



Seventh National Monitoring Conference

Monitoring From the Summit to the Sea

April 26-29, 2010 –Denver, Colorado

APPLICATION OF PALEOLIMNOLOGY TO A LARGE RIVER TO RECONSTRUCT METAL AND ORGANIC CONTAMINANT INPUTS

Marc Desmet, Gwenaelle Roux and TSIP members

M. Babut, C. Miège, A. Roy, B. Motte & C. Lopez – CEMAGREF

P. Van Metre et B. Malher - USGS

H. Persat – LEHF

P. Bonté & I. Lefèvre – LSCE

J. P. Bravard - EVS

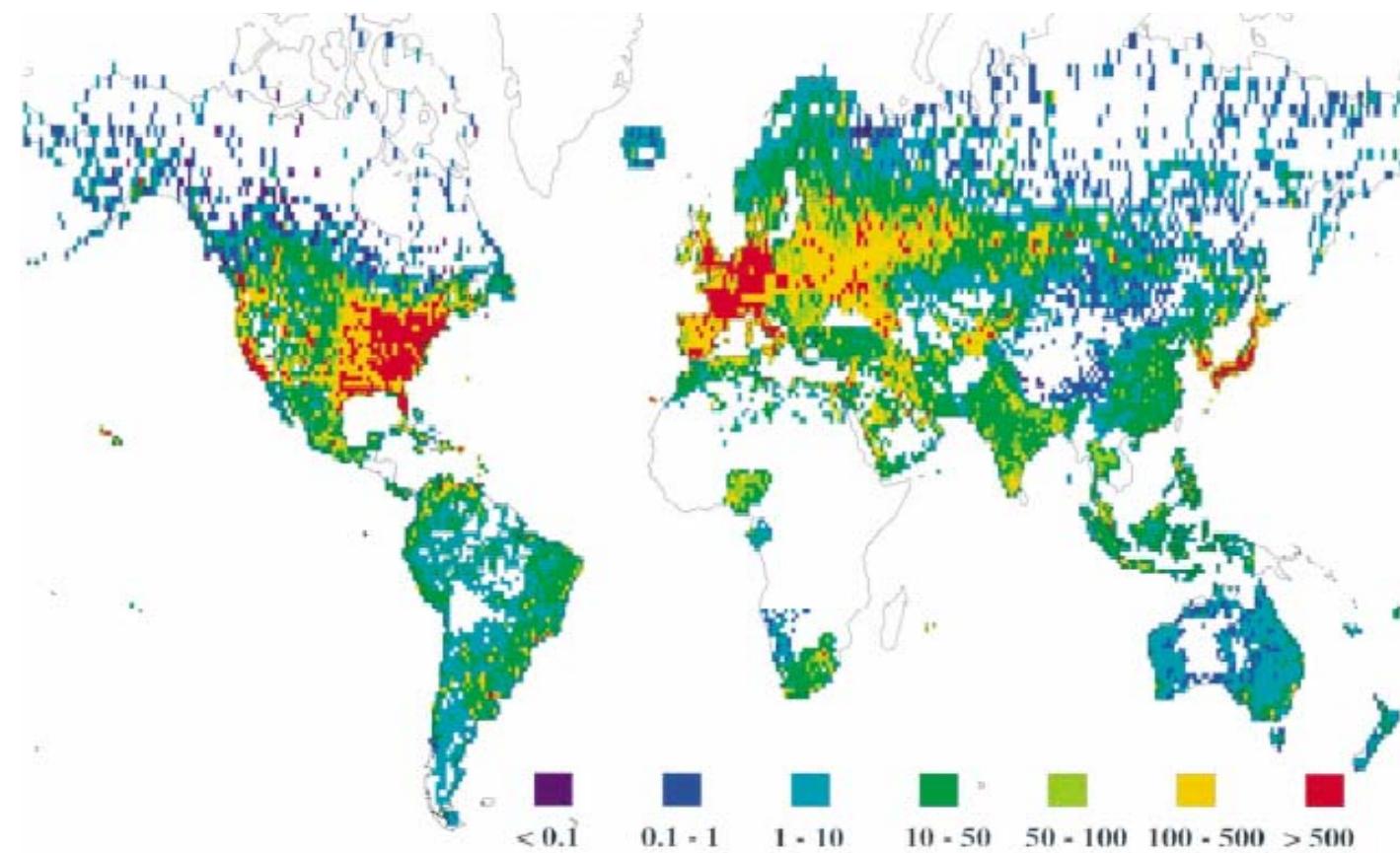
ZABR

ZONE ATELIER BASSIN DU RHÔNE
RHÔNE BASIN LONG TERM ENVIRONMENTAL RESEARCH



Global PCBs production

(Breivik, 1992)

