

Rivers and lateral carbon fluxes

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Introduction (1)

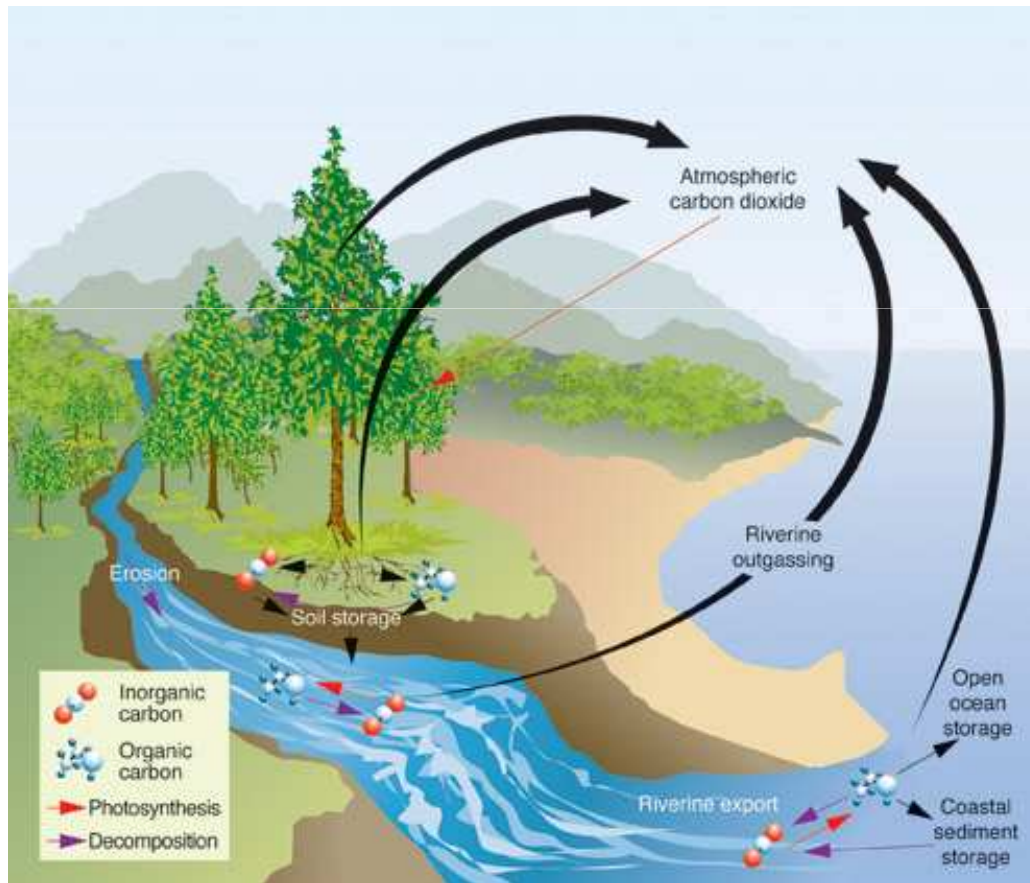
- Severe soil erosion in mountainous environments
- Sediment exports are massive and episodic
- Important problems downstream



- Fine-grained sediment is the main vector of biogenic elements (e.g., carbon) and pollutants (e.g., metals, organic contaminants)
- Those transfers need to be better understood and quantified

Introduction (2)

- Development of « fingerprinting » techniques to trace sediment and associated substances in space and time
- Combination of monitoring / fingerprinting / modelling techniques



Project conducted in two mountainous river catchments



Bléone River (1000 km²; French Alps)

Cointzio (600km²; Volcanic highlands; central Mexico)



Source: www.llnl.gov

Method (1)

