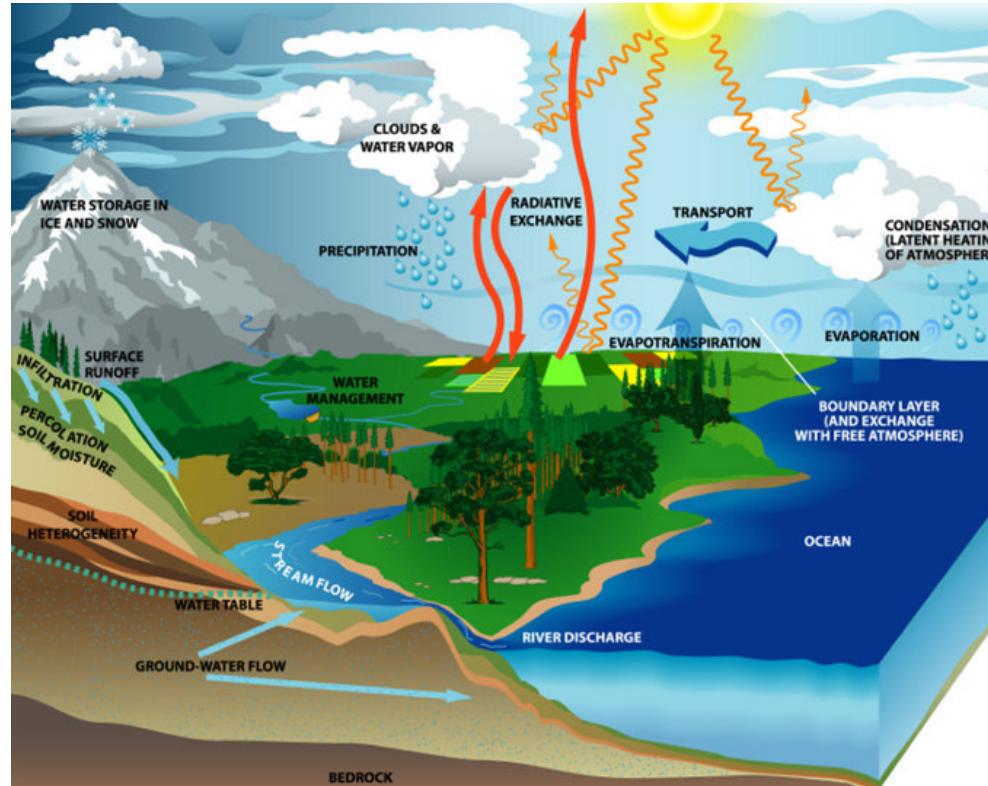
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1. Rationale

The water and nutrient cycles are closed linked!!!



The nutrient inputs and outputs are directly related to the amount of water that reach and leave the ecosystems.

1. Rationale

- Interactions between hydrologic and nutrient cycles are **well documented** for many **temperate forests** (e.g. Likens *et al.* 1977)
- In the tropics, Bruijnzeel (1990) concluded that rates of litterfall and litter decomposition are well known, but that **hydrologic fluxes** (wet deposition, throughfall and groundwater) **are poorly characterized**.
- Increasing atmospheric [CO₂] has encouraged questions such as: "How much carbon can be **sequestered by forests** and **where in the forest does this occurs?**" (Murillo *et al.* 1997)
- Although the major sources and sinks of DOC have been **well identified** and **quantified** previously, little attention has been given to the **spatial and temporal variations of these sources and sinks within catchments**, and the relative importance of the factors that contribute to DOC production and export (Dalva, 1991).

2. Goals

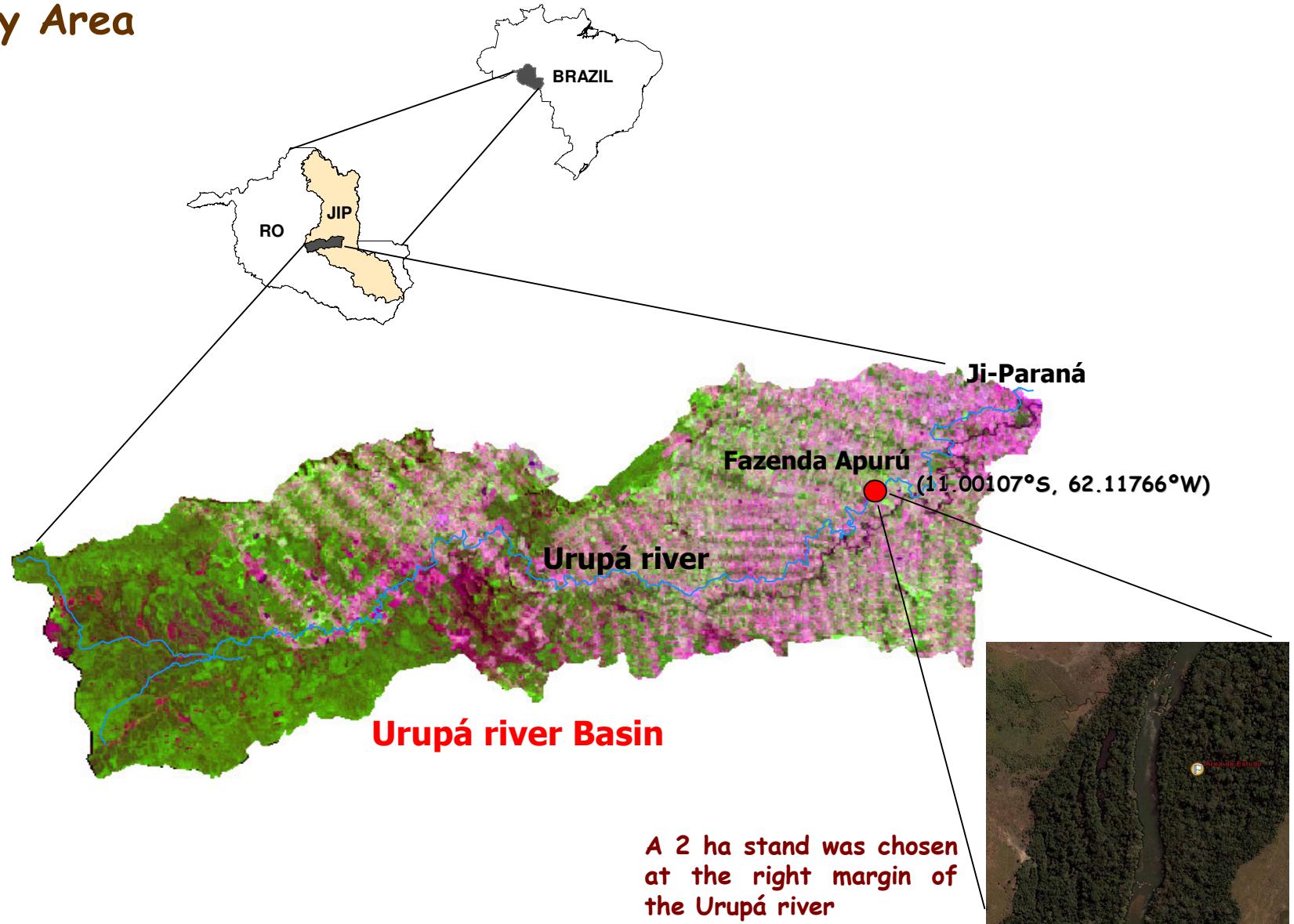
■ "Here we present data on **C fluxes** in wet deposition and overland flow at a **riparian fragment in the western Amazon (Rondônia)**"