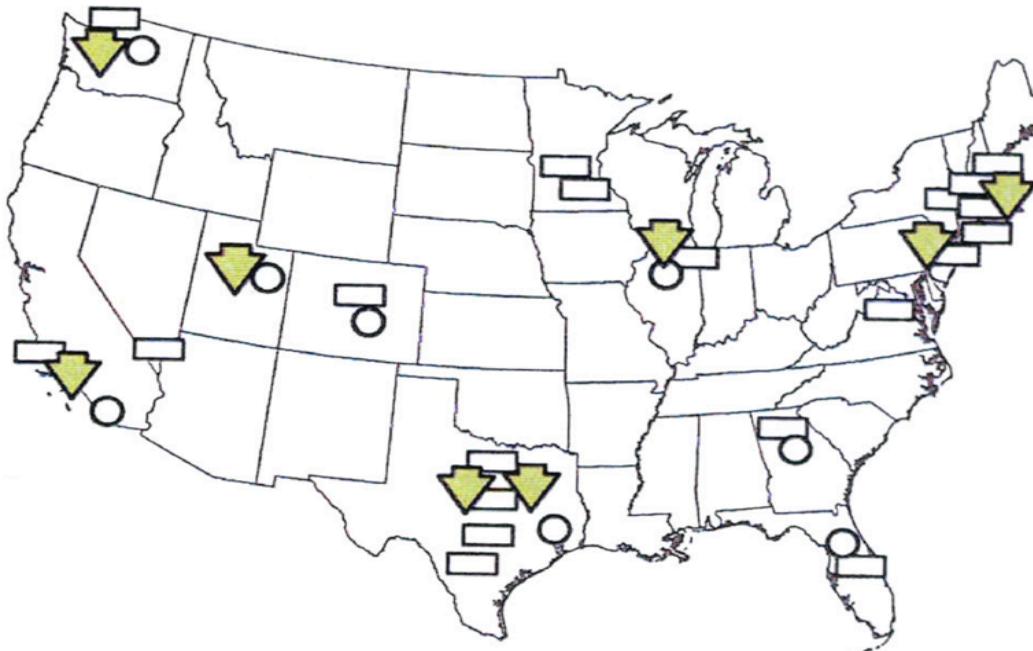


- 80 % of the production in US and western Europe
- Local contamination and distal fall-out atmospheric deposits
 - 1985 : European regulation



PCBs trends for the last 30 years (1970-2000)

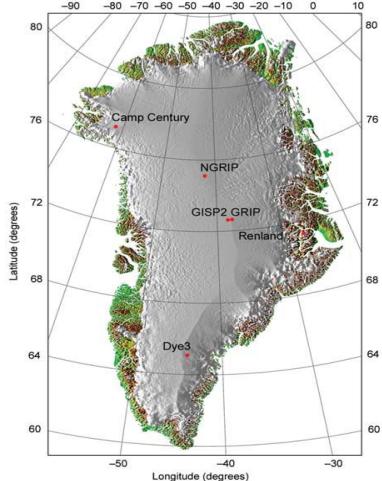
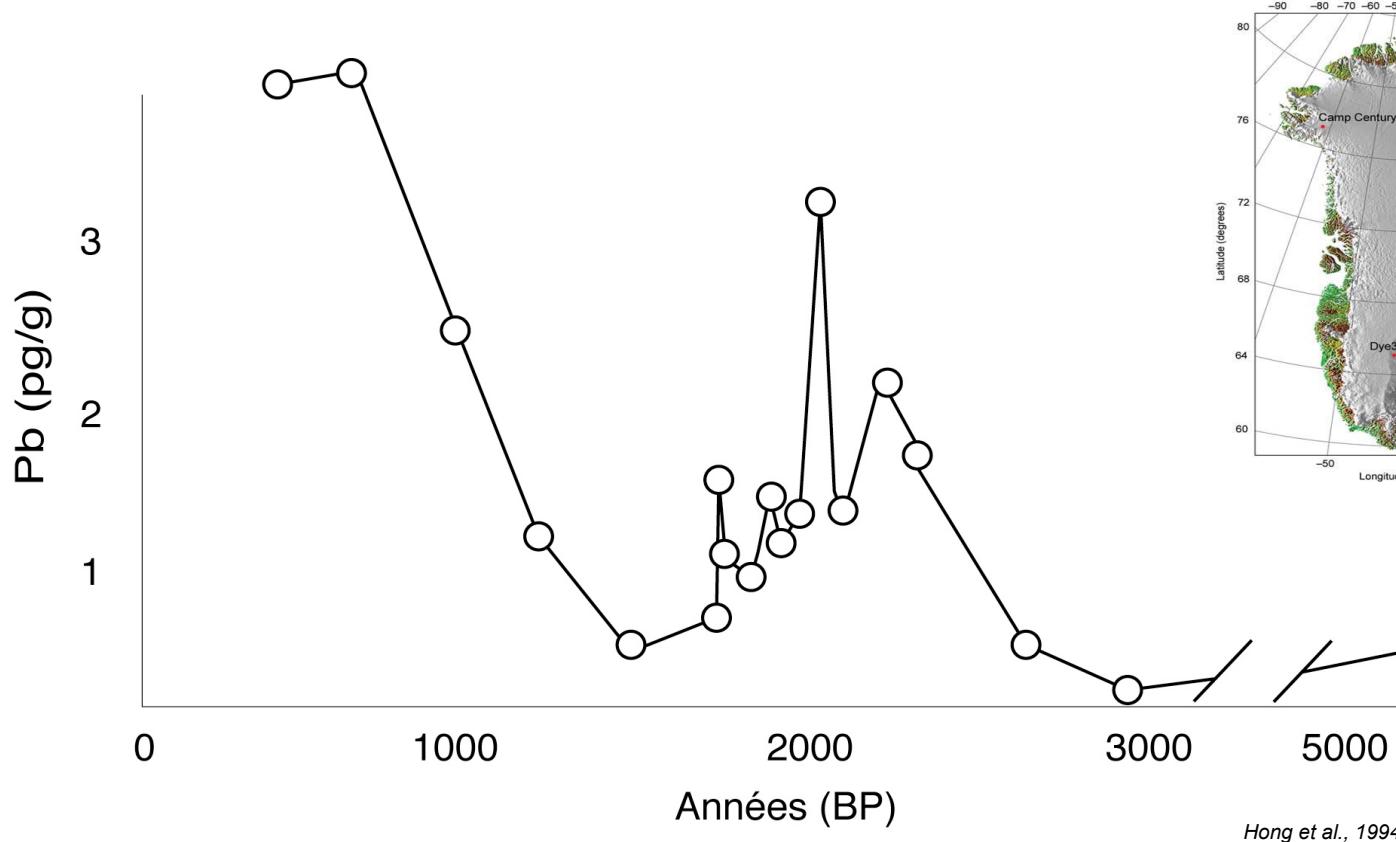
(Van metre, 2007)



