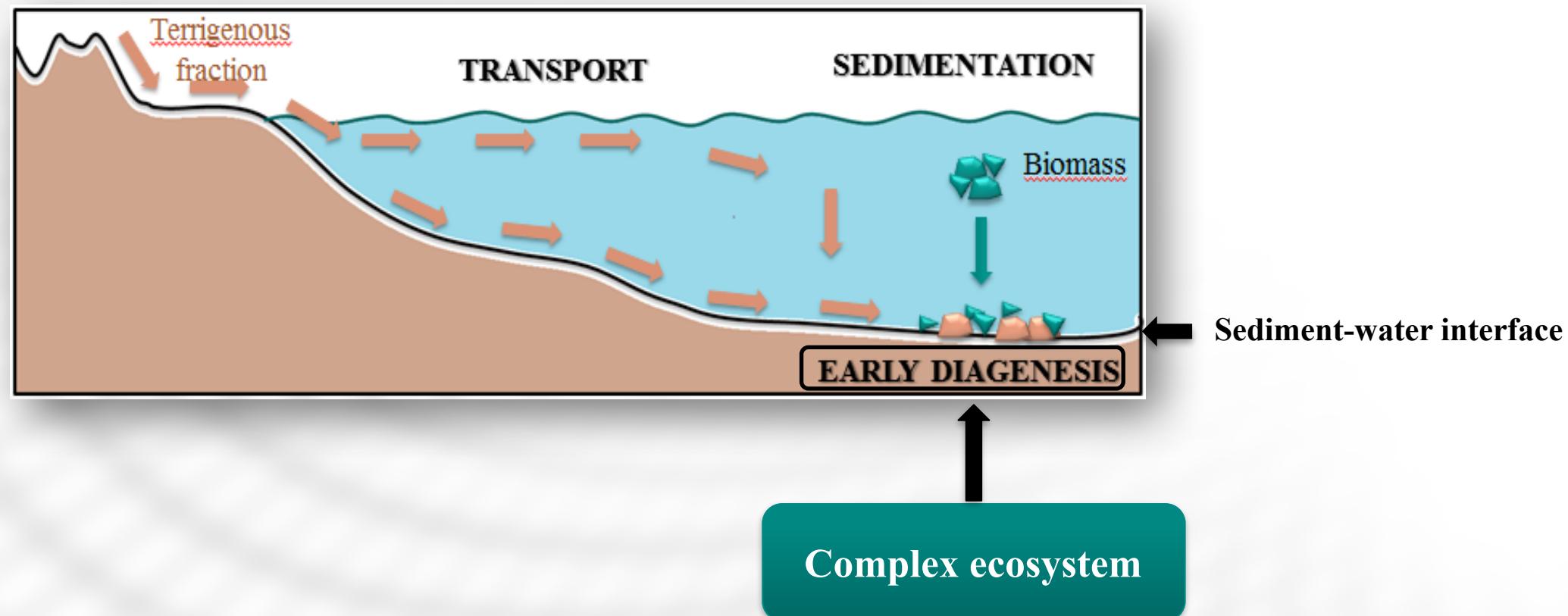
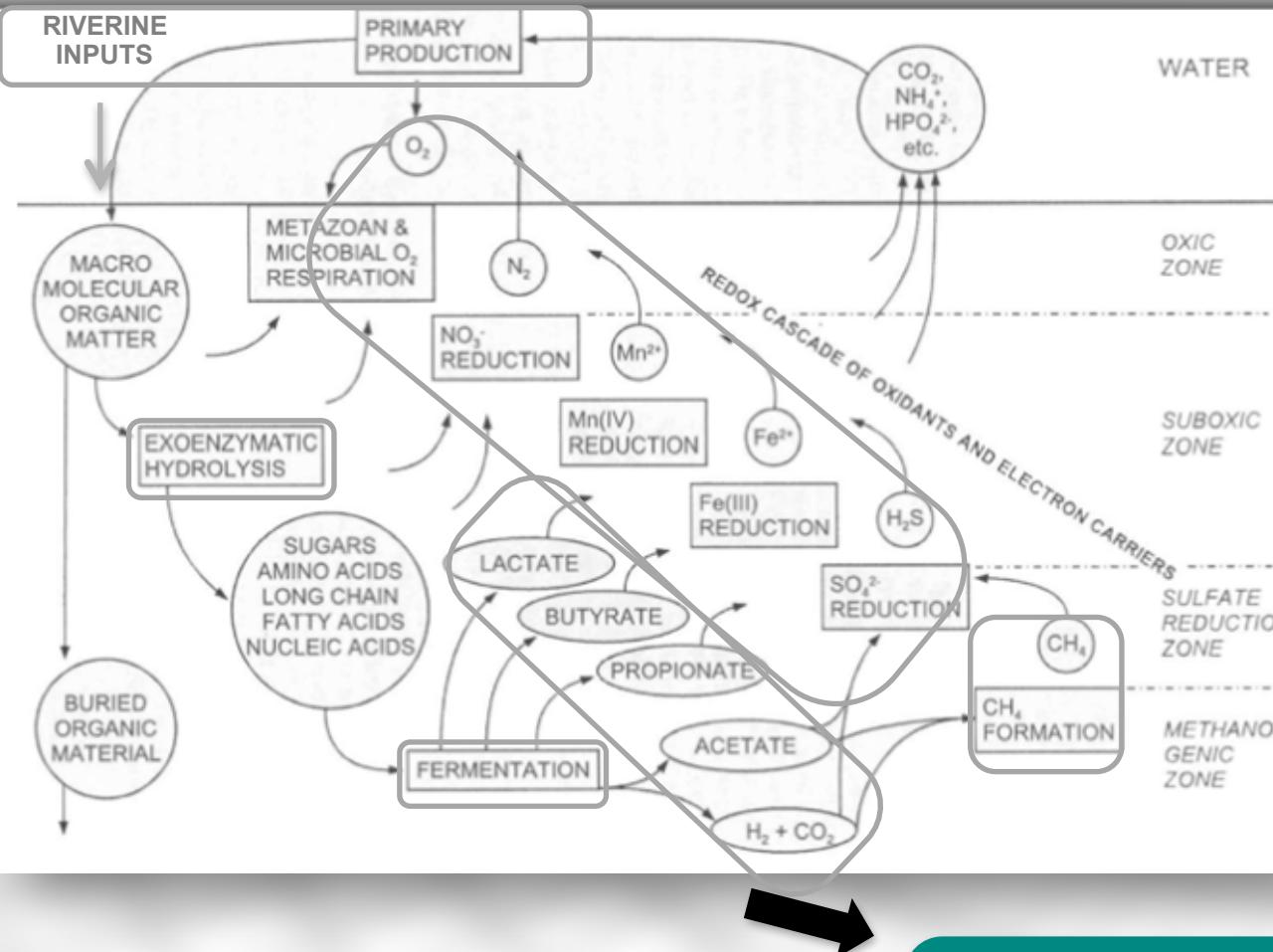

