

Fluxes of dissolved and fine particulate organic carbon from terrestrial to aquatic systems in dependence on temperature and precipitation regime



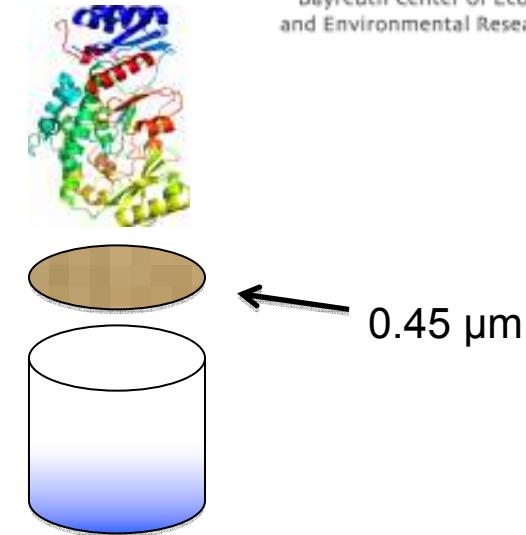
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What is DOC/POC in soil solutions and runoff?

Dissolved Organic Matter

- < 0.45 µm filtrate
 - colloidal: 1 kDa - 0.45 µm
 - low molecular weight DOM: < 1 kDa



Particulate Organic Matter

- > 0.45 µm
 - 0.45 µm – 1 mm: fine particulate organic matter
 - 1 – 10 mm: coarse particulate organic matter

Origins:

Plant litter, root exudates, microbial biomass, soil organic matter,

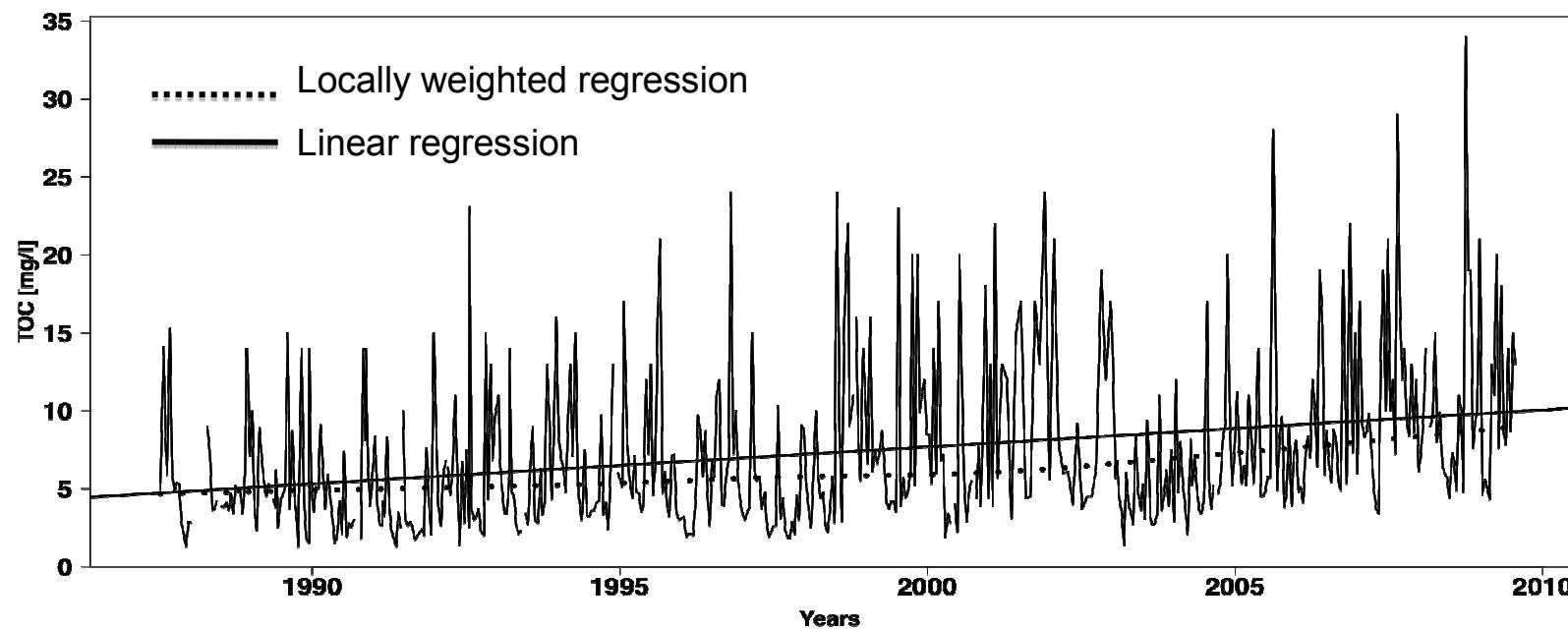
Why is DOC/POC important?