- Inventory of more than 50 sedimentary archive
 - Evidence of important US regulation
 - No equivalent study in France



Greenland Lead record : a case study



- One of the longest record of atmospheric fall-out deposition
 - Evidence of Human activity since the Neolithic times
 - Incomplete and low-resolution record



Lead (and other heavy metals) trends for the last 30 years (1970-2000)

(Van metre, 2007)



- PCBs and Lead patterns can be compared



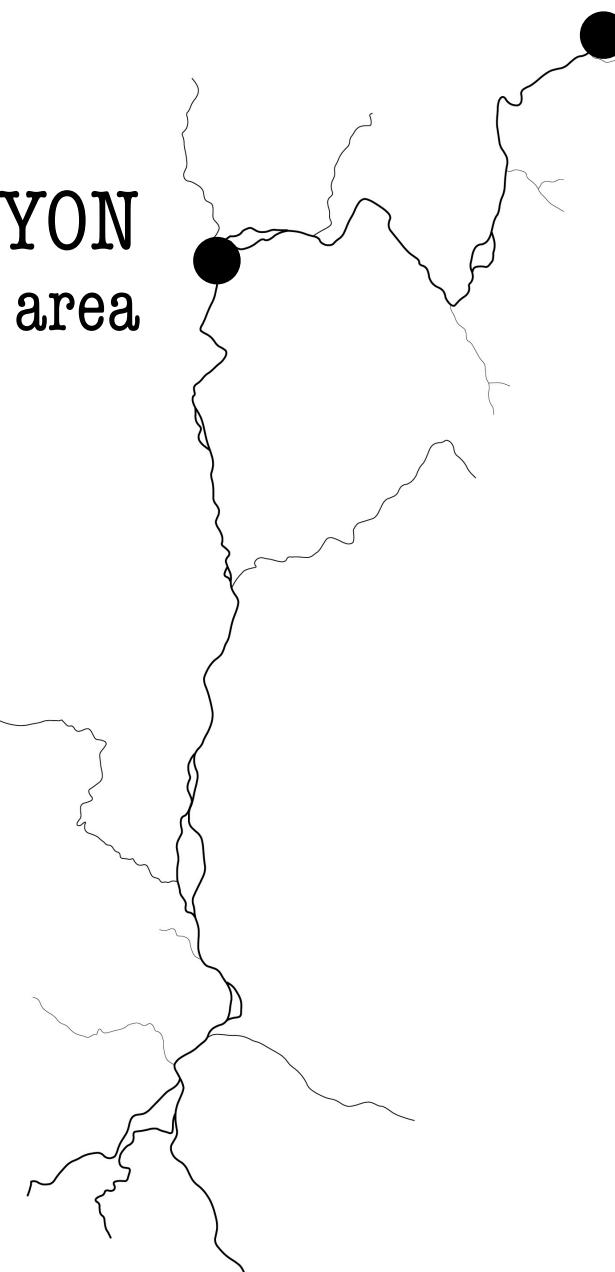
GEOGRAPHICAL AND HYDROLOGICAL SETTINGS



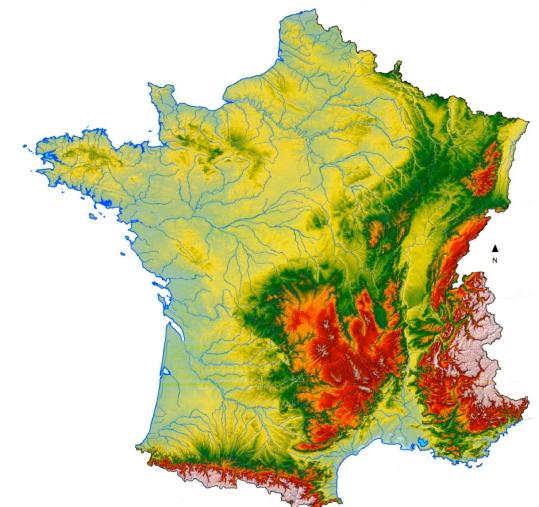
- Rhone river is the 4th in Europe
- river discharge 10 times less than mississippi river !
- Important sediment discharge due to the difference in height
 - 22 000 T/day during extreme flow events.