Organic Matter Modelling in the Estuarine Sediments (Aulne and Elorn, France)

F. Ait Ballagh, K. Khalil, C. Rabouille, F. Andrieux, K. Elkalay, K. Soetaert

The estuarine and coastal margins are influenced by intense deposition of organic matter and nutrients due to anthropogenic pressure, pollution and natural inputs (Epping, 2002)

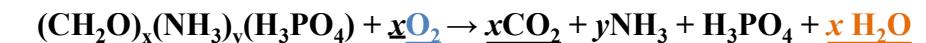


INTRODUCTION

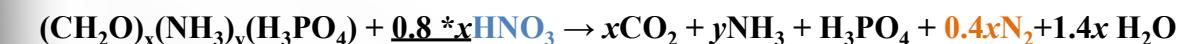


Mineralization pathways
Transport processes
Benthic biogeochemical cycles

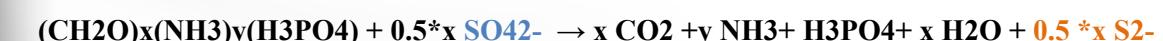
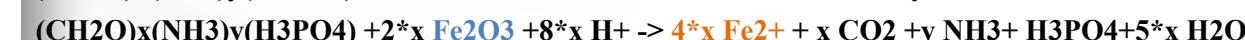
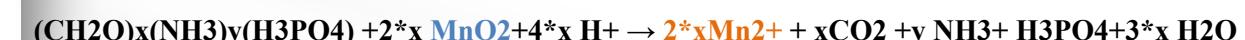
OXIC MINERALIZATION



DENITRIFICATION:

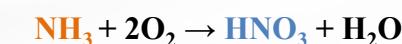


ANOXYGENIC MINERALIZATION



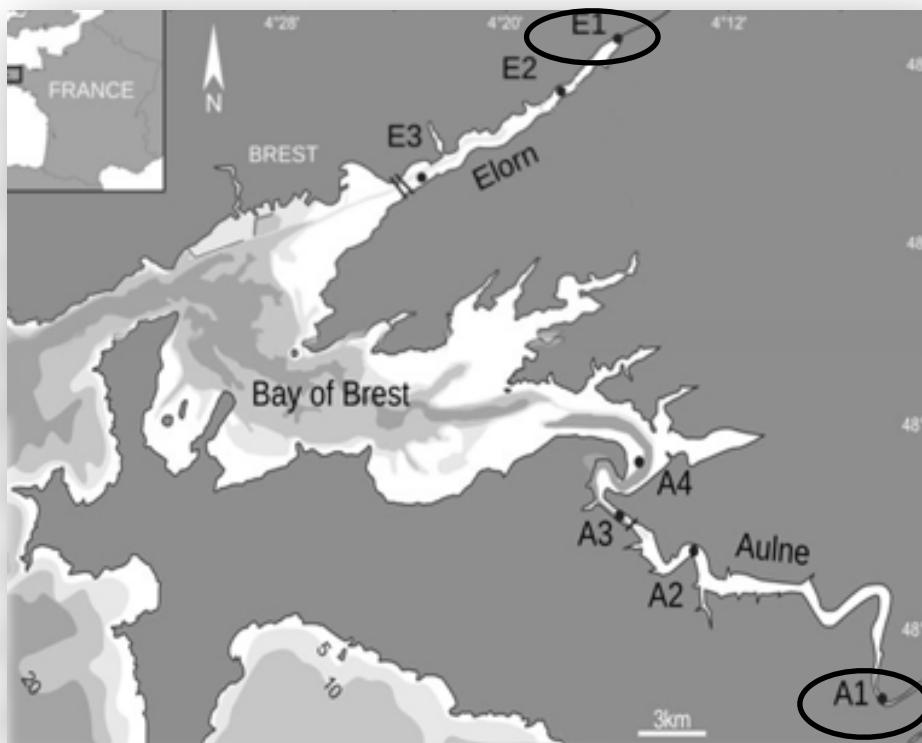
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REOXIDATION OF REDUCED SUBSTANCES



(Soetaert al., 1996)