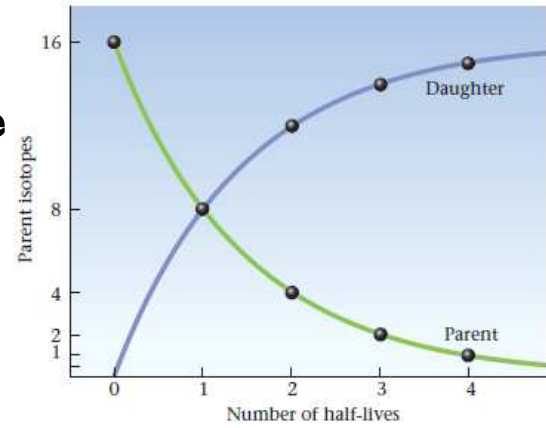
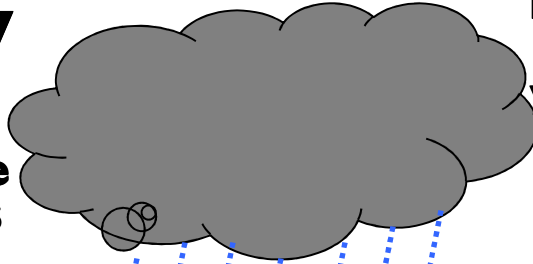


Be-7

**Half life
53 days**

Pb-210

**Half life
22
years**

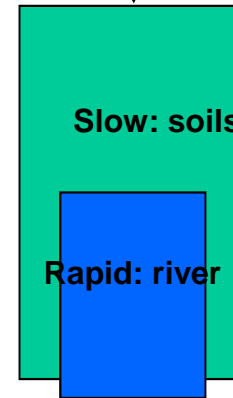


Calculating the age of sediment

Modelling residence times



Atmospheric fallout



Cs-137

**Half life
30
years**

Method (2)