The main goal of this study was to:

Understand the quantitative role (*fluxes*) of the wet deposition (**precipitation + throughfall**) and **overland flow** in controlling the input and/or retention of carbon on a riparian fragment in the Amazon region.

3. Fazenda Apurú

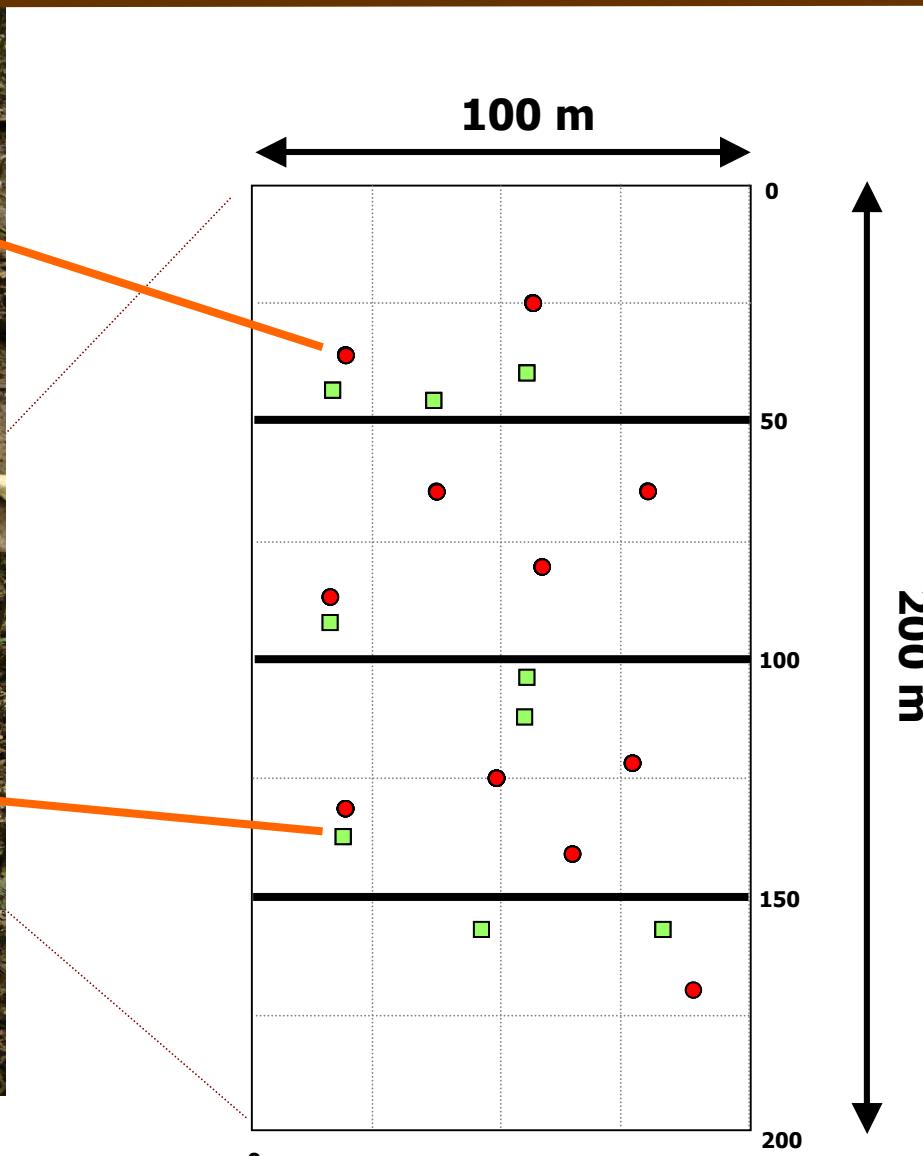
3.1 Study Area



3. Fazenda Apurú



- 3 Precipitation
- 11 Throughfall
- 9 Overland Flow

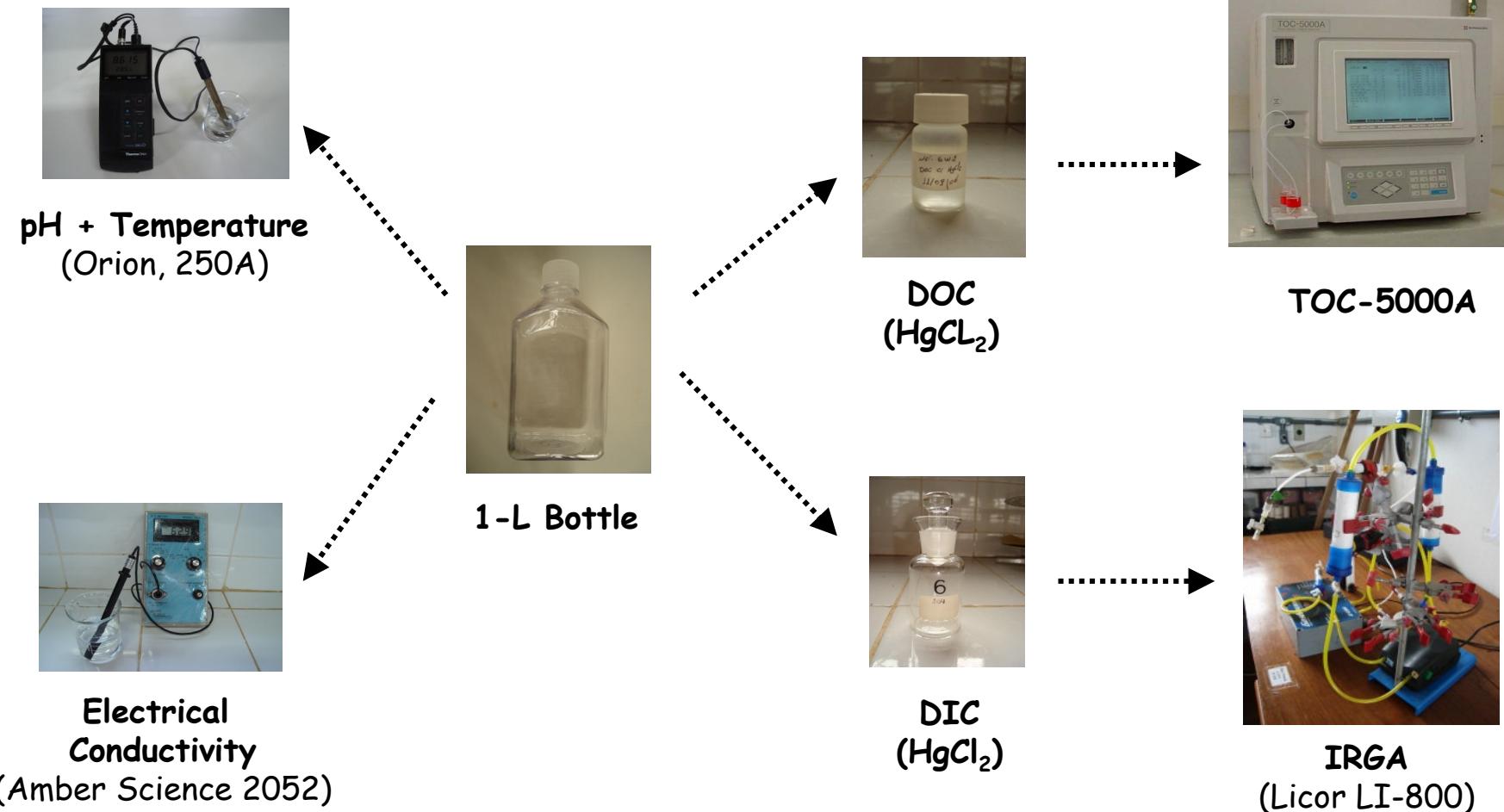


3. Fazenda Apurú



3. Fazenda Apurú

3.2 Sampling Methods



4. Some results

4.1 Studied Period

Season	Rainfall	Throughfall	Overland Flow
dry-to-wet		01/12/05	01/12/05
	16/12/05	13/12/05	13/12/05
wet	27/12/05	27/12/05	27/12/05
	10/01/06	10/01/06	10/01/06
	24/01/06	24/01/06	24/01/06
	08/02/06	08/02/06	08/02/06
	21/02/06	21/02/06	21/02/06
	08/03/06	08/03/06	08/03/06
	22/03/06	22/03/06	22/03/06
	05/04/06	05/04/06	05/04/06
wet-to-dry			
	24/05/06	24/05/06	24/05/06
dry			
	21/06/06	21/06/06	
	31/08/06		
	11/09/06		
dry-to-wet	28/09/06	28/09/06	28/09/06
	12/10/06	12/10/06	12/10/06
	27/10/06	27/10/06	27/10/06
	06/11/06	06/11/06	06/11/06
	22/11/06	22/11/06	22/11/06