STUDY AREA ► INNER OF AULNE AND ELORN ESTUARIES



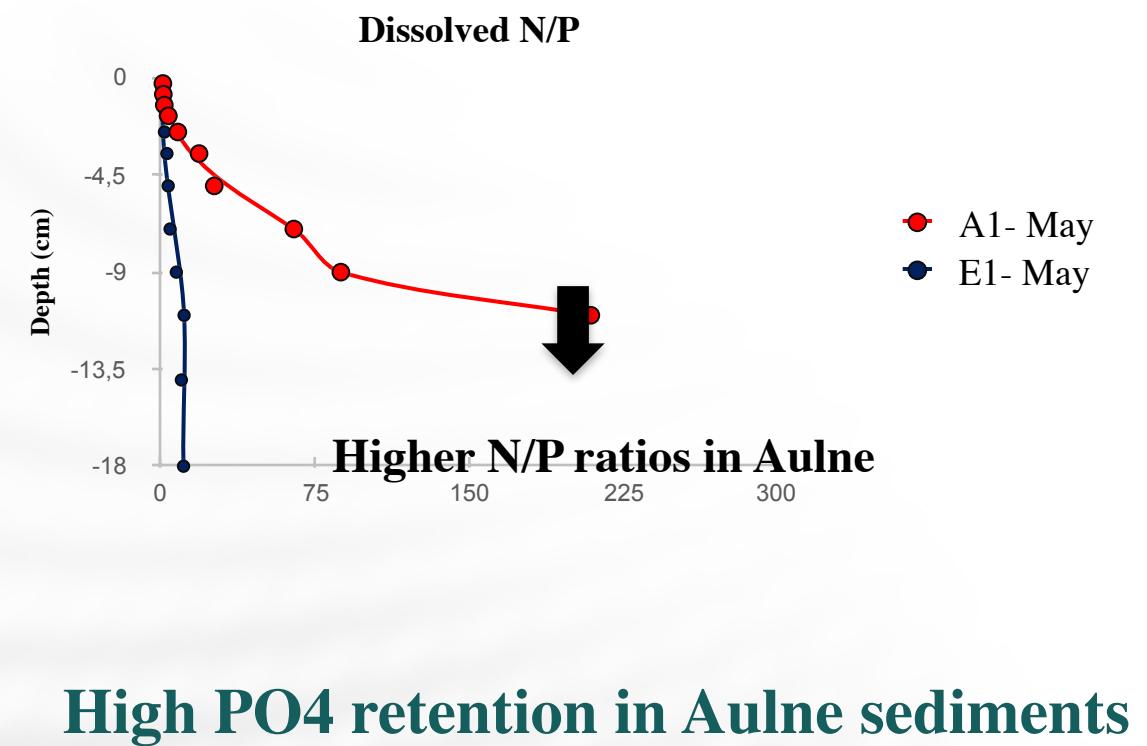
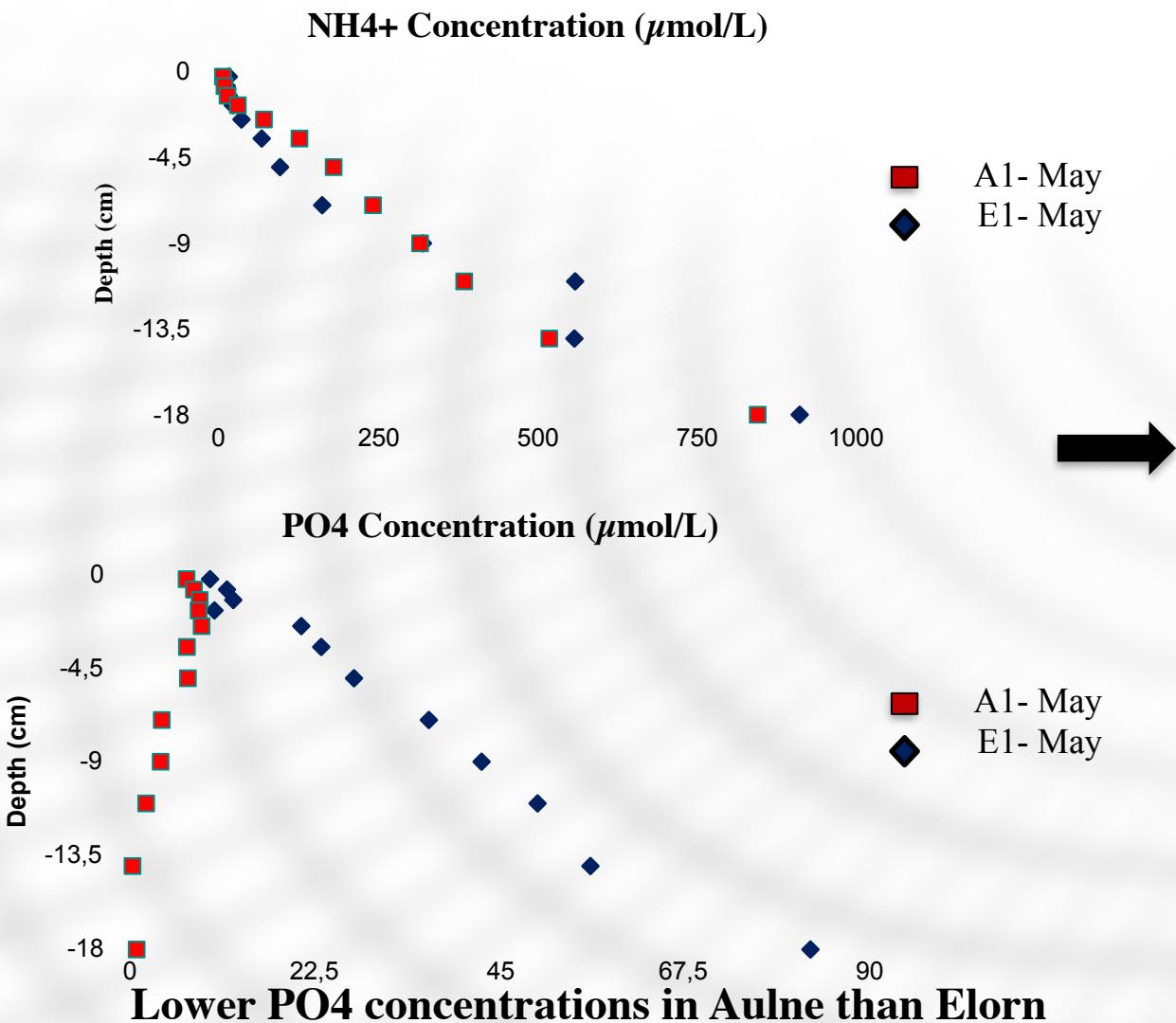
	Station E1	Station A1
Watersheds	280 km ²	1 822 km²
Population	285 000	70 000
Climate	Temperate oceanic climate	
River discharge	4,69 m ³ s ⁻¹	10,4 m³ s⁻¹
Salinity	0	0
Morphology	15 km Straight	35 km Meandering
Exposure	Exposed to marine influence	Protected by the Bay