LYON
2nd french city area



GENEVA
2nd Swiss city area

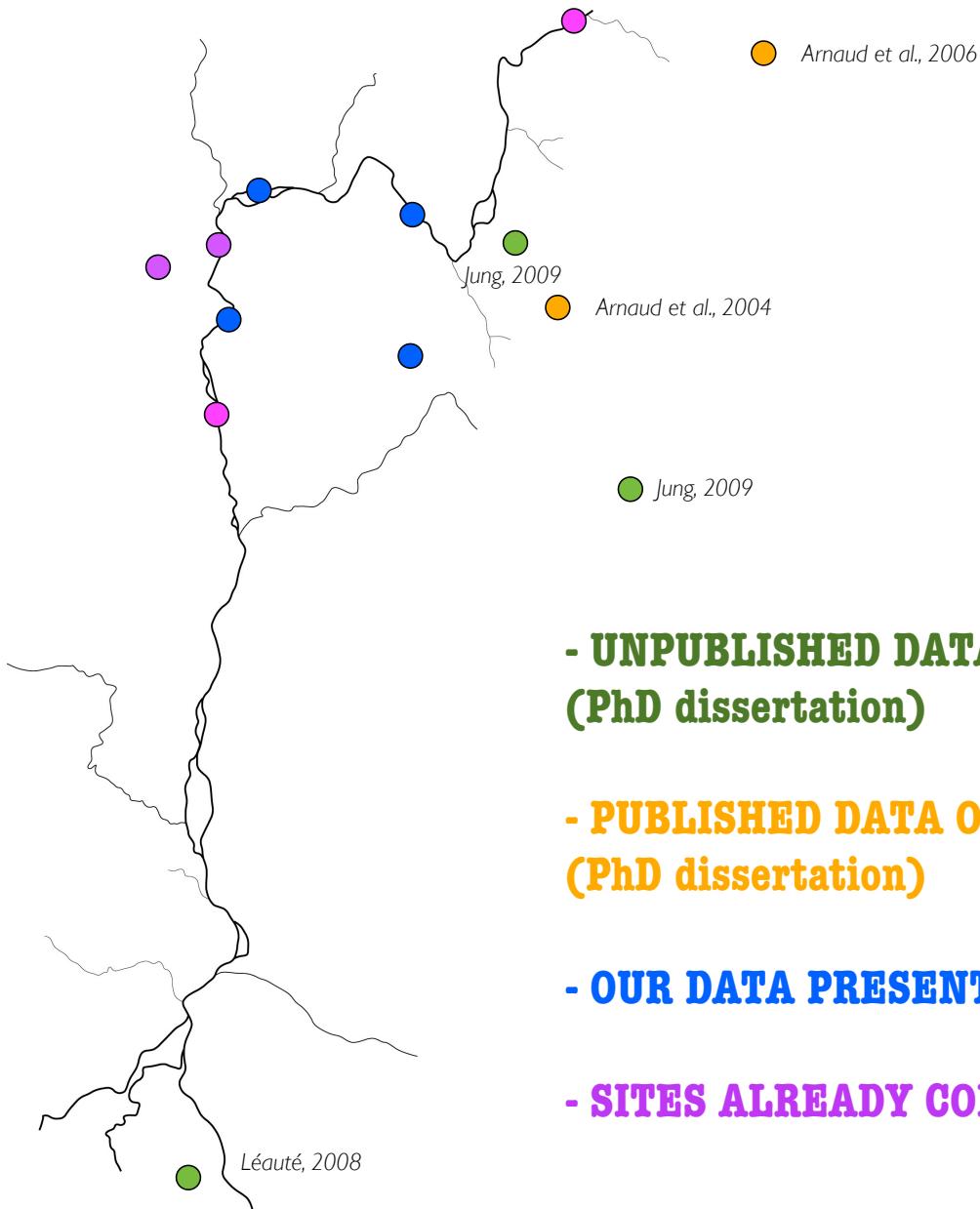


ZABR

ZONE ATELIER BASSIN DU RHÔNE
RHÔNE BASIN LONG TERM ENVIRONMENTAL RESEARCH



Coring sites and previous studies



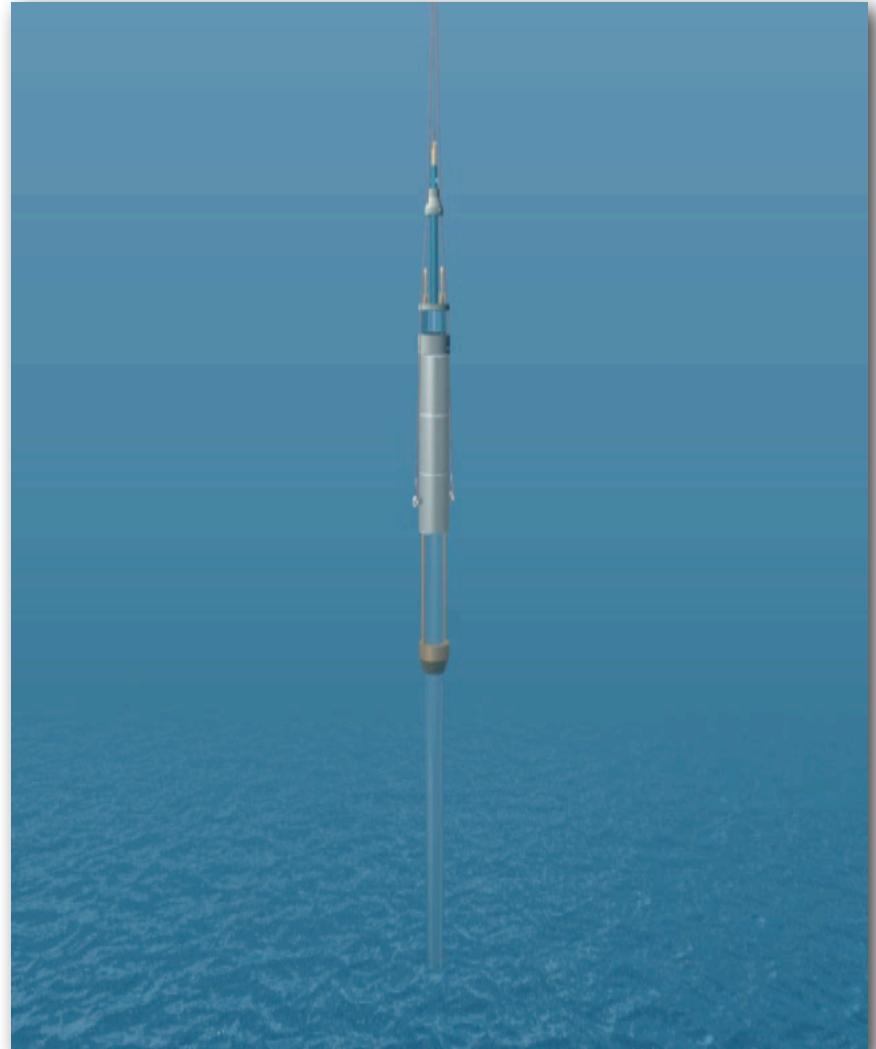