Pool	Samplings	n
P	18	23
TF	17	213
OF	16	72
LF	24	346

4. Some results

4.2 Water

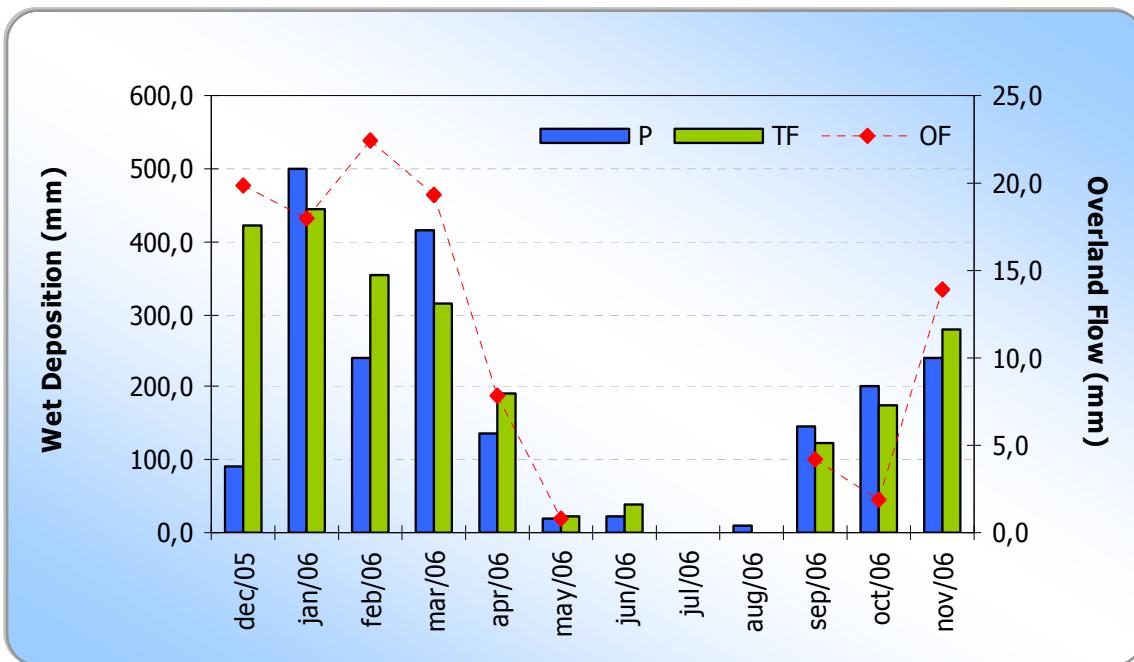
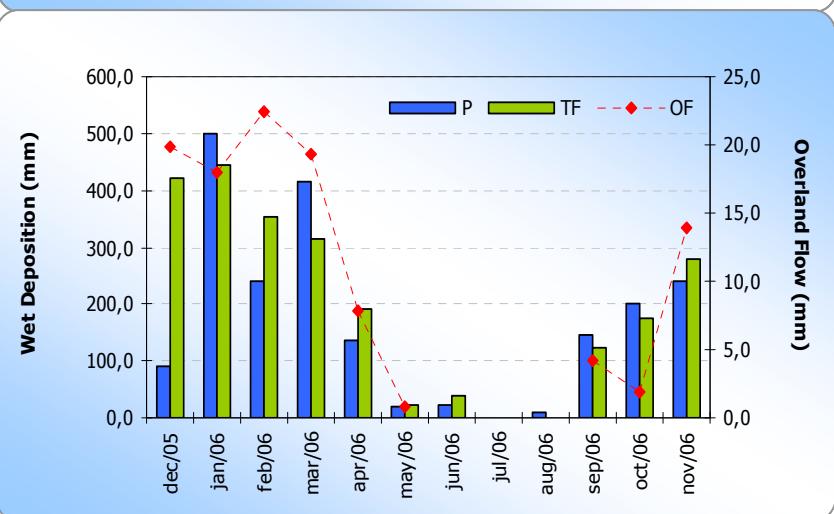
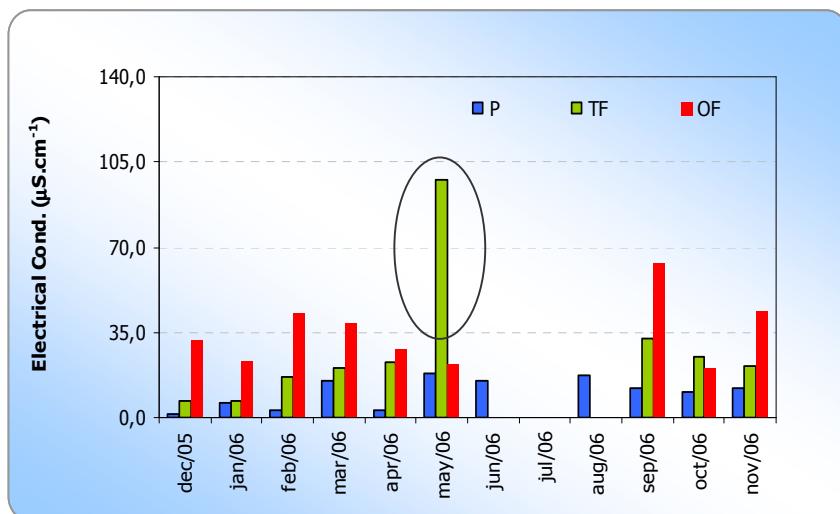
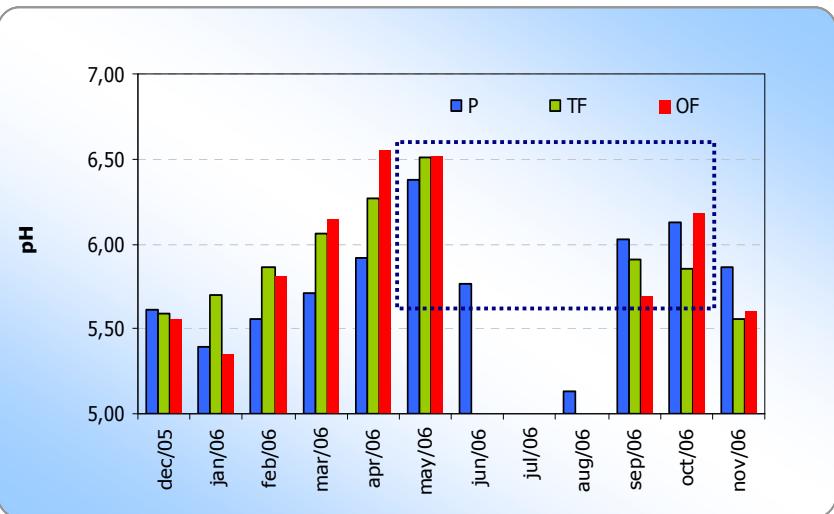


Figure 1. Monthly variation of stream water gauge level (2005-2006) and averaged precipitation (2005-06) at the studied region.

- Stream water gauge level has been daily monitored since dec/04
- Wet season (Nov - Apr) ⇔ Dry season (May - Oct)
- Between Dec/16/05 and Dec/19/06, 2374 mm of rainfall were recorded

4. Some results

4.3 Physical-Chemical



Elect. Cond. Averages ($\mu\text{S} \cdot \text{cm}^{-1}$)

- P: $10,5 \pm 7,9$ (n=25)
- TF: $22,1 \pm 29,7$ (n=176)
- OF: $19,9 \pm 19,9$ (n=89)