Measurement of radionuclide /
geochemical concentrations



Selection of discriminating properties
and run of a mixing model



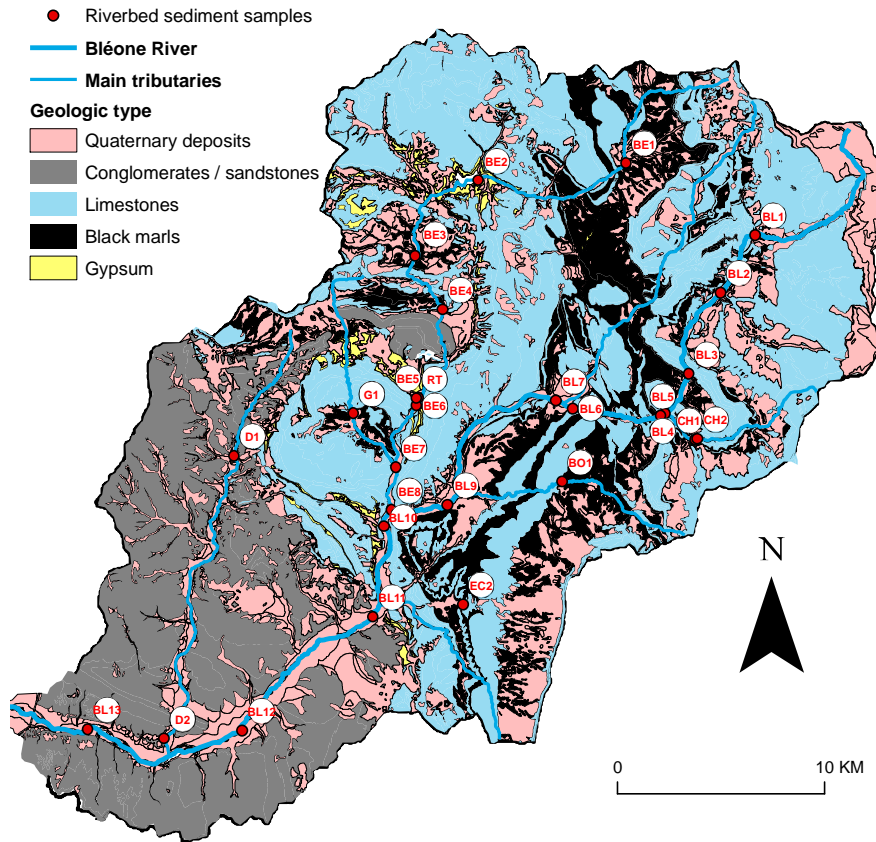
Quantification of the sediment
sources



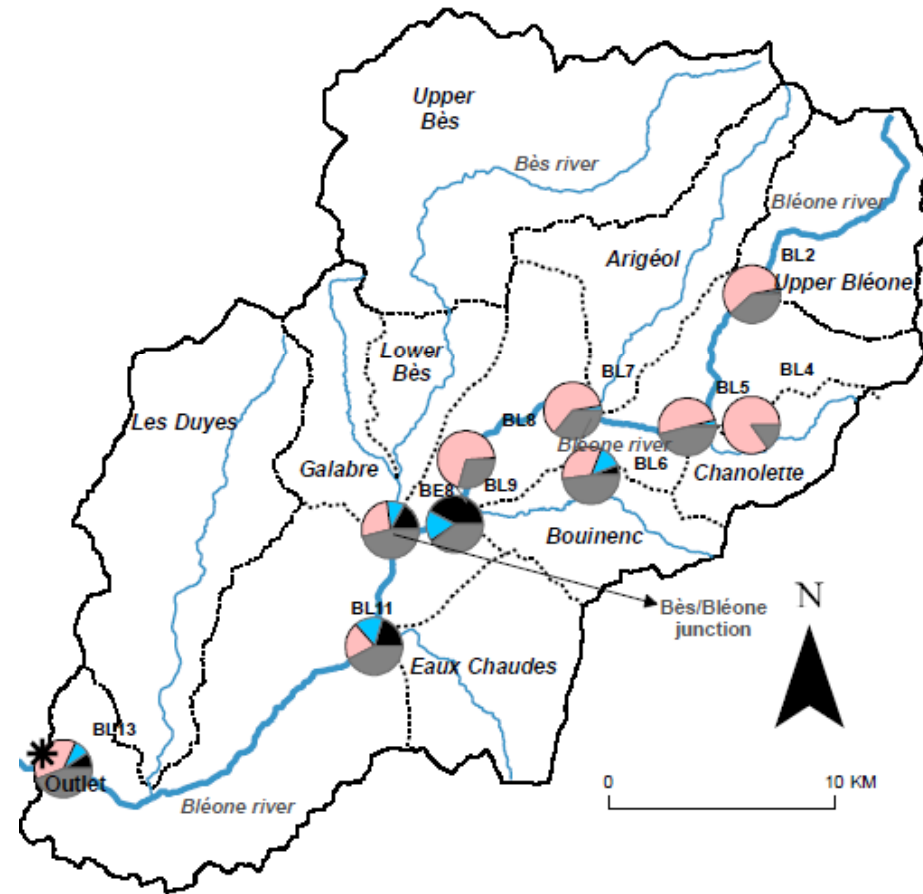
Results (1)

Where does sediment come from ?