- **Critical parameter for drinking water purification**
- **Transport of toxic elements (heavy metals, POPs)**
- **Can contribute to acidification of surface waters**
- **Influences aquatic life**
- **Global Carbon budget**
 - C turnover in terrestrial soils
 - 2 Pg from terrestrial systems to inland waters (transformation, loss)
 - Terrestrial „Missing Sink“ ?
 - 1000 Pg DOC stored in oceans

Factors influencing the export of organic matter from watersheds:

- 1. Soil carbon content / peatland area**
- 2. Bedrock characteristics**
- 3. Land use**
- 4. Hydrology, storm events vs. base flow ;**
surface vs. subsurface flow conditions

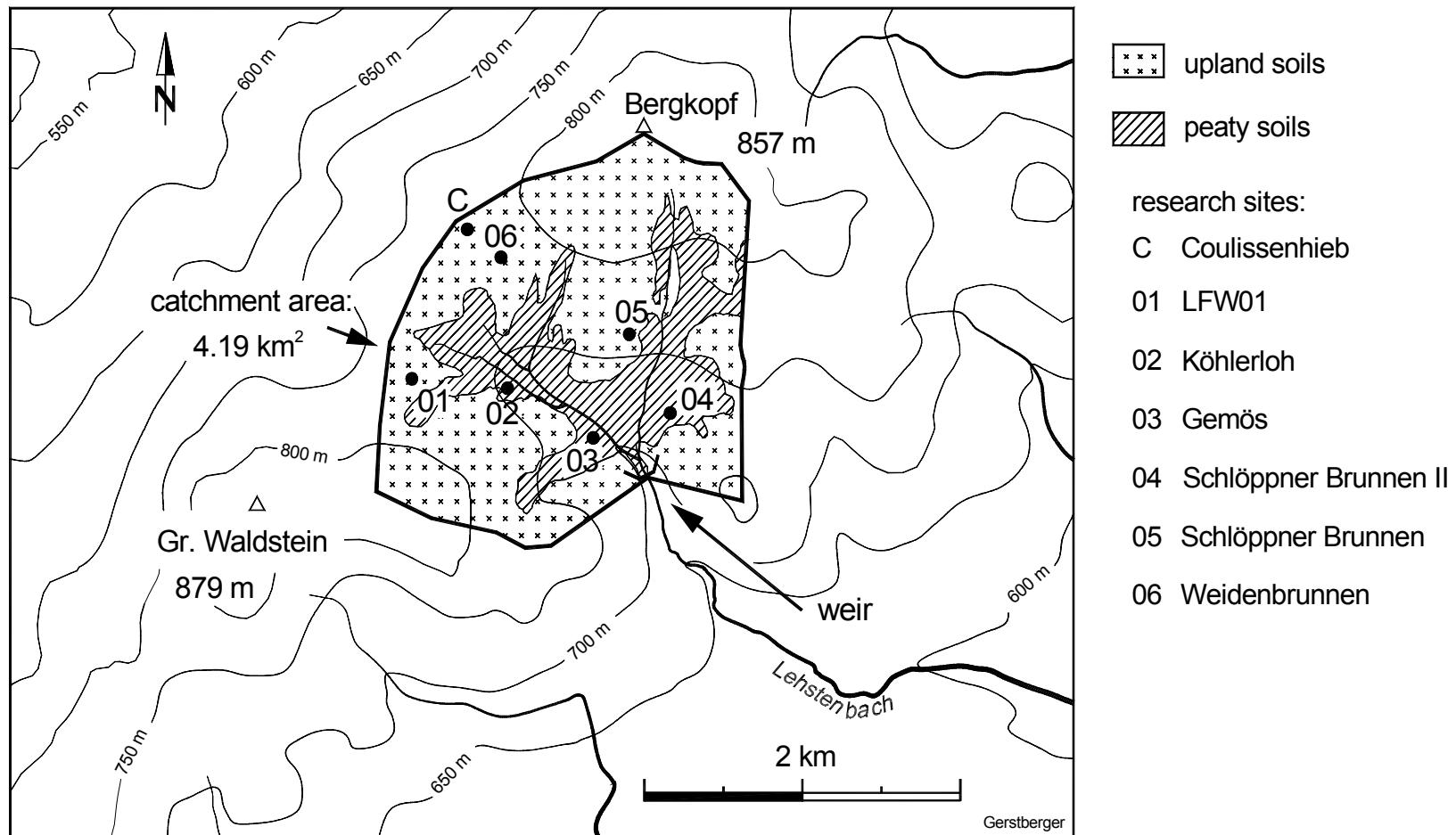
DOC/POC concentrations are increasing in aquatic systems!



