I.S.RIVERS
LYON 2018

CONTRIBUTION OF THE SEDIMENT COMPARTMENT TO NUTRIENT STOCKS AND FLUXES IN A RESERVOIR

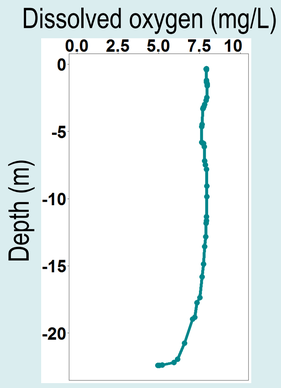
Contribution du compartiment sédimentaire aux stocks et flux de nutriments dans une retenue hydraulique

Reservoir on large stressed rivers: accumulation of fine sediments loaded with N and P [1,2]
can contribute to eutrophication problems: impacts on water (drinking purposes, recreational activities)
Water-sediment interface : source of nutrients for water column [3]

Assessment of the spatial variations of nutrient loads and fluxes from sediments depending on their locations relative to reservoirs and tributaries from May to October 2016

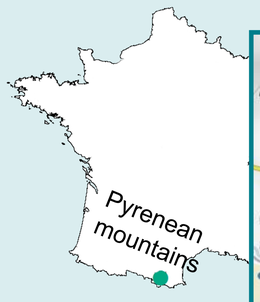
Materials

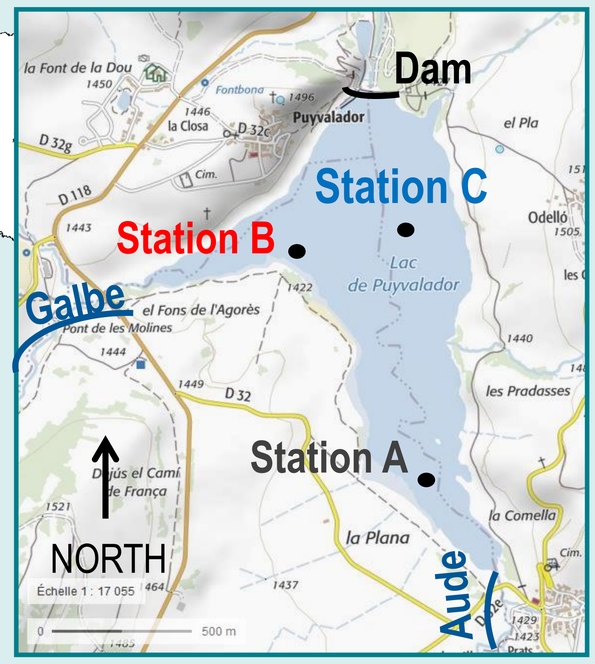
Reservoir of Puyvalador (Pyrénées Orientales)
eutrophic, regular algal blooms, no anoxia in the water column



Profile of dissolved oxygen in the water column, Station C, 6th of July

3 sediment cores per station on 2 seasons (July & October 2016)

