

# Exports of stream organic carbon from two Pyrenean peatlands and potential anthropogenic impacts



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# What is a peatland?

Context



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# Peatlands and carbon

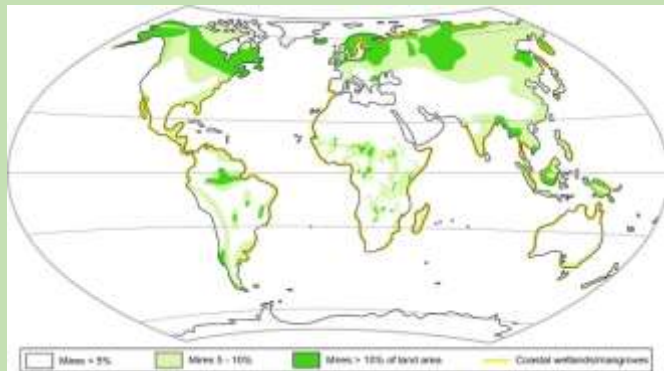
Context

## Climate change and anthropogenic pressure

2-3% continental surfaces

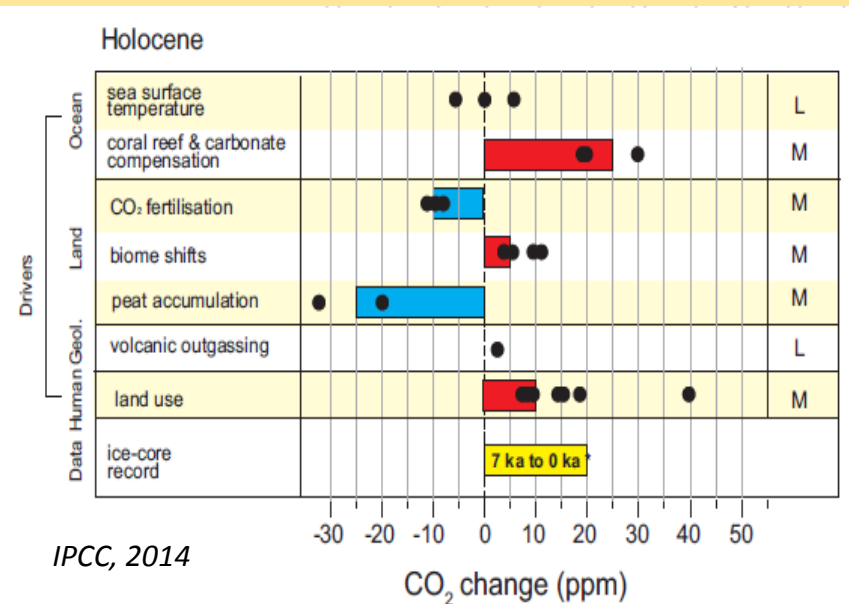


Gorham, 1991



F. De Vleeschouwer, d'après Lappalainen, 1996

## Regulating atmospheric CO<sub>2</sub> during the Holocene



IPCC, 2014

## Carbon sinks

~ 20 and 30 % global soil organic carbon



Gorham et al. 1991,  
Scharlemann et al. 2014,  
Leifeld and Menichetti 2018