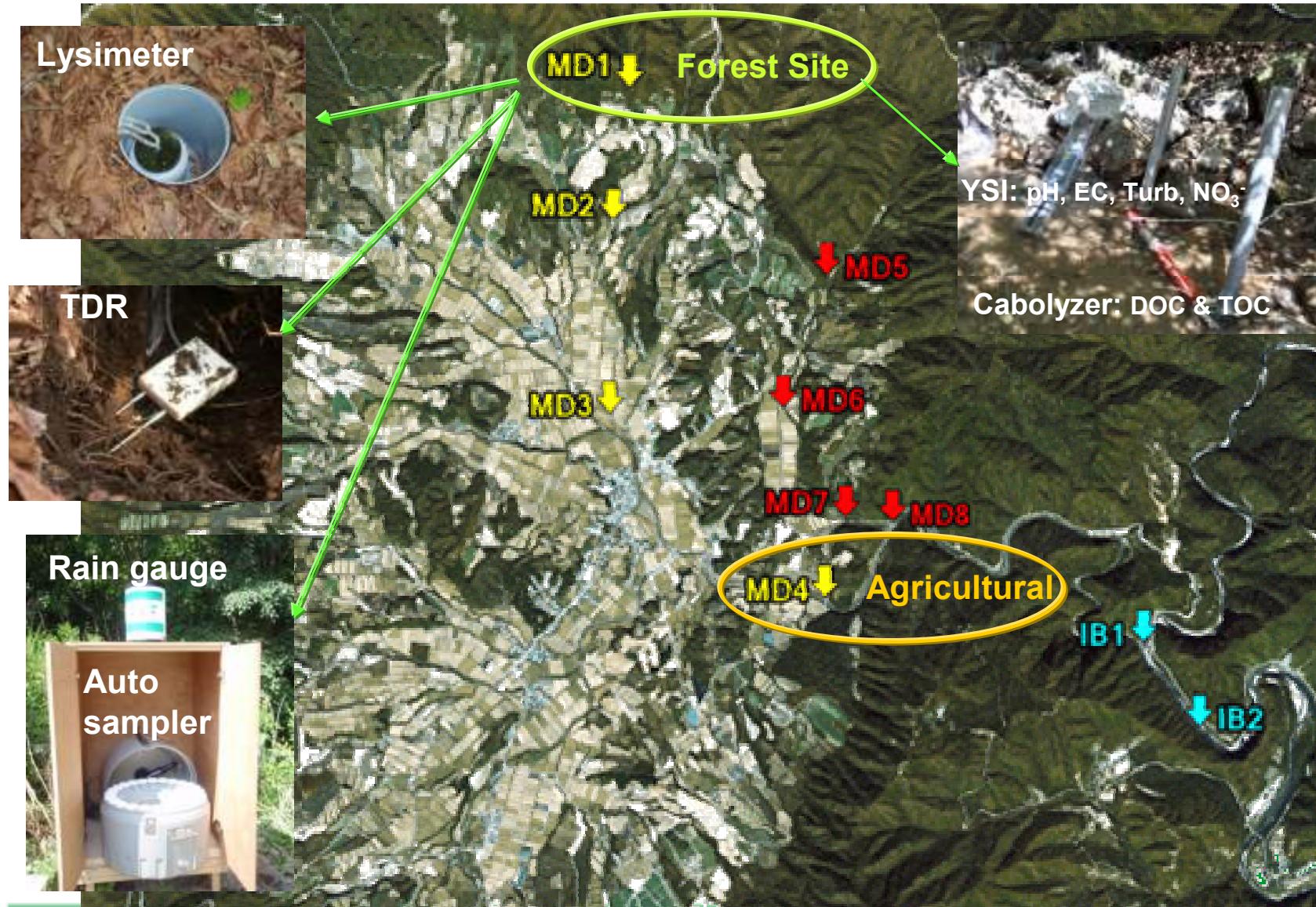
DOC in runoff from the Lehstenbach catchment (1988-2009)