- UNPUBLISHED DATA OF PCBS RECORDS
(PhD dissertation)

- PUBLISHED DATA OF LEAD RECORDS
(PhD dissertation)

- OUR DATA PRESENTED TODAY

- SITES ALREADY CORED. ANALYSIS IN PROGRESS

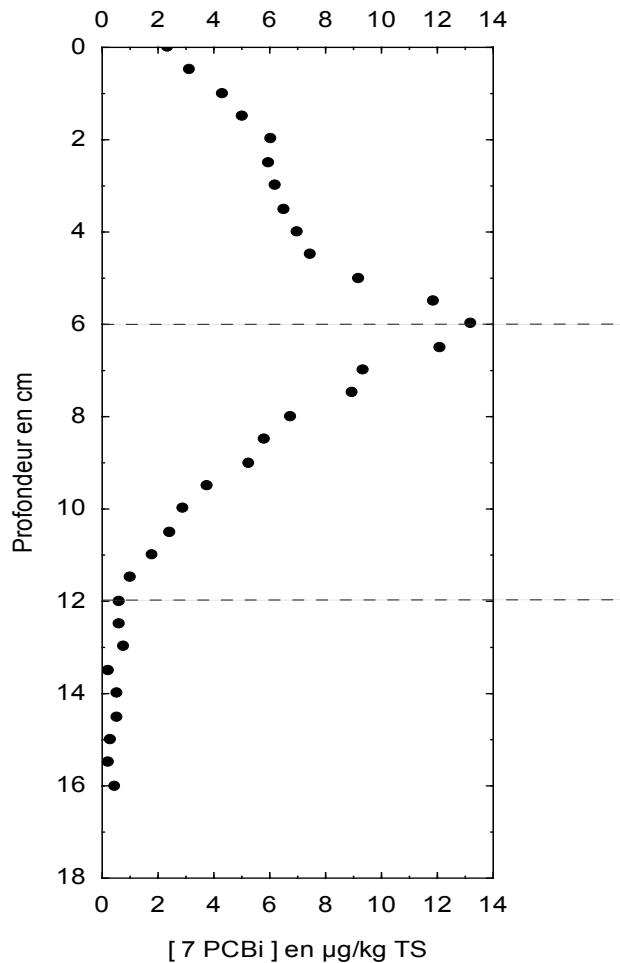
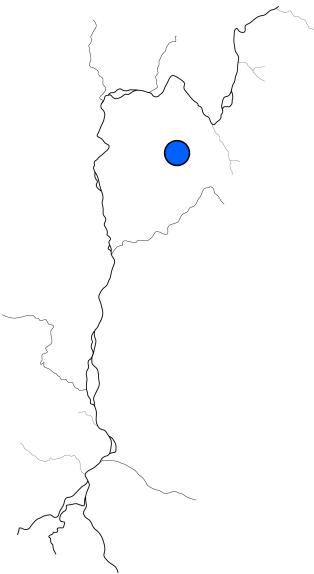
Coring techniques