Peatlands : 400-600 GT C  
Vegetation : 560 GT C  
Atmosphere : 850 GT C

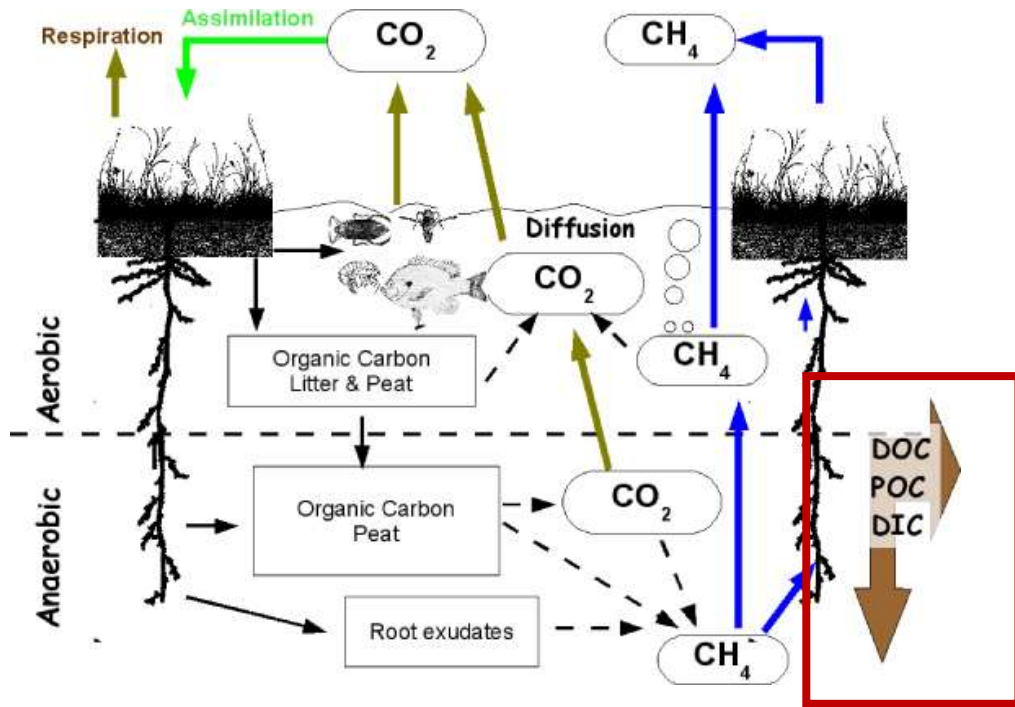
IMPACTS

Retro-actions? Positive? Negative?

# Stream organic carbon

Context

Carbon cycle in a peatland

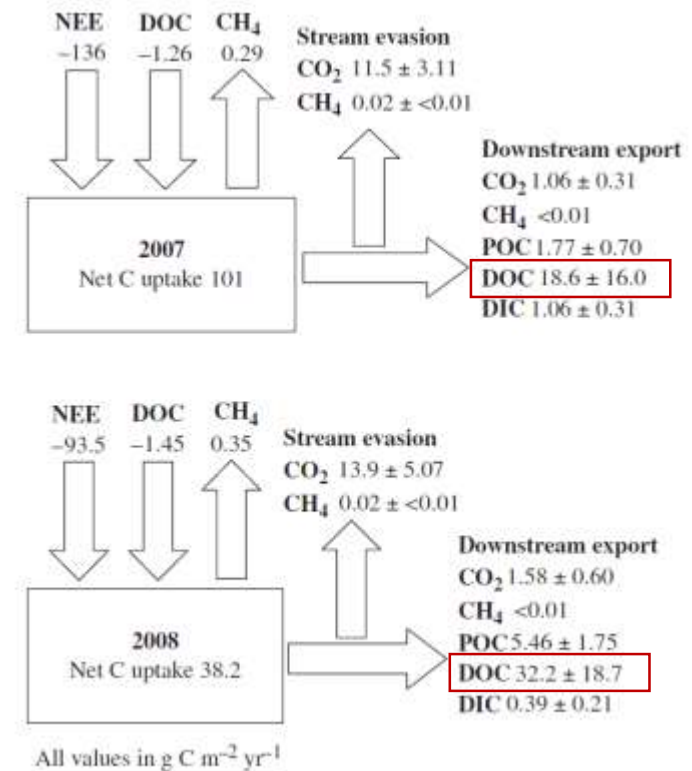


Lloyd et al. 2013

**Stream carbon exported =  
~ 40% stored carbon (NEE)**

Leach et al. 2016

Variability and dominance of the dissolved organic carbon in the exports



Net Ecosystem Carbon Balance, Dinsmore et al. 2010

# Mountainous area

Context

Stream organic exports drivers in the literature:

- Precipitation  
(Dinsmore et al 2013, Leach et al 2016 ...)

- Air temperature  
(Dinsmore et al 2013 ...)

- Floods  
(Yang et al 2015, Nilsson et al 2008 ...)