Data from the Bavarian Environment Agency (LfU)

Lehstenbach Catchment in Fichtelgebirge, Germany



Research Site – Haean Basin (Punch Bowl)



Research Question

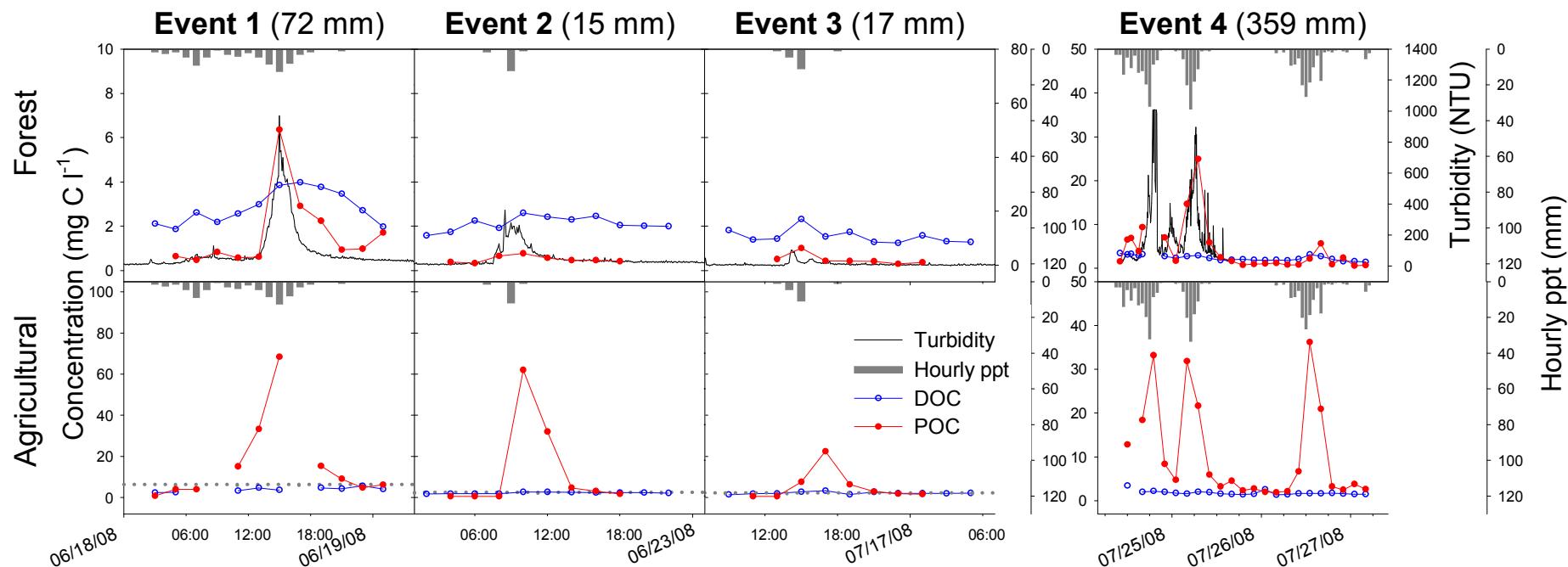
**What is the role of DOM compared to FPOM for the transport of Carbon
from terrestrial to aquatic ecosystems? And which are the sources?**