TF > OF >P

➤ Although OF exhibits the highest values during most of the year

4. Some results

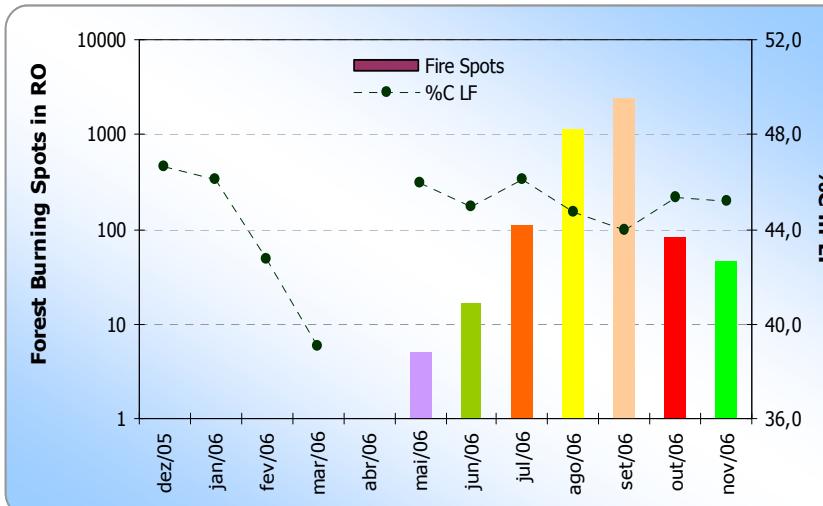
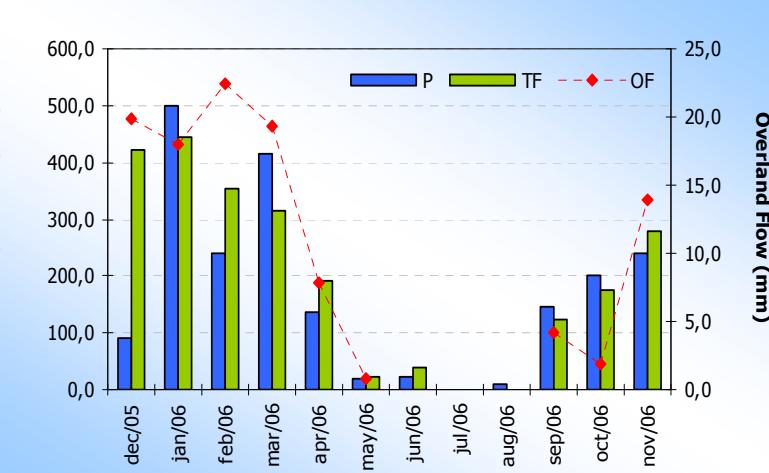
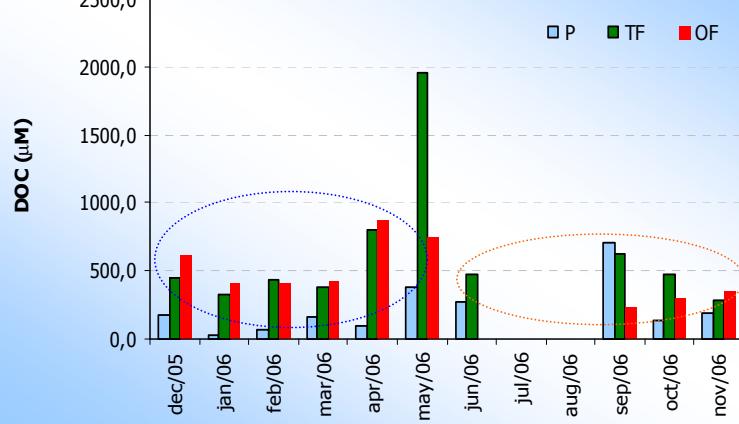
4.4 DOC Concentrations

Averages (VWM)

- P: **335,7** \pm 496,8 μM (n=20)
- TF: **596,6** \pm 506,85 (n=187)
- OF: **531,6** \pm 277,9 (n=89)

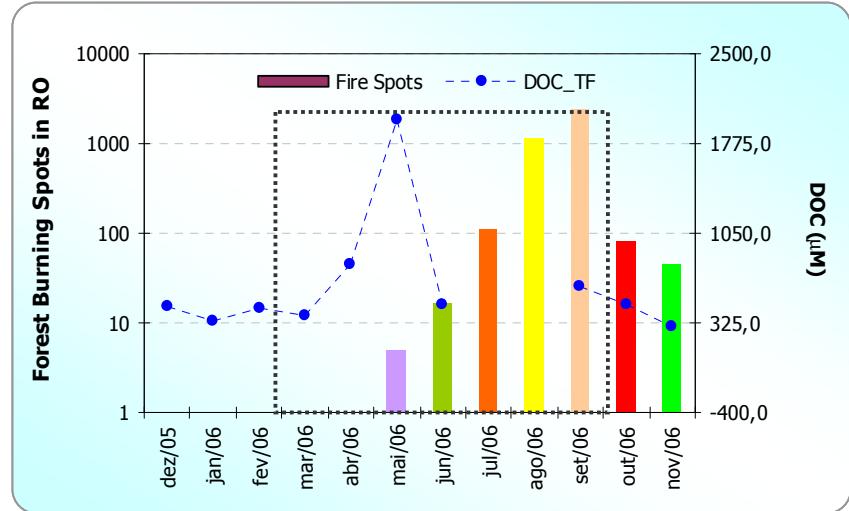
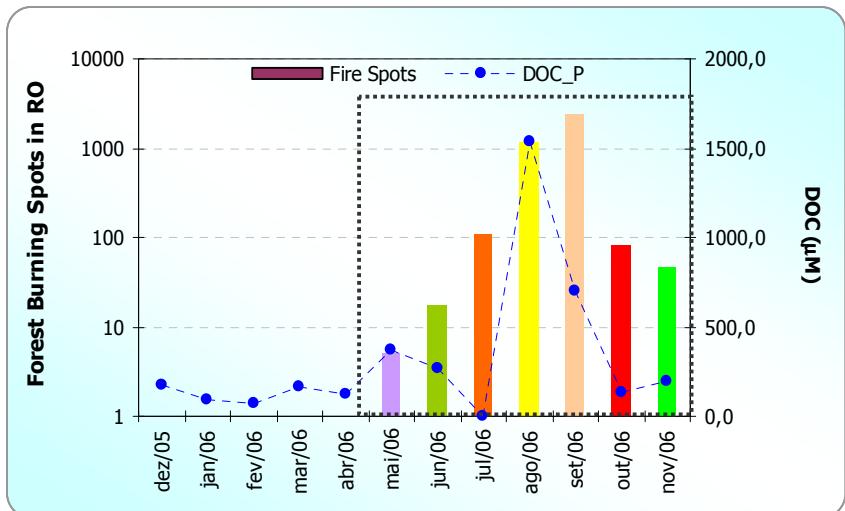
✓ **TF > OF >> P**