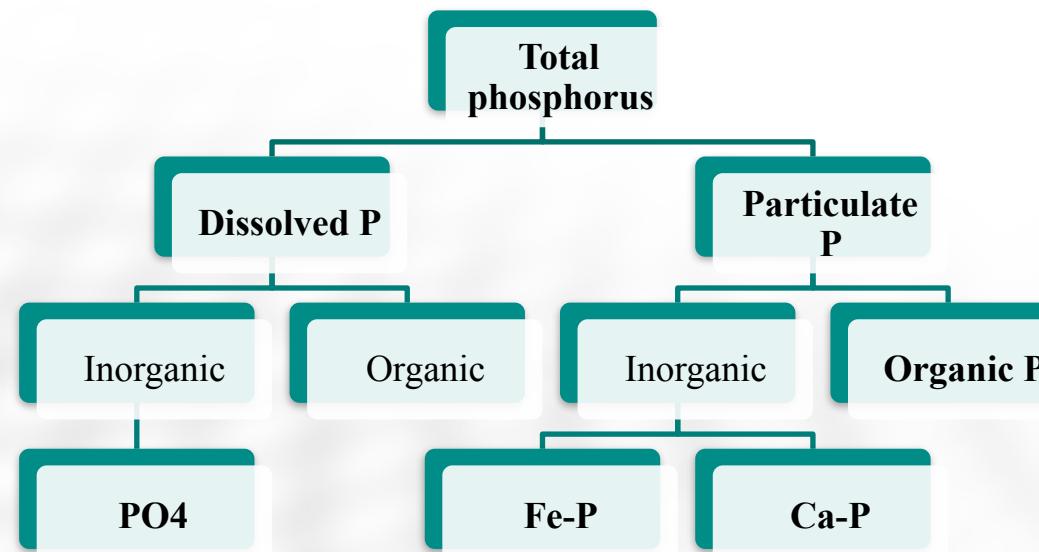
Location and environmental parameters in the inner of estuaries in May (Khalil et al., 2013)

Contrasted estuaries

DISSOLVED N/P AT STATIONS A1 AND E1 - MAY



BIOGEOCHEMICAL PROCESSES OF PHOSPHORUS IN SEDIMENTS



$d\text{Org P}$ → - Mineralization

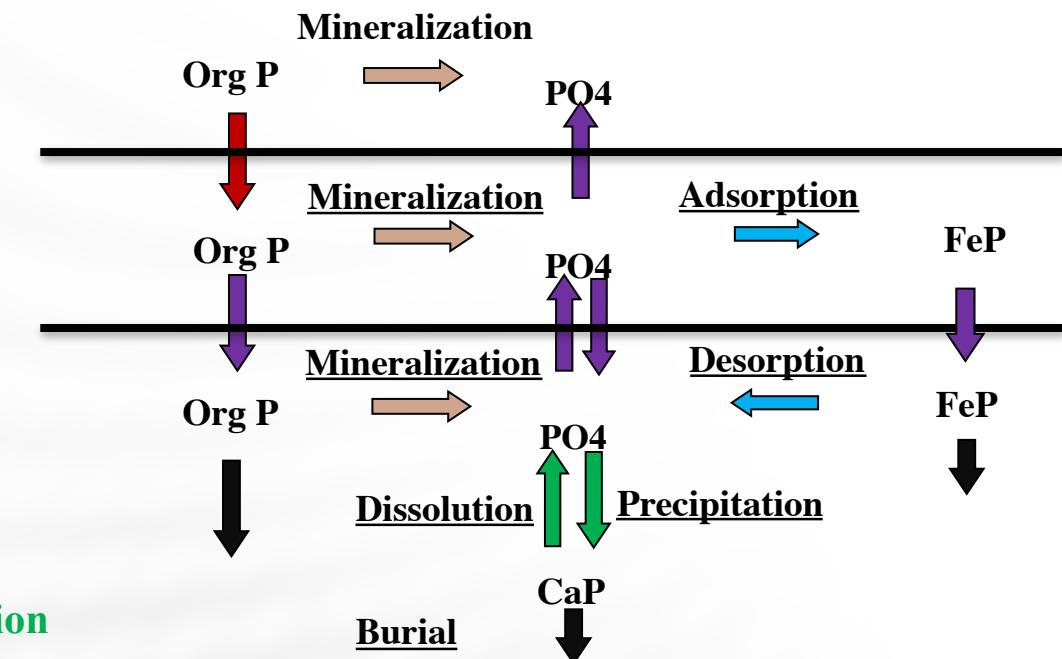
$d\text{PO}_4$ → Mineralization - Adsorption + Desorption - Precipitation + Dissolution