Comparison of DOC & POC - 2008

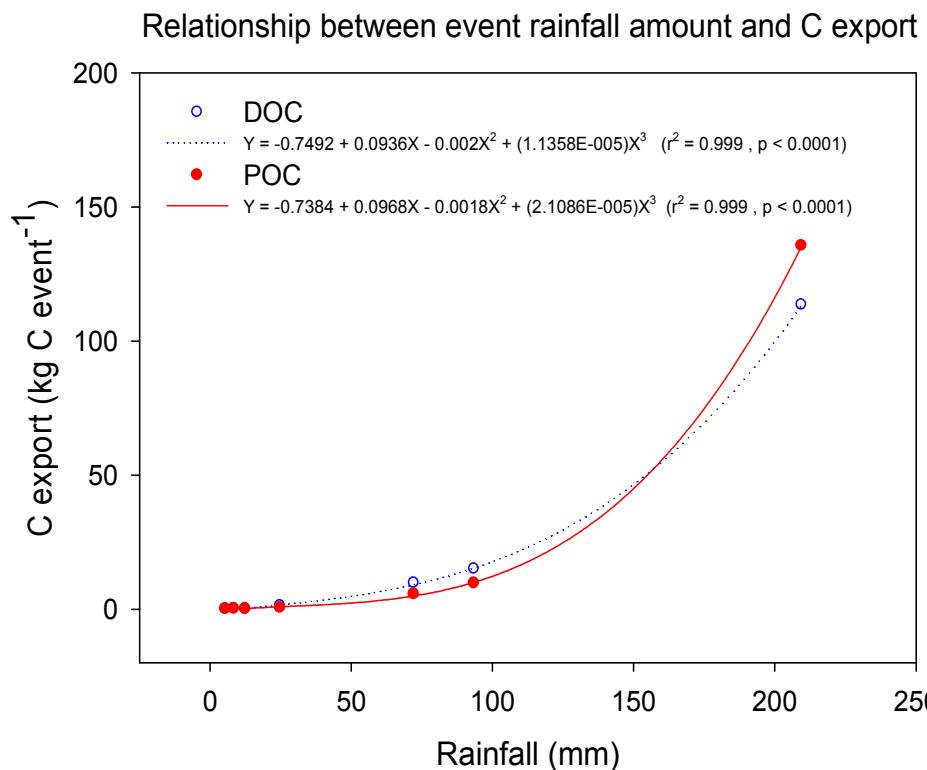
❖ DOC vs POC

- **Forest stream:** nonlinear increases in POC from small to extreme events
- **Agricultural stream:** POC $>>$ DOC, not corresponding to rainfall amount & intensity