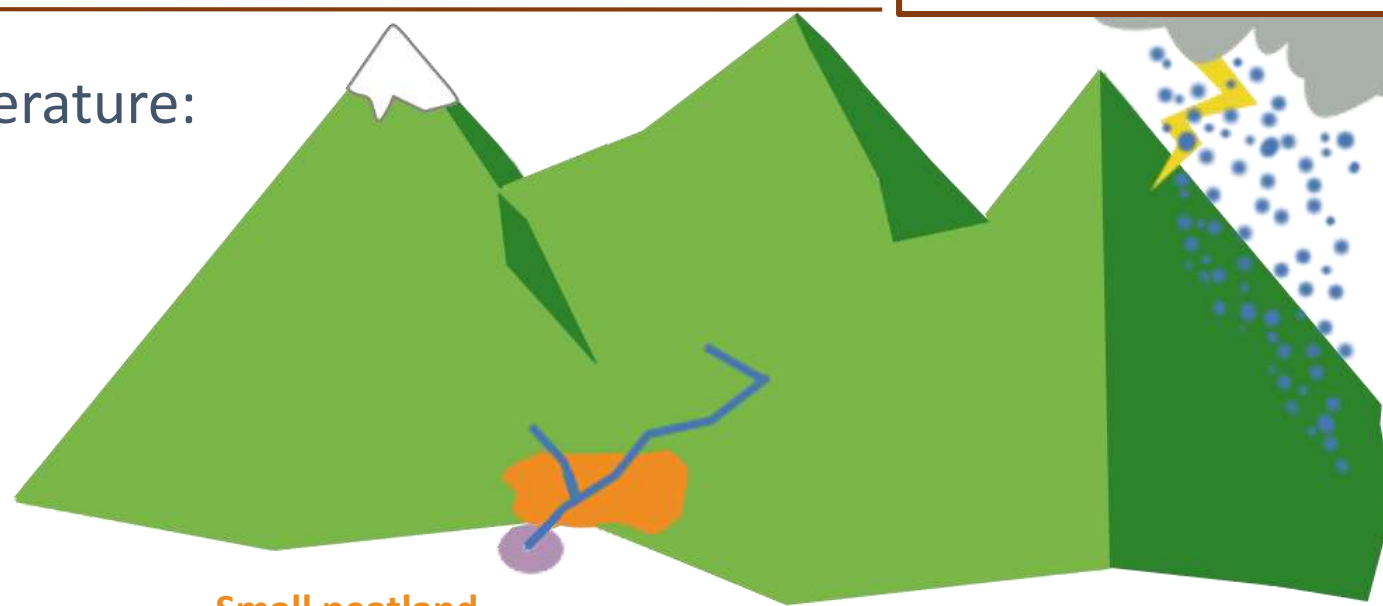
- Acrotelm oxygenation  
(Ritson et al 2017 ...)

	0 à 5 ha	5 à 10 ha	10 à 20 ha	20 à 50 ha	50 ha et plus
■ 2200-2400 m	0	0	0	0	0
■ 2000-2200 m	90	4	2	0	0
■ 1800-2000 m	37	2	6	2	1
■ 1600-1800 m	7	7	0	1	1
■ 1400-1600 m	1	2	3	0	0
■ 1200-1400 m	32	4	1	2	0
■ 1000-1200 m	0	0	0	0	0
■ 800-1000 m	2	0	1	0	0
■ 600-800 m	4	0	0	0	0
■ 400-600 m	2	2	0	0	0

Relative wetness of the acrotelm  
(Tunaley et al 2016 ...)

Vegetation type  
(Ritson et al 2017 ...)

Infen, 2005



Small peatland  
Mountain peatland imply :  
above 1200 m

Variability	Drivers impacted
Altitude	Precipitation, Temperatures, Végétation
Seasonality	

Specific areas	
Topography	Extreme events
Watershed size	Few landscape elements
Climate change sensitivity	Sentinel role



# Scientific questions

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1. How do the Pyrenean peatlands export stream organic carbon ? Is it similar with lowland (boreal, temperate) peatlands?
2. What are the processes driving the exports at the outlet of the Pyrenean peatlands?