$d\text{FeP}$ → Adsorption - Desorption

$d\text{CaP}$ → Precipitation - Dissolution

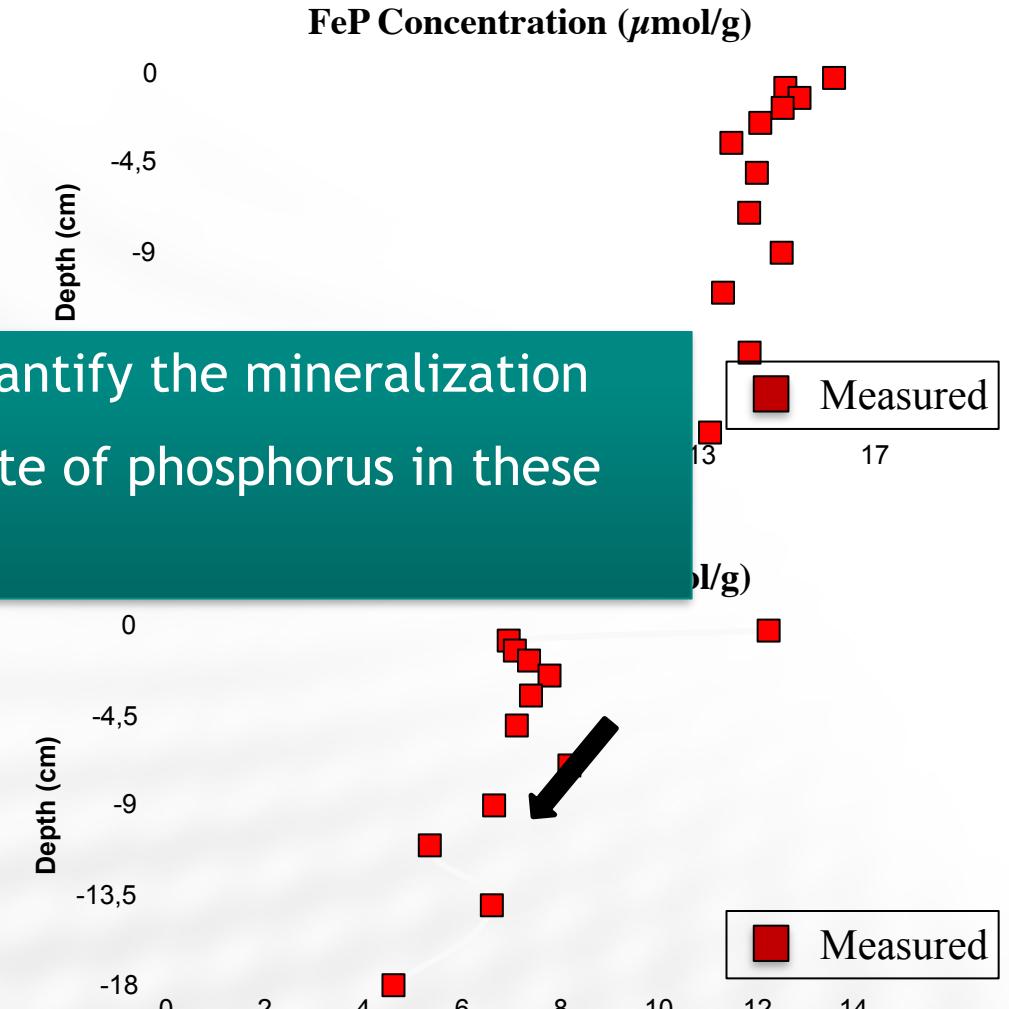
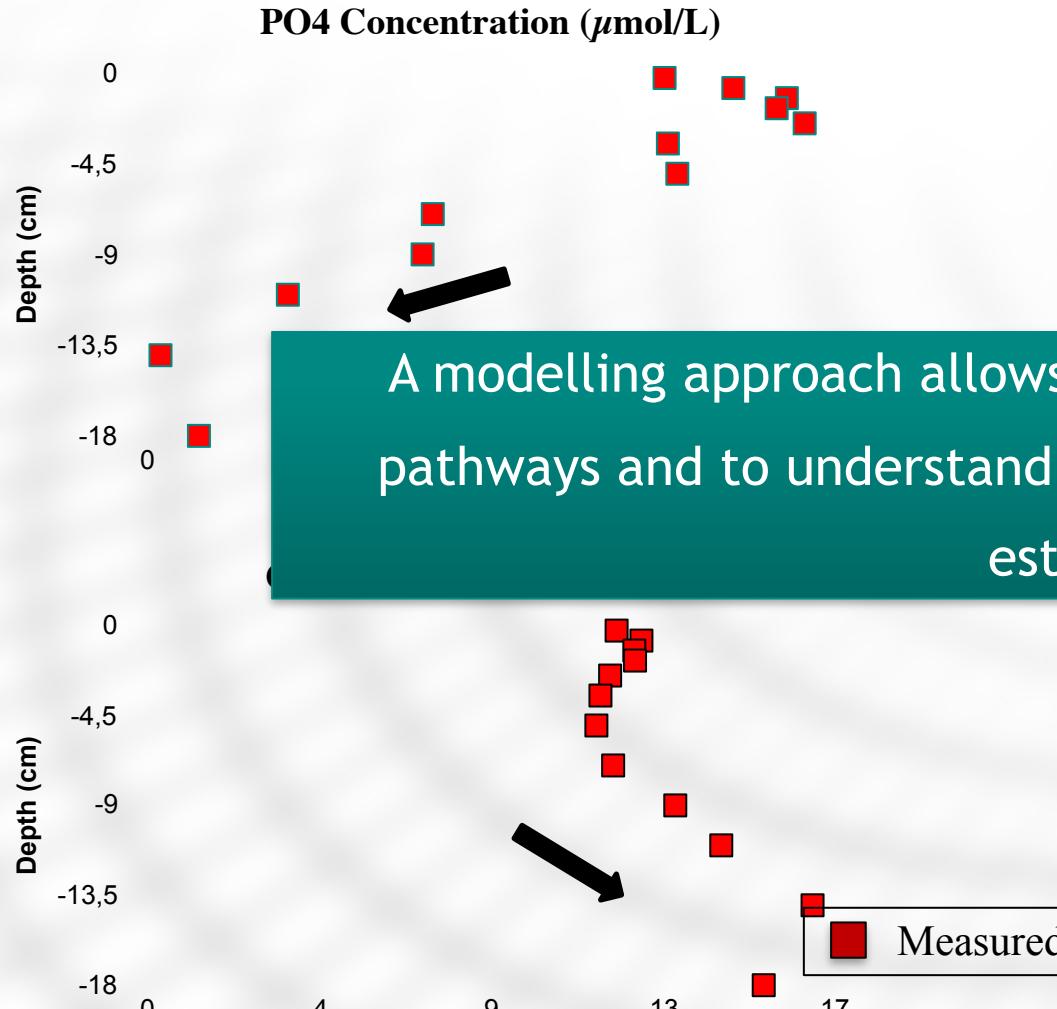
- Source
- Burial
- Mixing