Origin of riverbed sediment



Geology

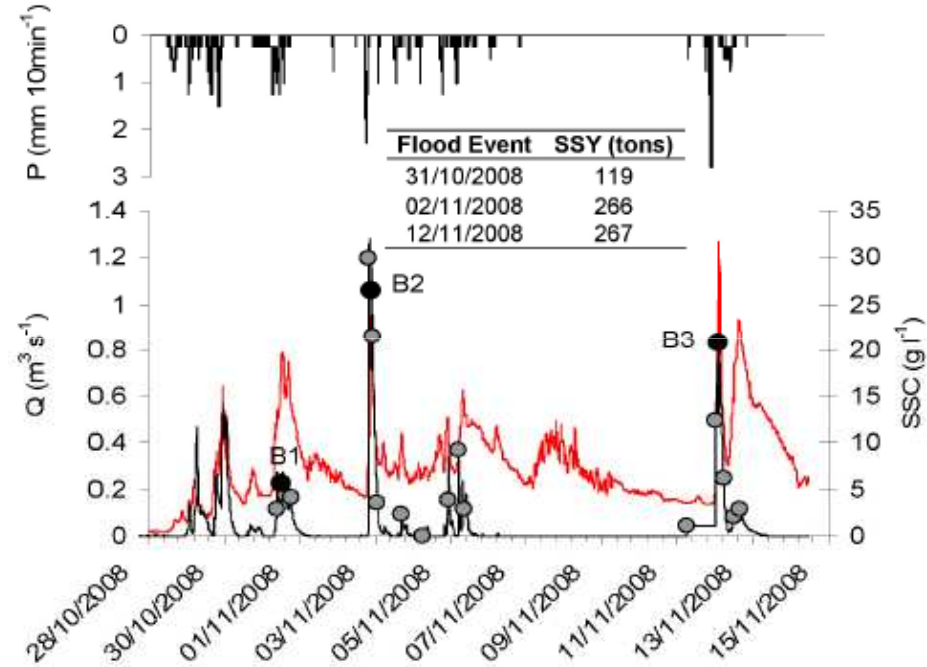
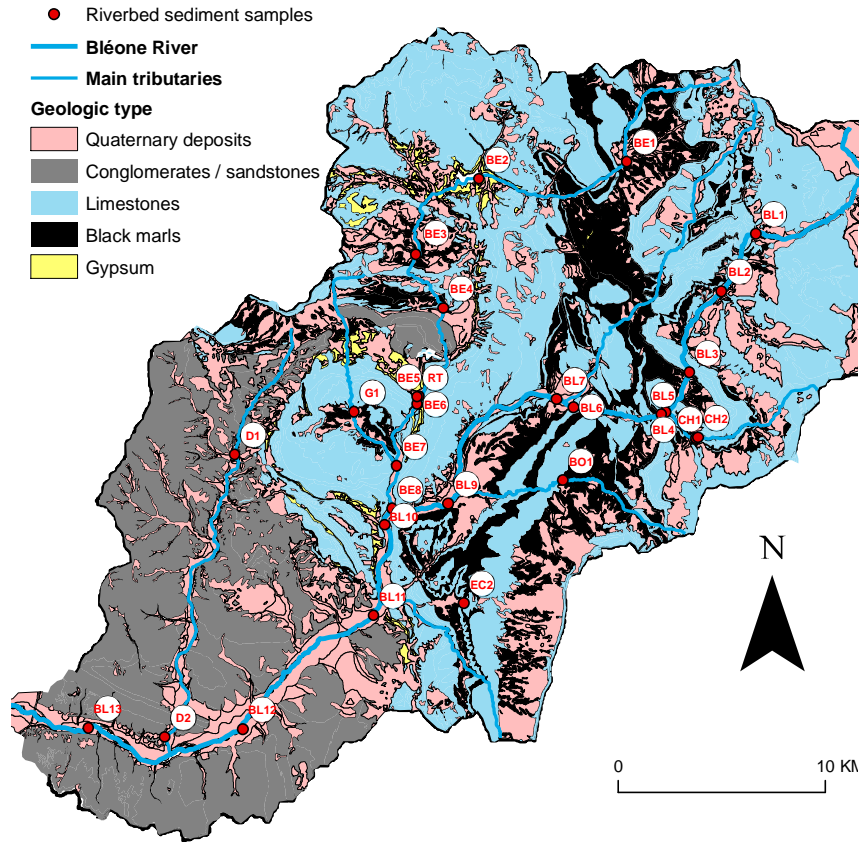