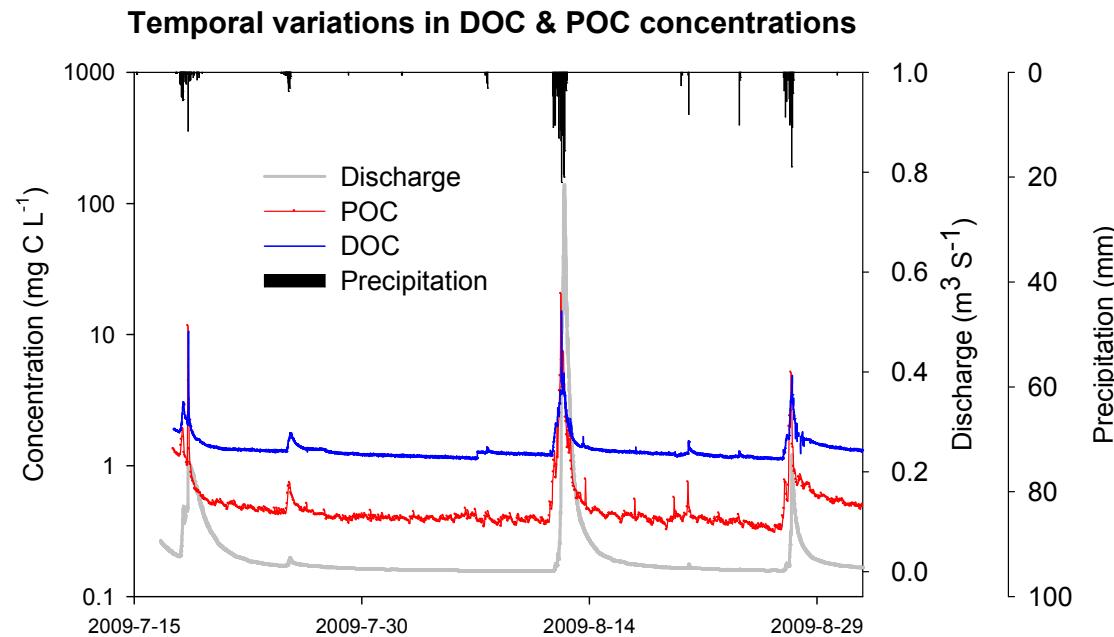
- **Monsoon period from July 17 – September 3, 2009**

- DOC: 7 storm events accounted for 58% of total DOC export
- POC: 7 storm events accounted for 75% of total POC export, with one extreme event (210 mm) comprising 68%



Event	Ppt (mm)	POC		DOC	
		kg C ha⁻¹	%	kg C ha⁻¹	%
1	72	0.1	2.8	0.2	4.0
2	25	0.0	0.2	0.0	0.5
3	6	0.0	0.0	0.0	0.0
4	210	2.5	67.5	2.1	47.0
5	9	0.0	0.0	0.0	0.1
6	13	0.0	0.0	0.0	0.0
7	94	0.2	4.8	0.3	6.2
Sum	427	2.8	75.4	2.6	57.8
Period total (Jul 17 - Sep 3)		3.7	100	4.5	100

- **Real-time measurement of stream DOC & POC using Carbolyzer**
 - Baseflow: very low POC conc. vs slightly higher DOC conc.
 - Peakflow: higher increases in POC relative to DOC conc.



Research Question

Do DOM and FPOM differ as a source for microorganisms?

Approach

Incubation experiments with DOM and POM from stream water, surface runoff and forest floor percolates

Plans for 2010

High temporal resolution measurements of DOC and POC in streams in response to precipitation events:

Lehstenbach and Haean catchment

Evaluation of long term data on runoff DOC from Lehstenbach:

Empirical relations to hydrological drivers

Start of decomposition studies on DOC and POC