Water column
Oxic sediment
Anoxic sediment



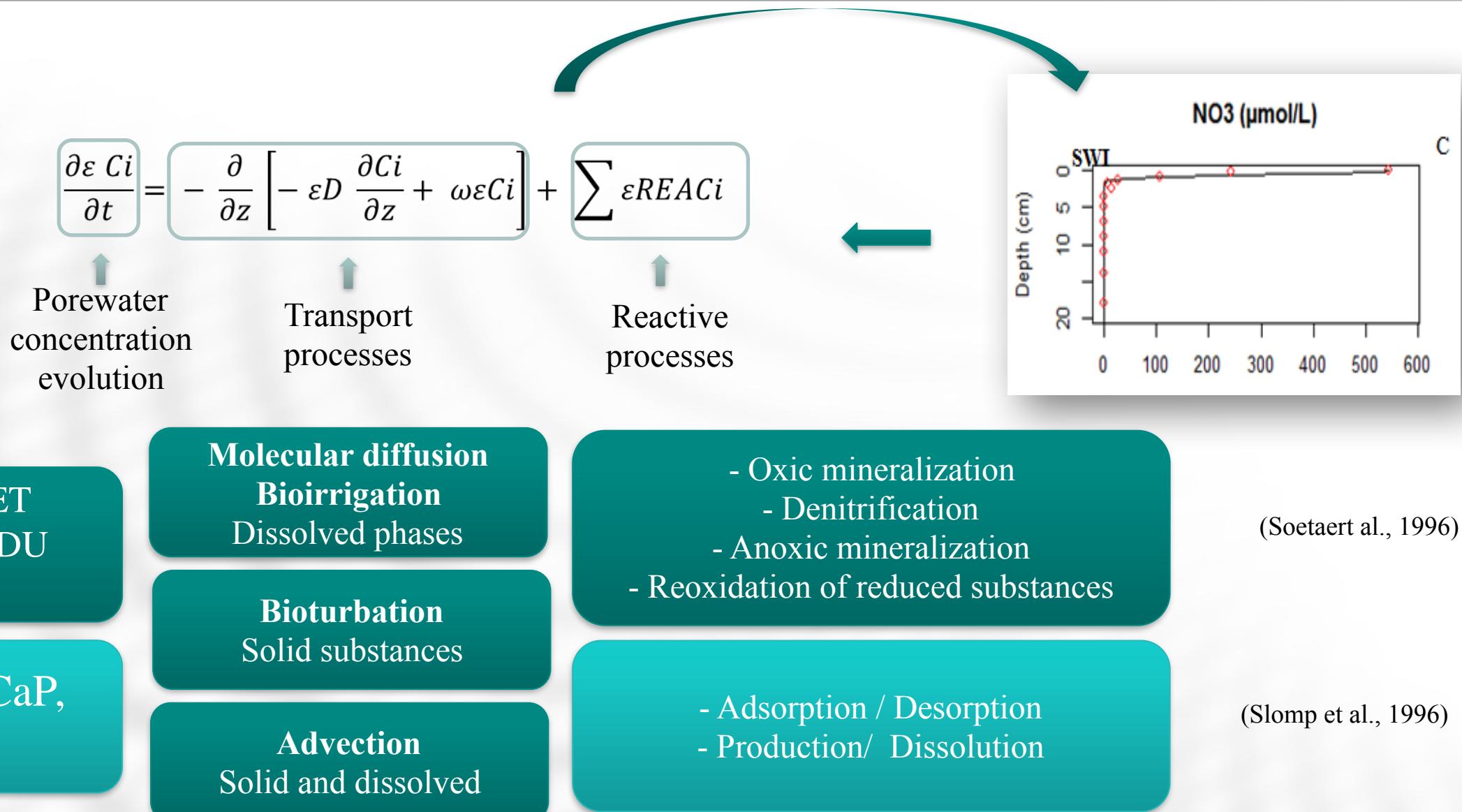
(Slomp, 1996)