$$C \text{ FLUX} = Q * [C]$$

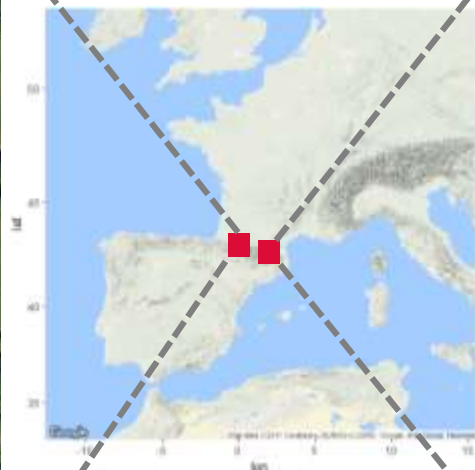
- a) What are the processes which drive the discharge at the outlet of the Pyrenean peatlands?
  - b) What are the processes which drive the stream organic concentrations at the outlet of the Pyrenean peatlands?
3. How anthropogenic activities can influence these exports in Pyrenean watersheds?

# Study sites

Col d'Ech  
Omex (65)



Altitude amsl	706 m
Peatland area	0,05 km <sup>2</sup>
Precipitation (mean 2014-2016)	~ 1600 mm.yr <sup>-1</sup>



Bernadouze  
Suc et sentenac (09)



Altitude amsl	1343 m
Peatland area	0,03 km <sup>2</sup>
Watershed area	1,4 km <sup>2</sup>
Precipitation (mean 2014-2016)	~ 1700 mm.yr <sup>-1</sup>



# In situ monitoring system

Methodology



Legend:



Inlet



Outlet



Manual sampling point



Piezometer



Weather station



# Database development

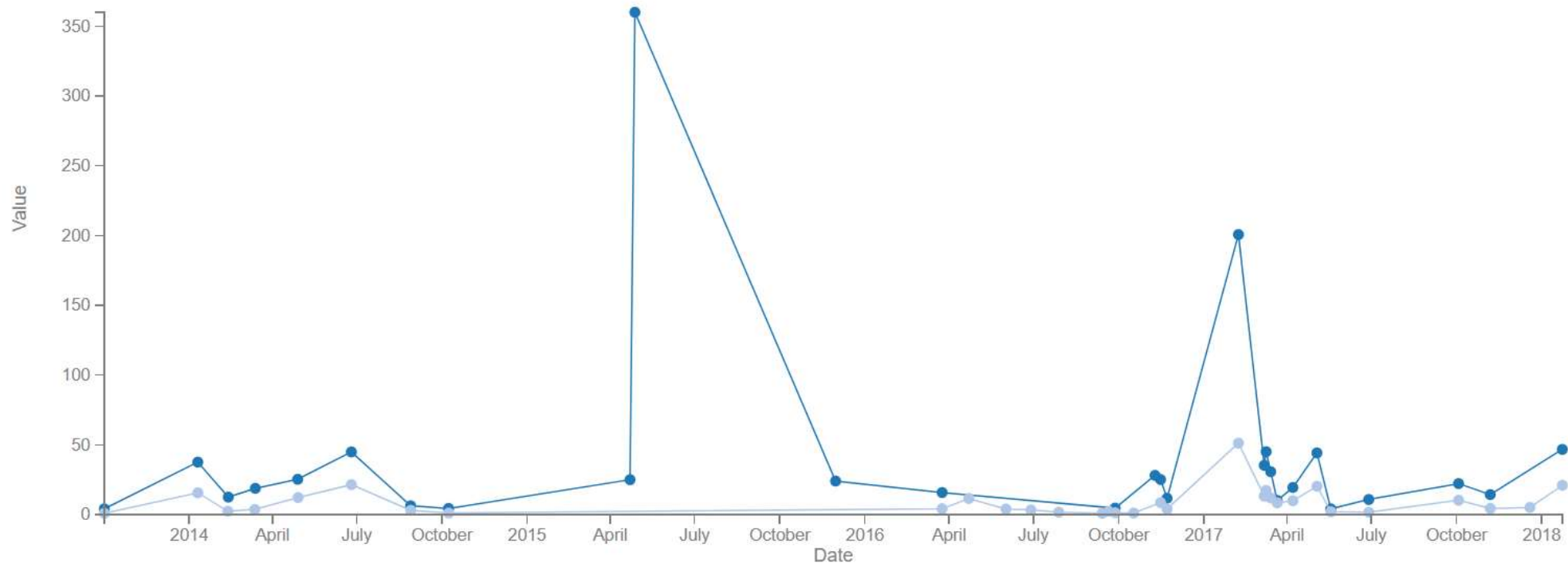
Methodology



CONNEXION

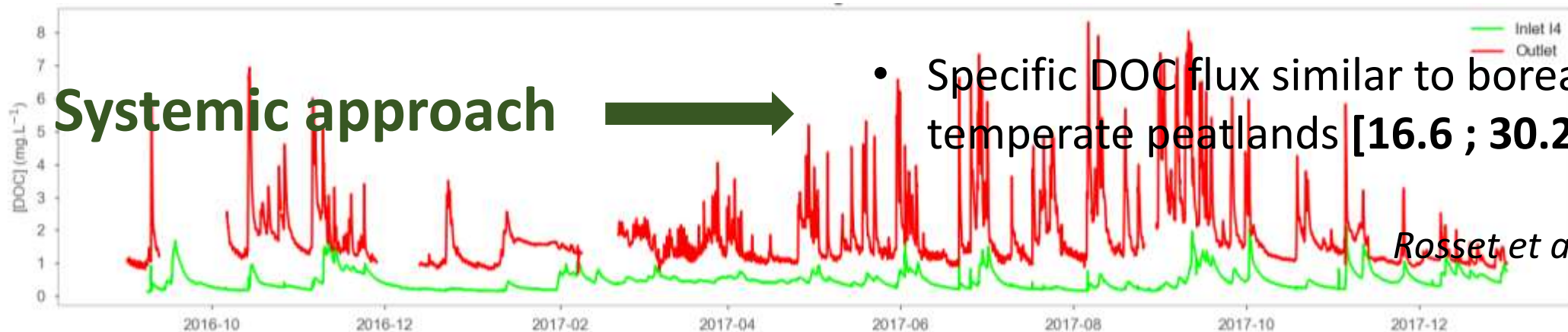
Preview area

■ Depth\_Ber3  
■ Flow\_Cha



# Peatland of Bernadouze, Principal source of DOC in the watershed

Results



- Specific DOC flux similar to boreal or cool temperate peatlands **[16.6 ; 30.2] g.m<sup>-2</sup>.yr<sup>-1</sup>**