Evrard et al. (in press), *Earth Surface Processes & Landforms*

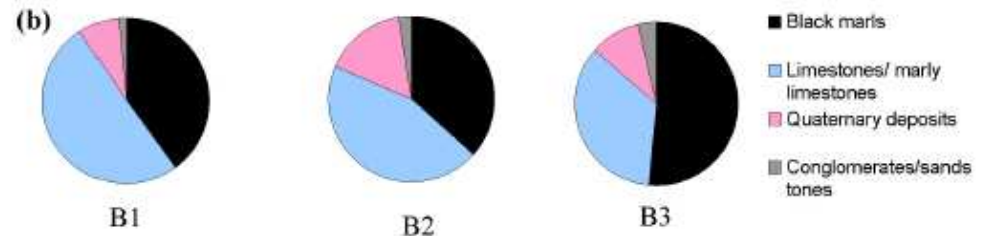
Results (2)

Where does sediment come from ?

Origin of suspended sediment



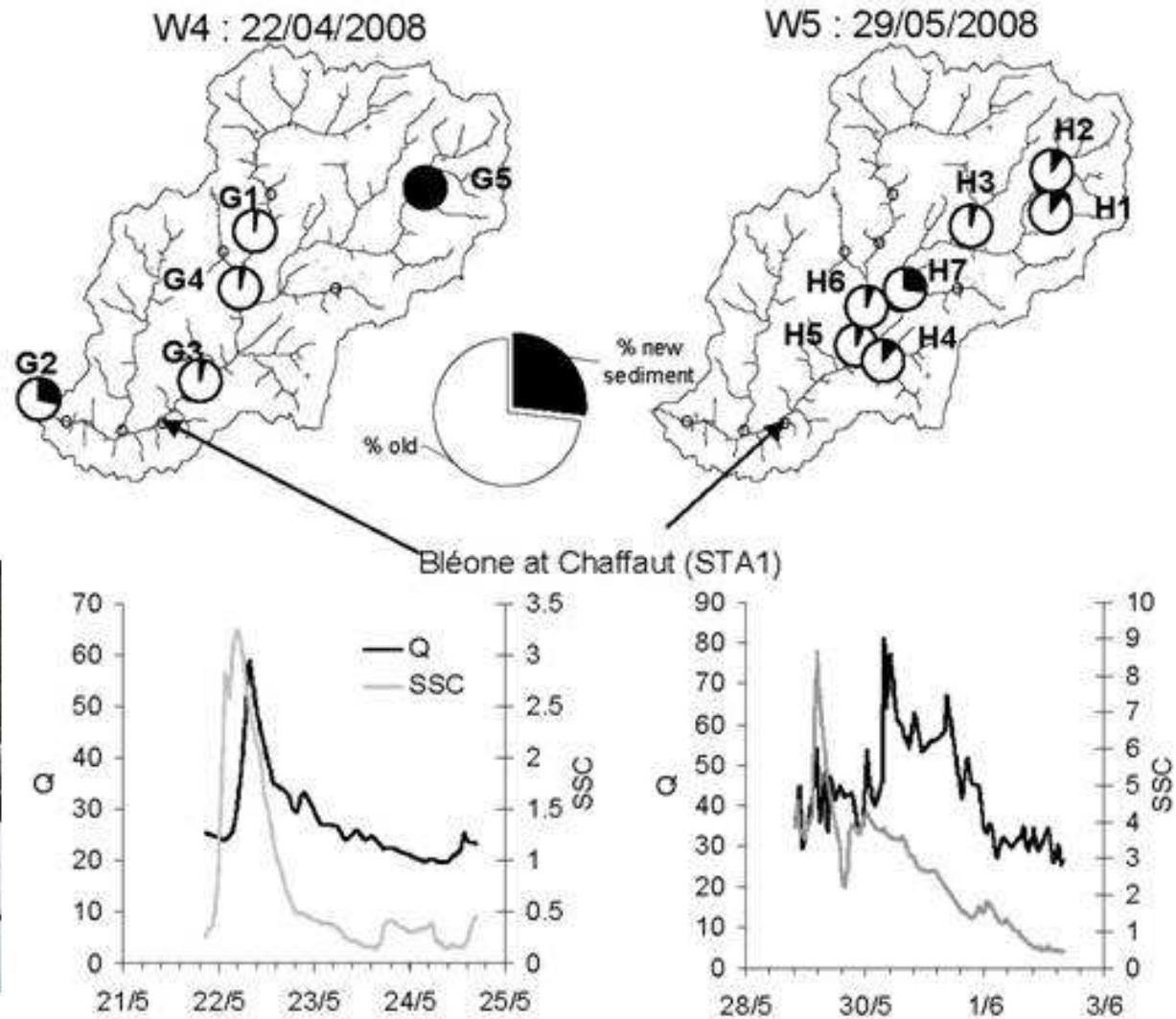
Geology



Results (3)

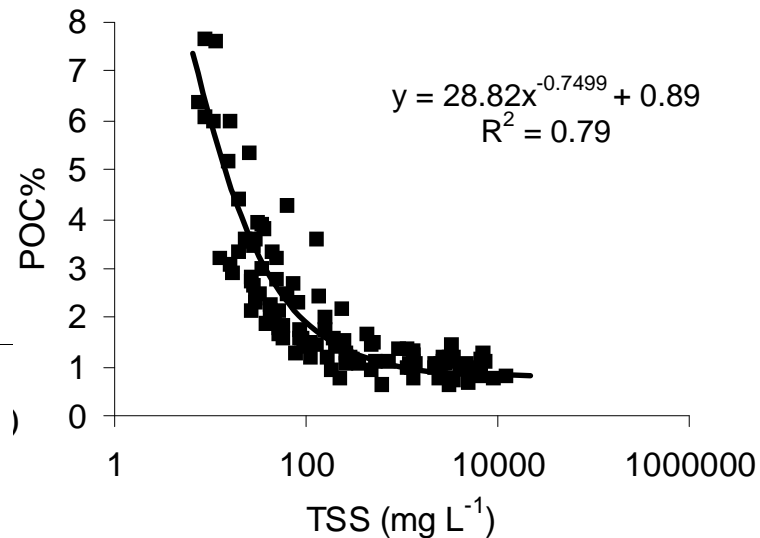
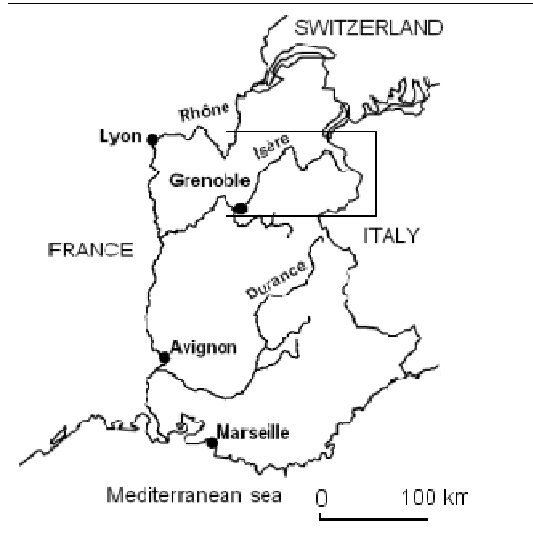
How does sediment move across rivers ?

Age of sediment during the snowmelt



Results (4)

Alpine tributaries supply the bulk of sediment / organic carbon to the Rhône River



Isère River = 6% of Rhône basin area but it supplies 15–35% of sediment and 5–10% of organic carbon

Source: Némery et al. (in review)



Perspectives

- Original combination of river/sediment and radionuclide monitoring
- Relevant method to trace sediment in space and time
- We now aim to trace substances associated with sediment
 - organic carbon (mountainous rivers)
 - contaminants (PAH in the Seine River basin)
- Development of alternative and low cost fingerprinting techniques for sediment and organic carbon



Mexico



French Alps

Thank you for your attention!