Annual PCBs lacustrine record

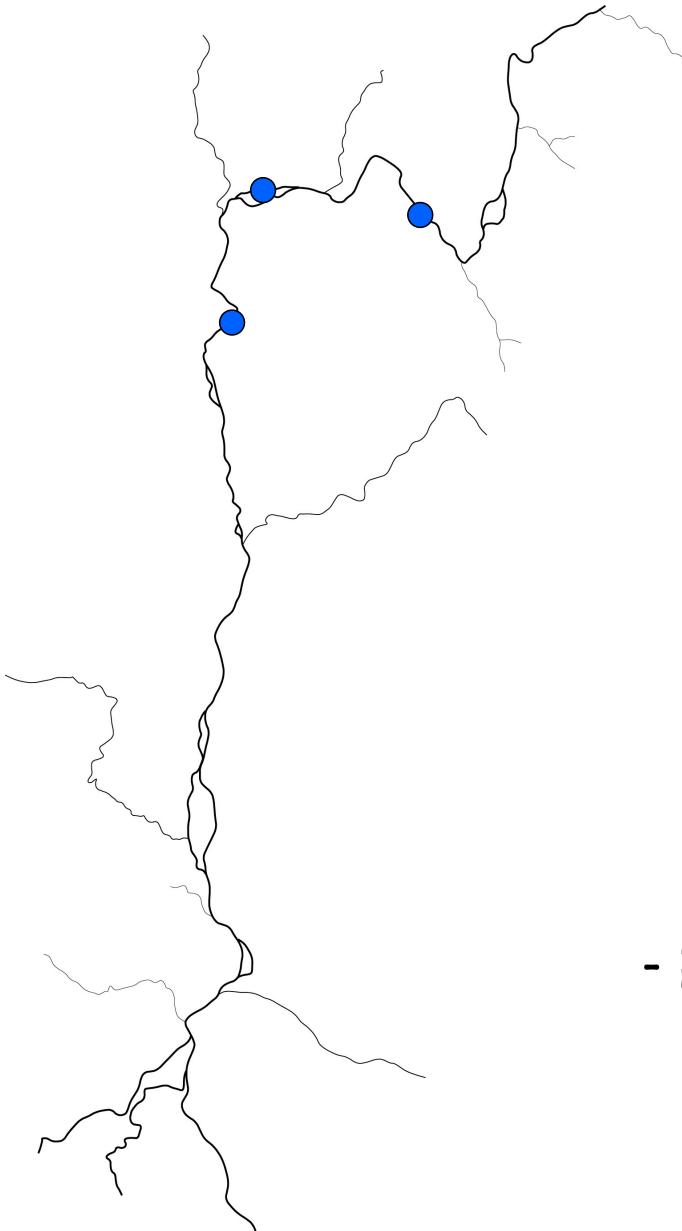
Concentration en PCBi dans la carotte PAL09-P2a



- No age-depth model
- A site considered as a remote record
- A global signal for the last 80 years
- A transition at 2 cm related to the European regulation in 1985