✓ Good correlation among pools

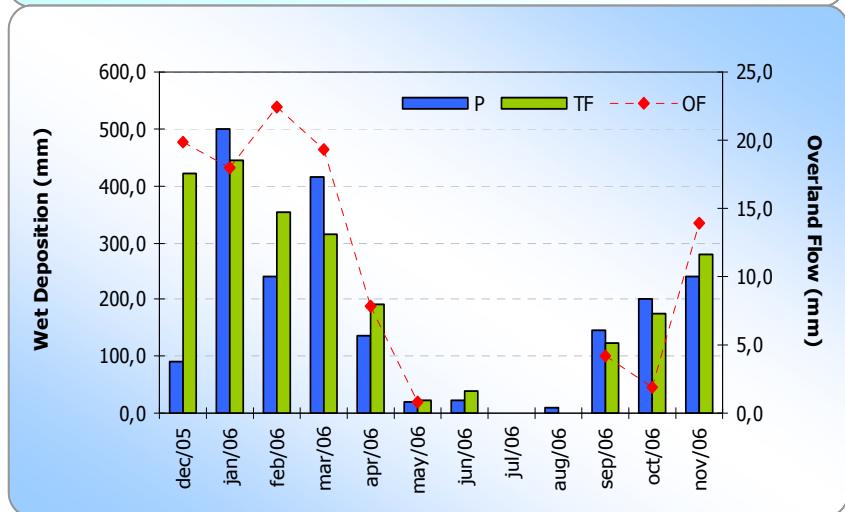


4. Some results

4.4 DOC Concentrations



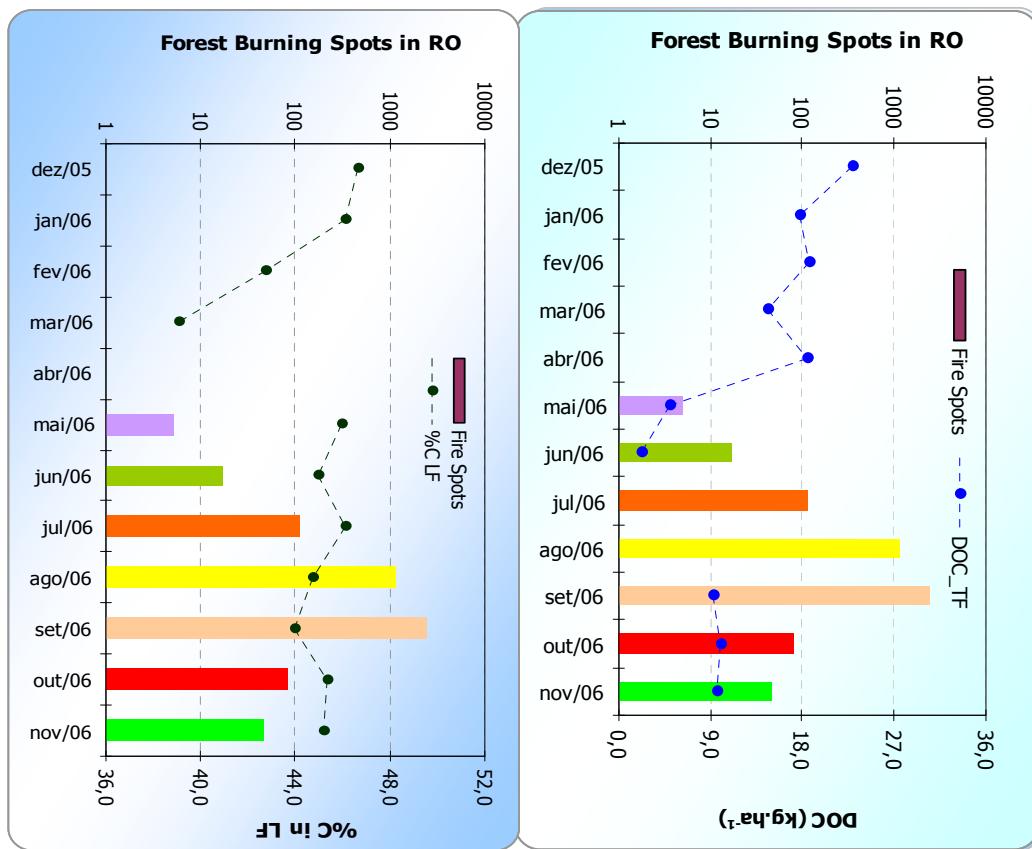
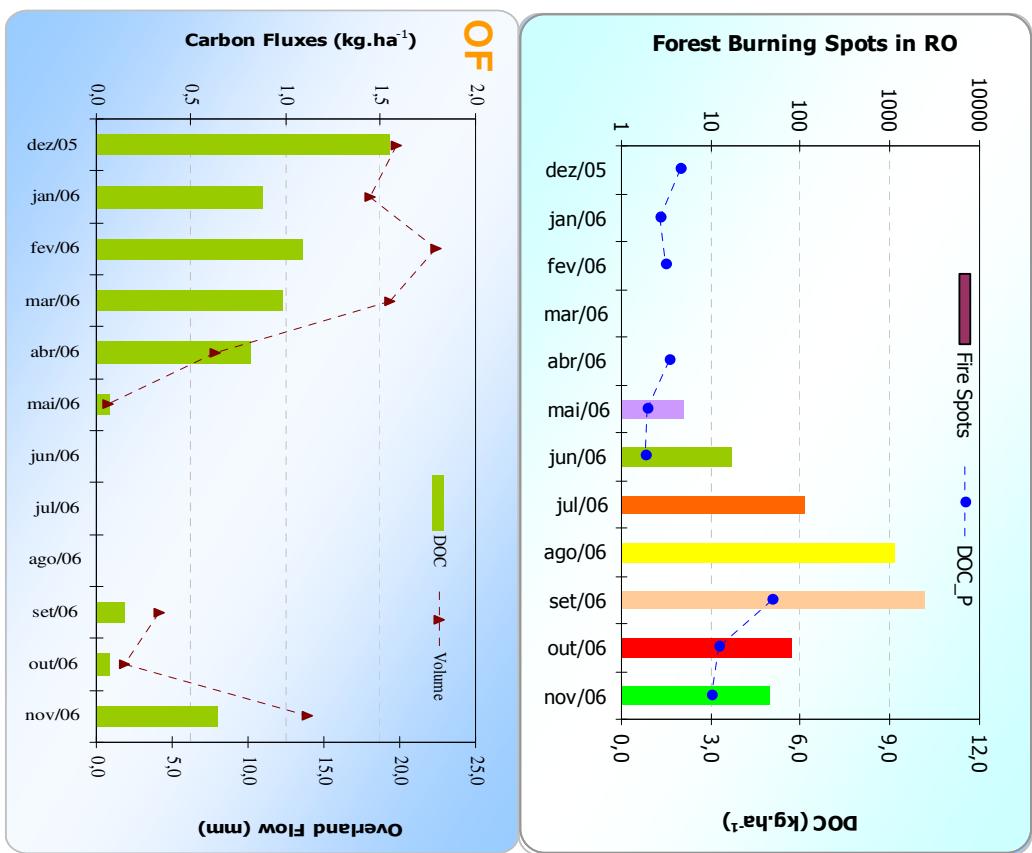
Source: BDQueimadas/INPE



- Dry deposition appear to be the **main contributor** of organic matter in P
- For TF, **prolonged dry period** provided higher []'s
- We observed constant concentrations after complete removal of particulate (for both pools)