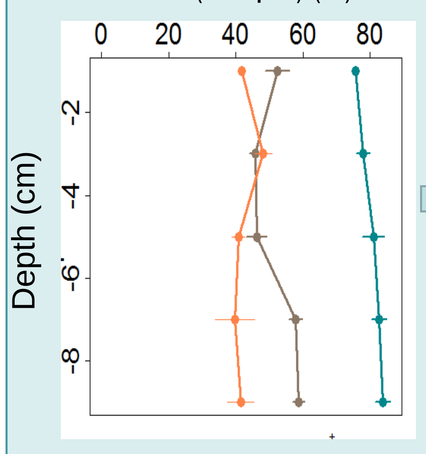




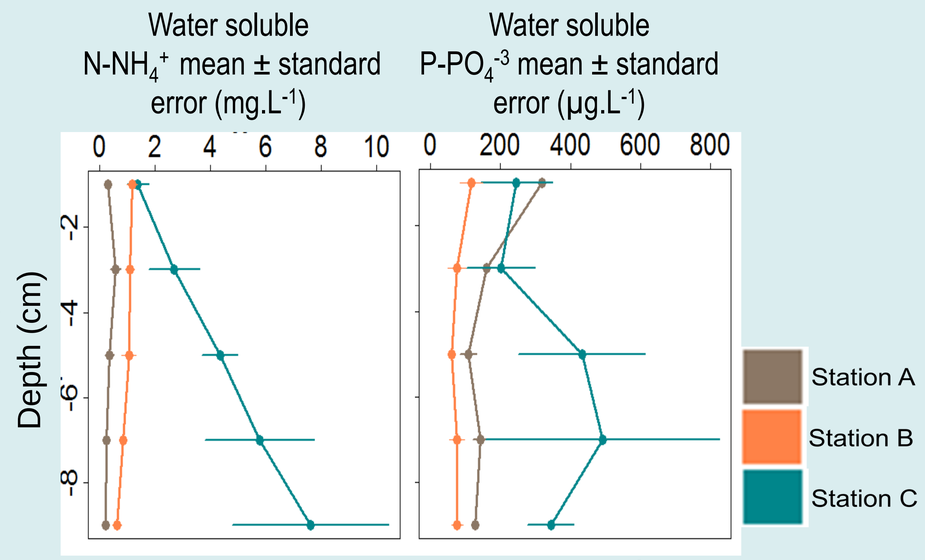
- Measures of grain size, total content (C, N and P), water soluble fractions ($N\text{-}NH_4^+$, $N\text{-}NO_3^-$, $N\text{-}NO_2^-$, $P\text{-}PO_4^{3-}$) for vertical profile on sediment cores
- Molecular diffusion based on soluble nutrients in the water, according to Fick's law [4]
- External inputs based on concentration of nutrients from tributaries (Aude and Galbe rivers) measured biweekly from May to October 2016

Results and discussion

Vertical profiles:

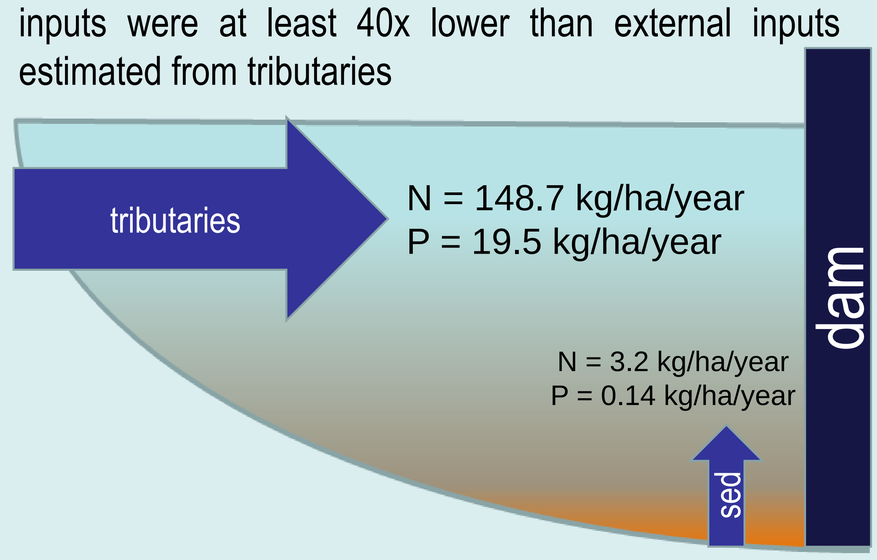


- **% of fine particles higher in Station C compared to A and B**



- **Accumulation of $N\text{-}NH_4^+$ and $P\text{-}PO_4^{3-}$ in Station C**
  - **Total N and P:** no differences among Stations
    - **Similar results among seasons**

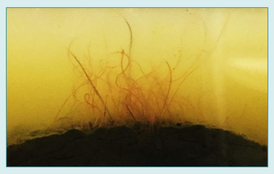
Molecular diffusion from sediments to water column from May to October 2016: higher contribution of Station C for N and P forms but these inputs were at least 40x lower than external inputs estimated from tributaries



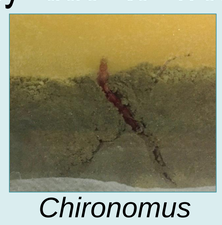
Conclusions

- **Central area of the reservoir:** main sedimentation area, highest contribution to nutrient recycling from sediments and molecular diffusion from sediments to water column
- **Total N and P:** not influenced by sedimentation
- **Estimations of fluxes from sediments and from tributaries:** external inputs >>> internal inputs, probably due to well oxygenated conditions in the water column

Perspective Fick's law does not consider the influence of dissolved oxygen dynamic and benthic fauna activities on nutrient fluxes at the water-sediment interface ➔ need to be considered in future studies



Oligochaeta



Chironomus plumosus

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Acknowledgements:
Athos Environnement, Félix Vallier and Pierre Rossignol

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[4] Boudreau, B.P. (1996). The diffusive tortuosity of fine-grained unlithified sediments. Geochim. Cosmochim. Acta 60, 3139–3142.