MEASURED PROFILES AT STATION A1 - MAY

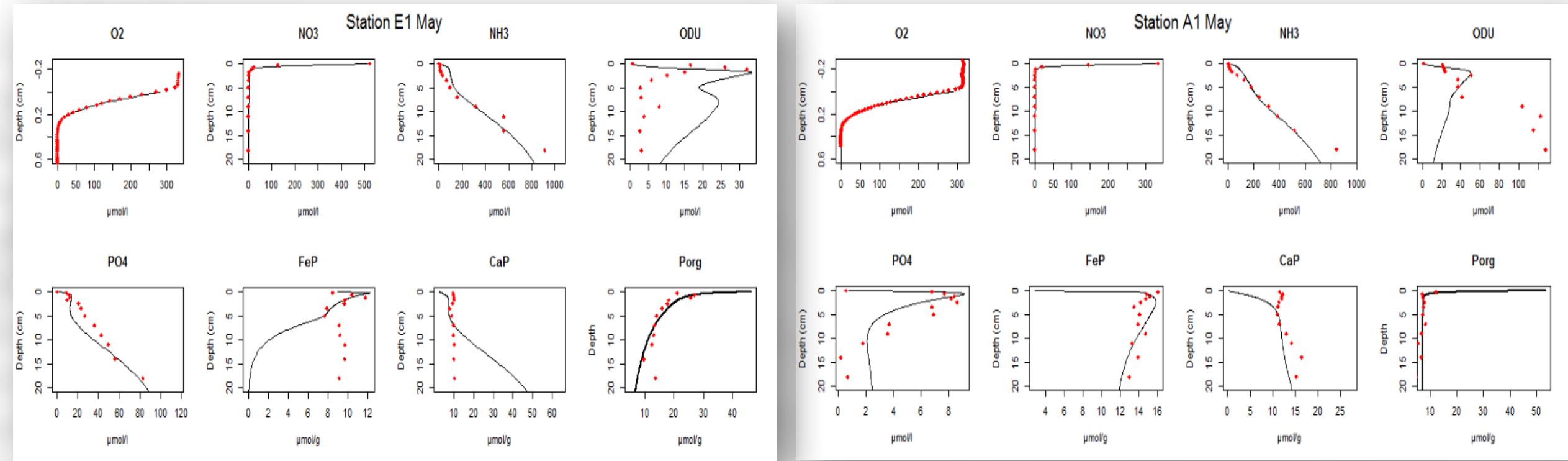


A modelling approach allows to quantify the mineralization pathways and to understand the fate of phosphorus in these estuaries

DESCRIPTION OF MODEL OMEXDIA-P



RESULTS ▶ MODEL FITS OF STATIONS E1 AND A1 - MAY



Measured (red points) and modeled (black lines) profiles at stations A1 and E1 in May

—	Modeled
■	Measured

ORGANIC MATTER AND PHOSPHORUS DYNAMICS

Parameter	Units	Station E1	Station A1
Rate fast decay detritus	/day	0,05	0,03
Rate slow decay detritus	/day	0,0006	0,0005
Fraction fast detritus in flux	%	50	60
N/C ratio Fast Detritus	molN/molC	0,14	0,14
N/C ratio Slow Detritus	molN/molC	0,1	0,1
Bioturbation coefficient	cm ² /d	0,003	0,0005
Mixing layer	cm	11,25	0,25
Bioirrigation coeff	/day	0,18	0,06
Bioirrigation depth	cm	5	7,4
P/C ratio Fast Detritus	molP/molC	0,0087	0,0087
P/C ratio Slow Detritus	molP/molC	0,006	0,0001



Aulne sediments are poor in semi-labile organic phosphorus

CONCLUSION

- ✓ Aulne and Elorn estuaries are contrasted in their morphology and processes that determine the fate of sedimentary phosphorus.
- ✓ FeP is an intermediate between organic phosphorus and CaP.
- ✓ Preliminary results indicate that deposited material at the inner of Aulne estuary is relatively poor in semi-labile organic phosphorus fraction.
- ✓ Is CaP a significant sink of the reactive phosphorus in these sediments ?

THANK YOU FOR YOUR ATTENTION