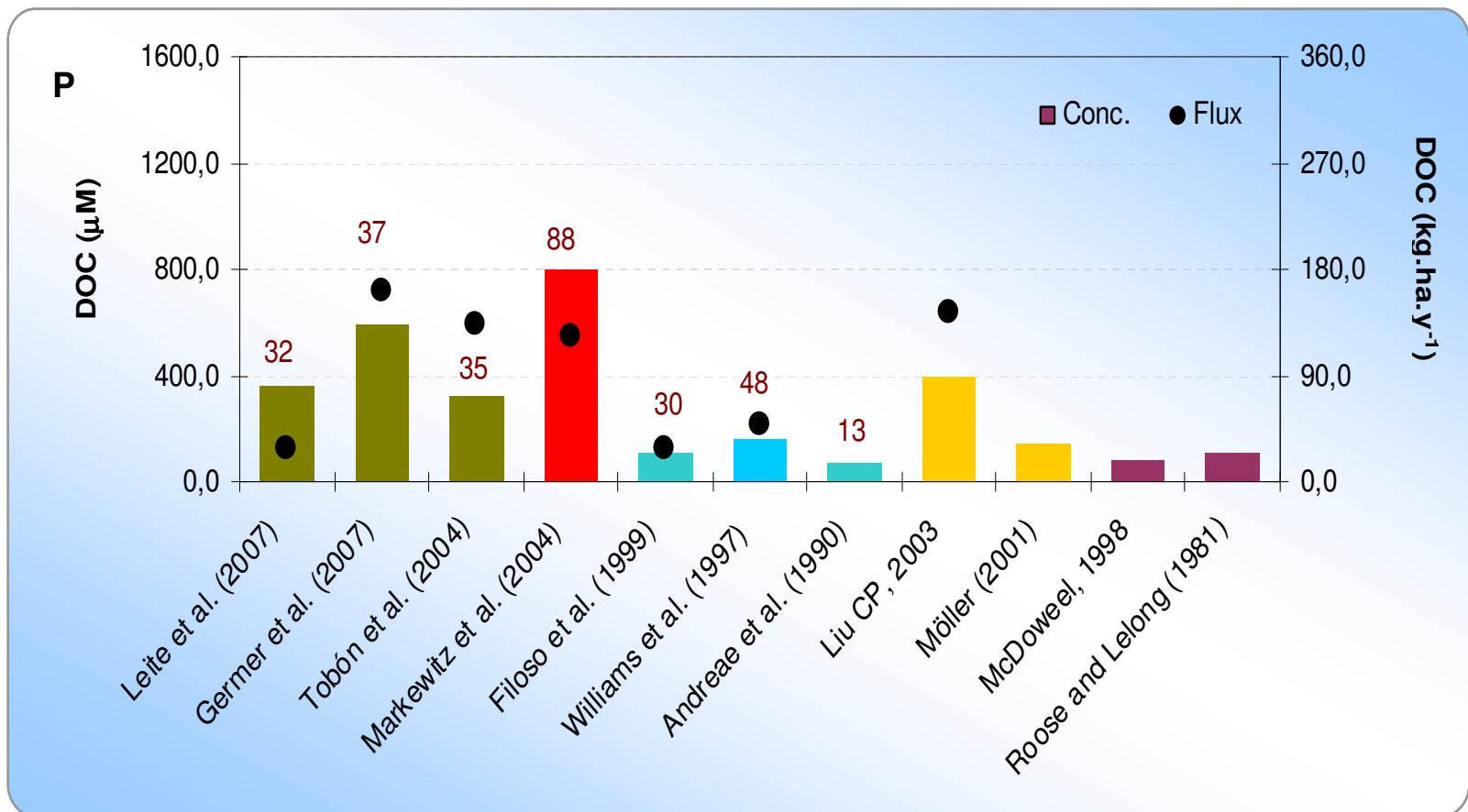
4. Some results

4.5 DOC Fluxes



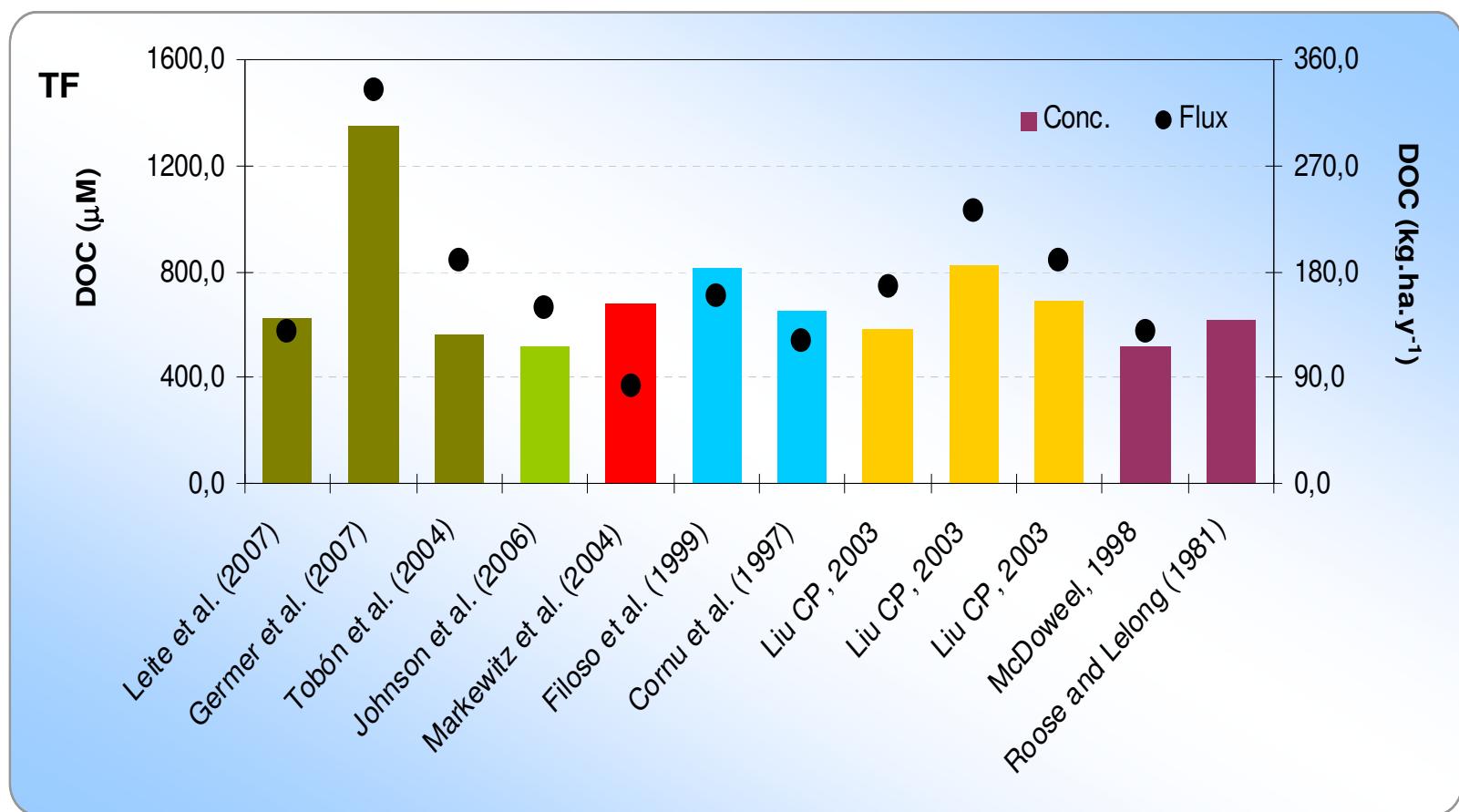
4. Some results

4.5 Comparison with other studies



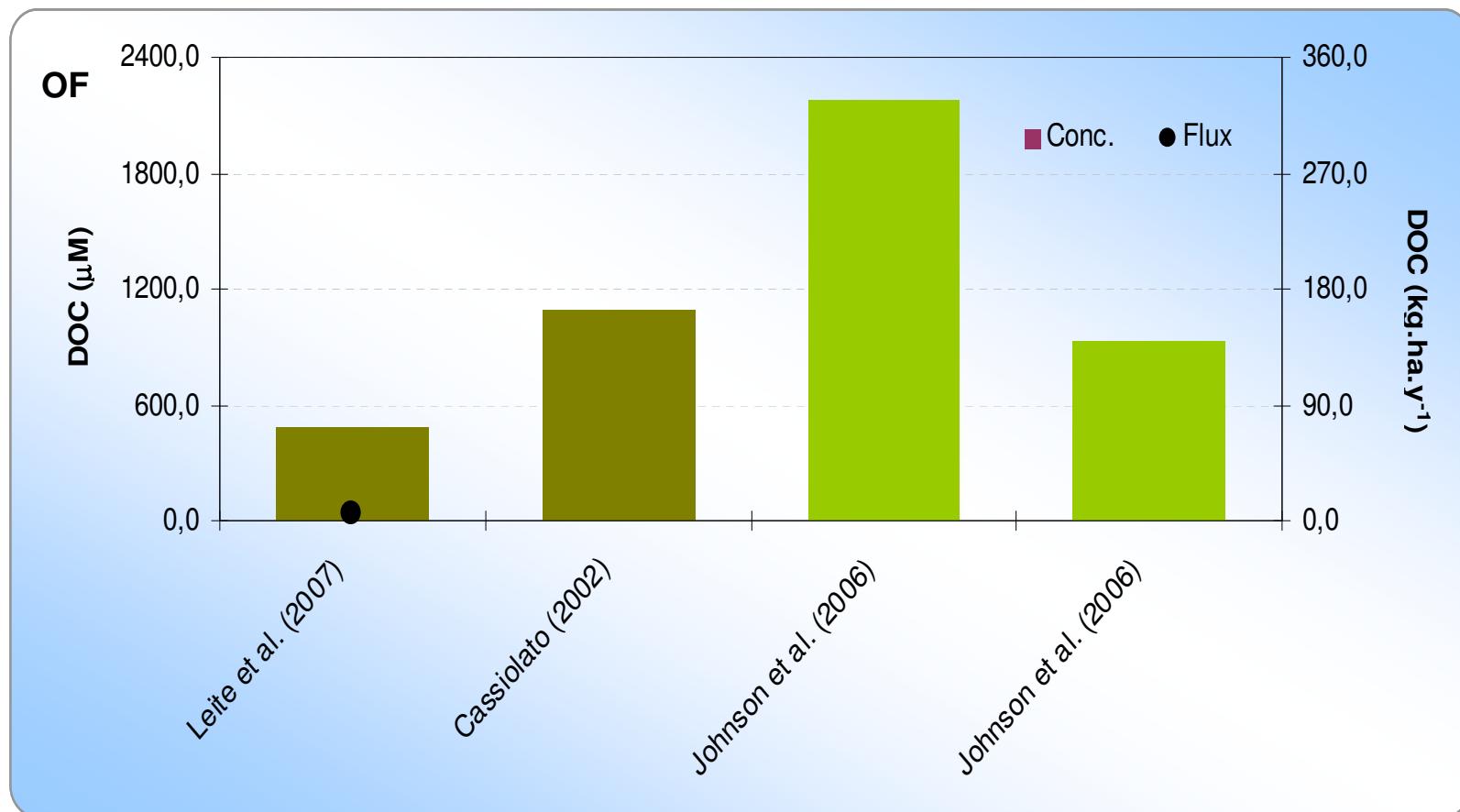
4. Some results

4.5 Comparison with other studies



4. Some results

4.5 Comparison with other studies



5. What have we learned so far...

- Forest Burning (particulate emissions/deforestation) seems to have a substantial role, mainly for incident precipitation
- In throughfall, the DOC dynamics seems to be controlled by different mechanisms according to the studied season (WET → Canopy Leaching; DRY → dry deposition)
- DOC in overland flow showed lower values than found in other Amazonian studies (lack of studies on this pool) indicating lower DOC export, this is due to the low volumes sampled during whole the studied period;
- DOC in precipitation and throughfall showed similar values than other studies in the Western Amazon (excepting for Germer, 2007) that were very high when compared with other regions in Amazon;
- In this study we could see that the forest canopy is acting as a effective carbon source to the forest floor, increasing the C flux from 27,2 (in P) to 128,31 kg.ha.y⁻¹ (TF)

Summarizing:

- DOC in wet deposition at the "Arch of Deforestation" region is very high when compared with other regions located in the Central Amazon suggesting a crucial role of the ashes released by forest burning on its chemistry

Acknowledgments

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