THE FLUVIAL RECORD



- Age-depth model
- Deposition processes
- Signature of PCBs congeners

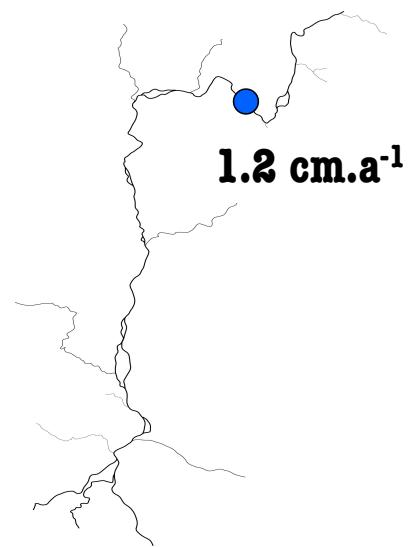
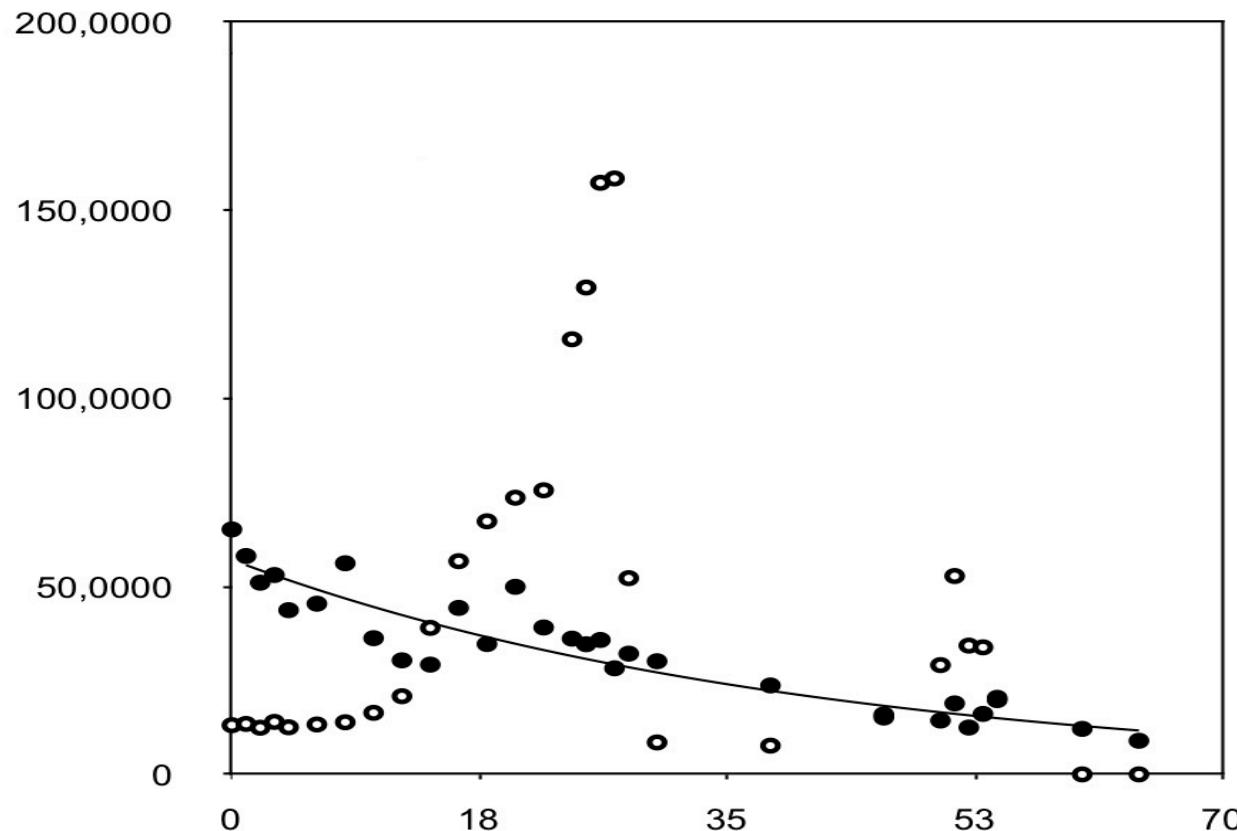


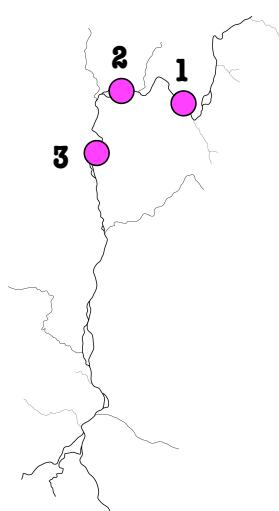
- Upstream/Downstream gradient
- Impact of the city of Lyon
- Sources of the PCBs in the Watershed