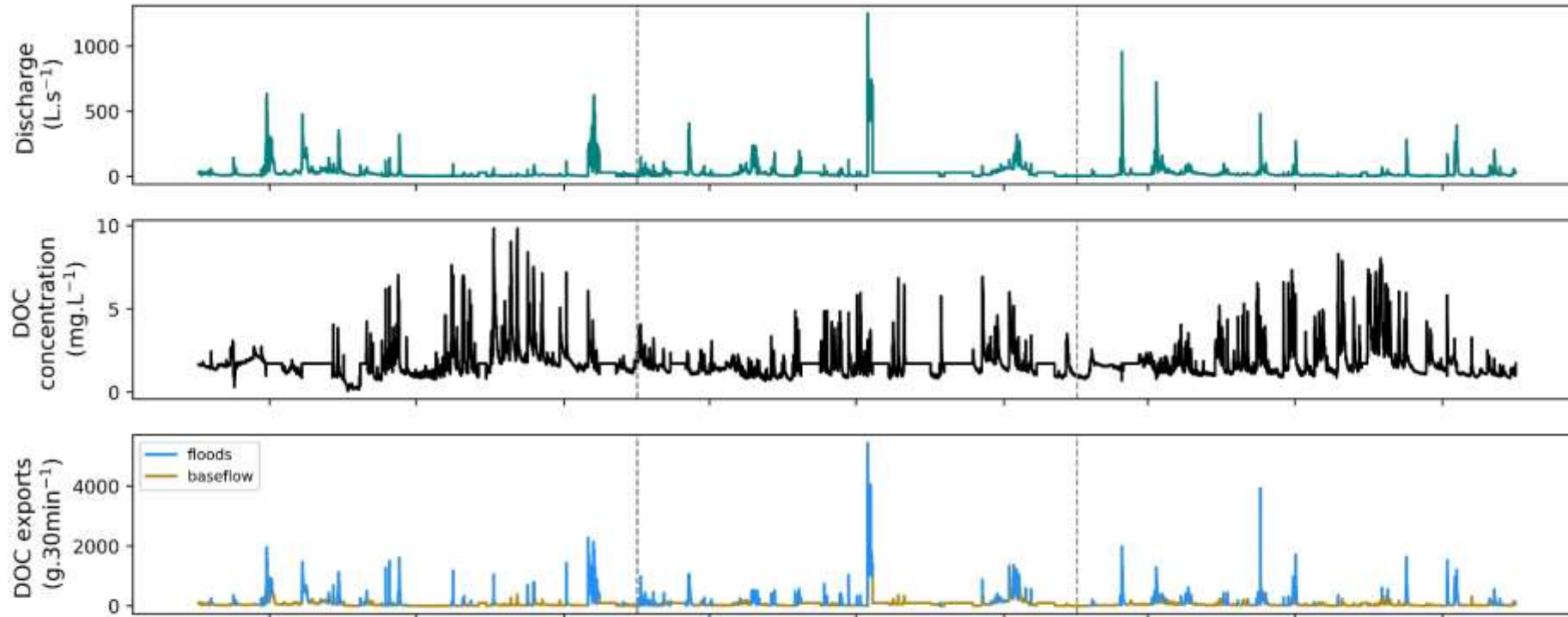
*Rosset et al. 2018 submitted*



# Hydrology

## Principal driver of the exports

Results



Orders of magnitude  
**3** times higher

**Floods = 9 % timeseries**

al

# Scientific questions

Ph.D. report

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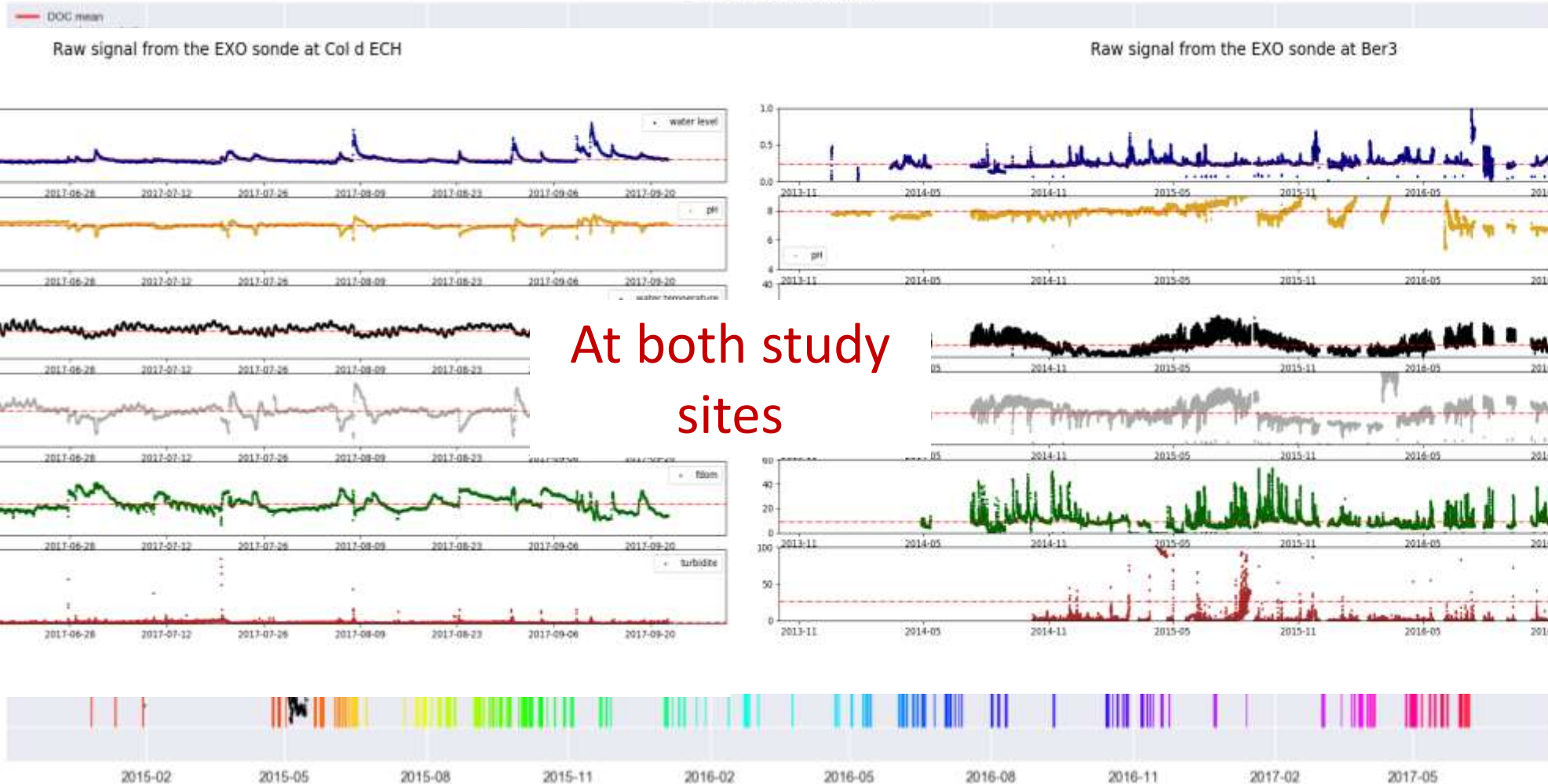
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# DOC peaks understanding

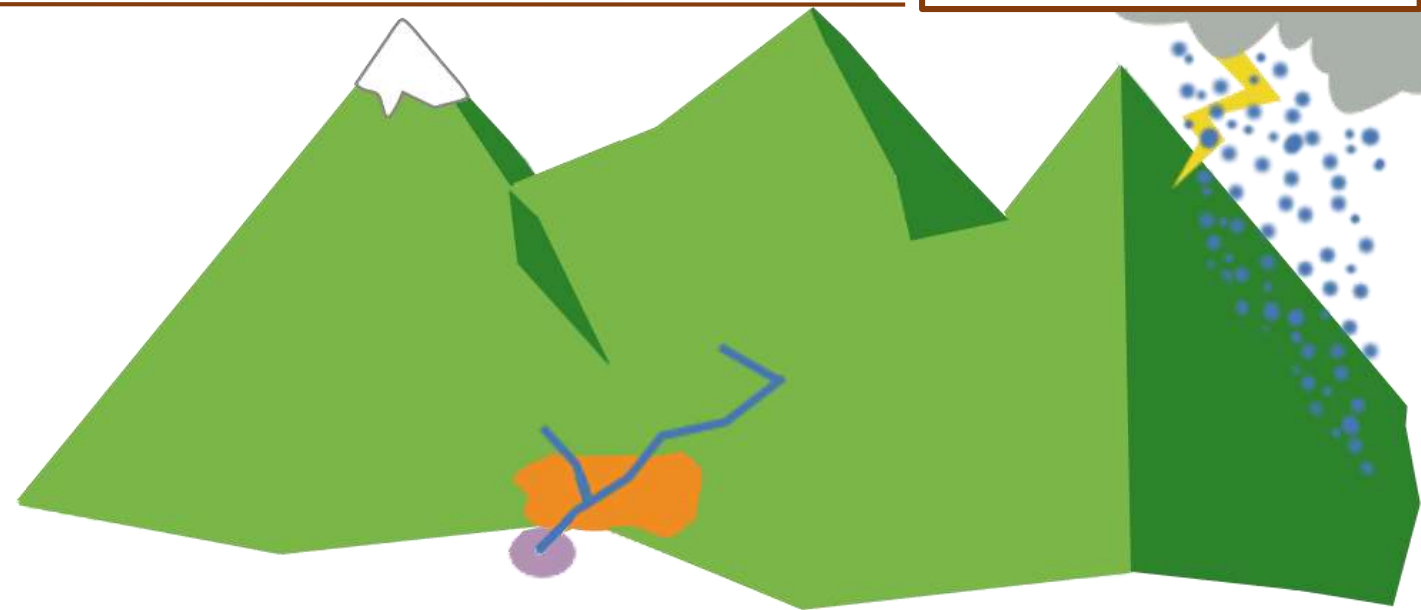
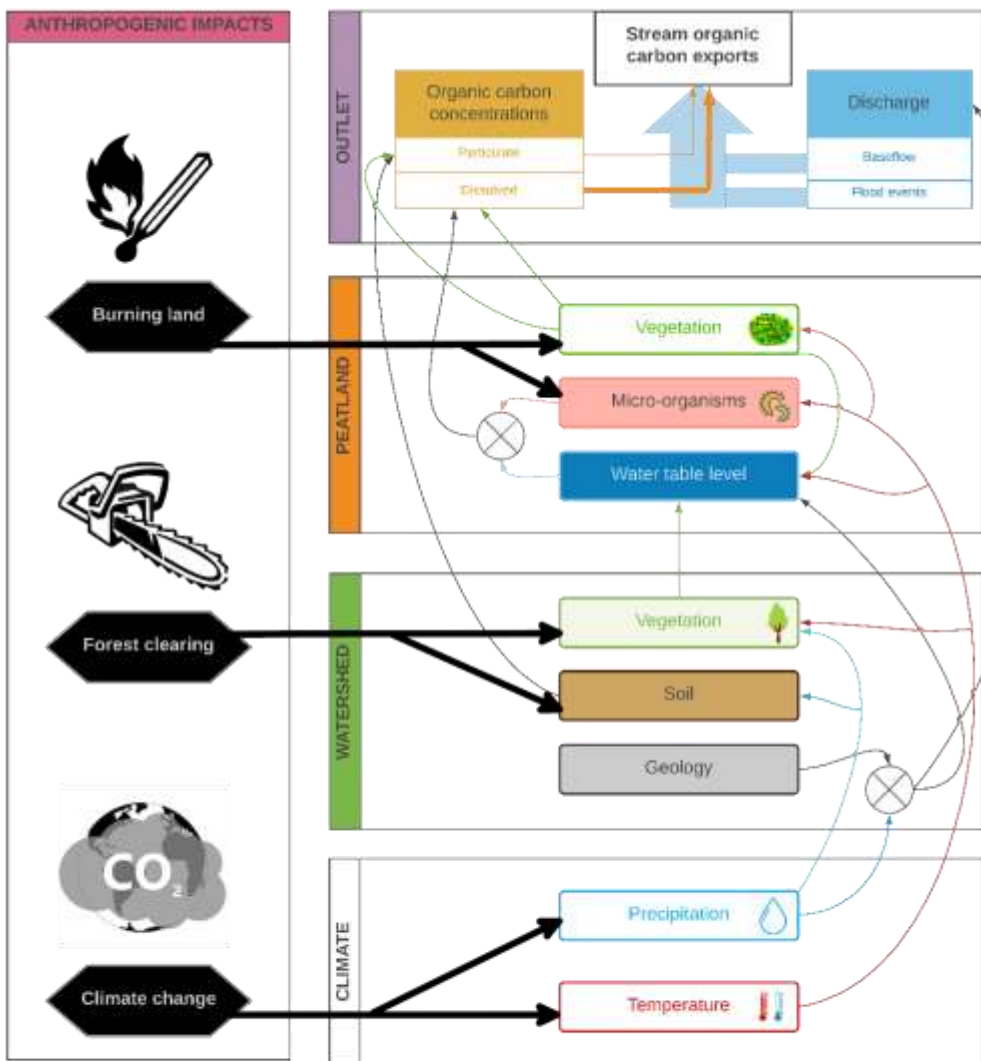
Prospects 1

DOC peak sequencement



# Impacts of anthropogenic activities

Prospects 2

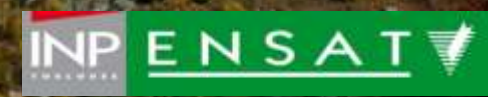


Statistical analysis

- ➔ Higher Water table
- ➔ Less DOC production
- ➔ Less DOC exports



... Merci pour votre attention ...



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