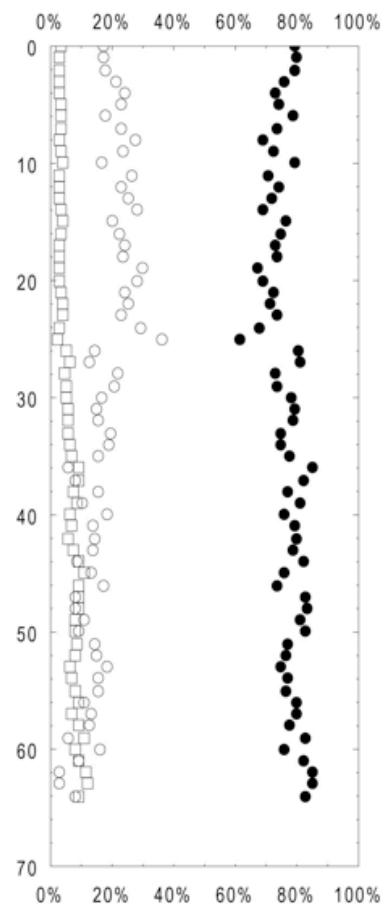
Age-depth model of the upstream site

^{210}Pb & ^{137}Cs gamma counting

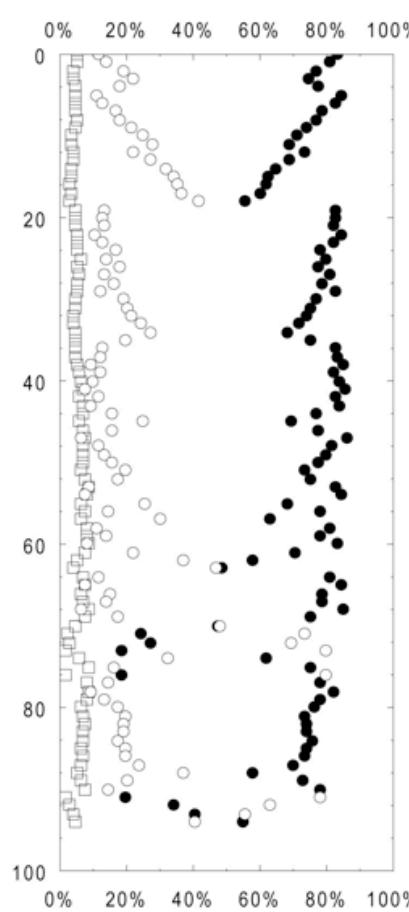




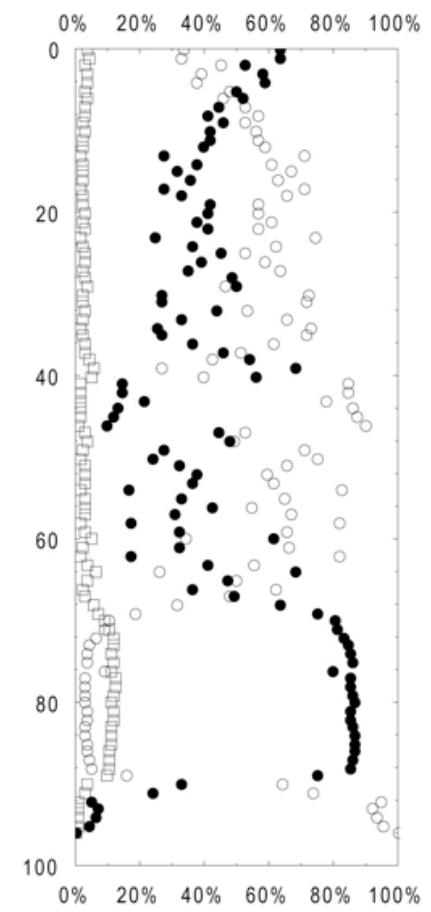
Comparison of grain size a tool to reconstruct sedimentary processes



1

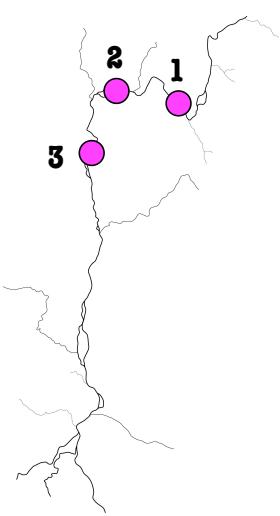


2



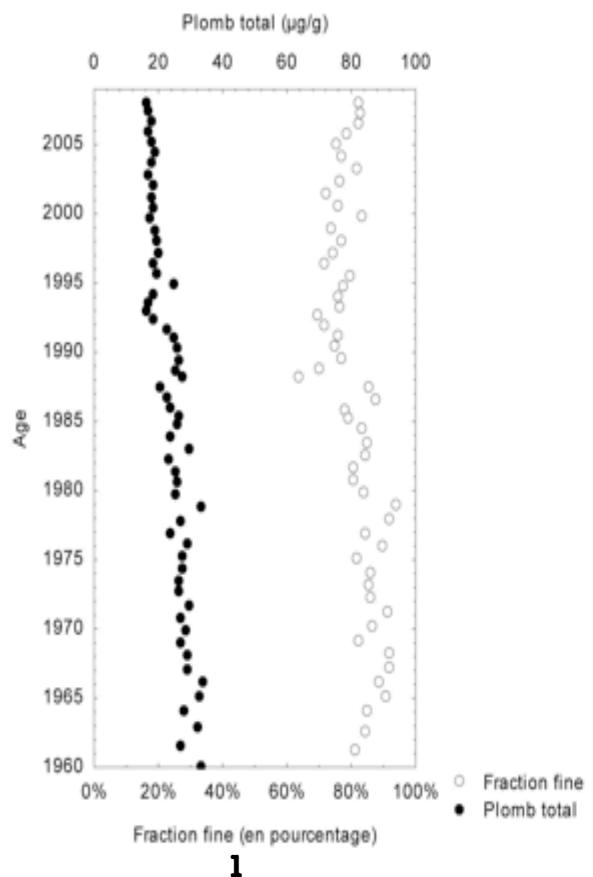
3

Z A B R

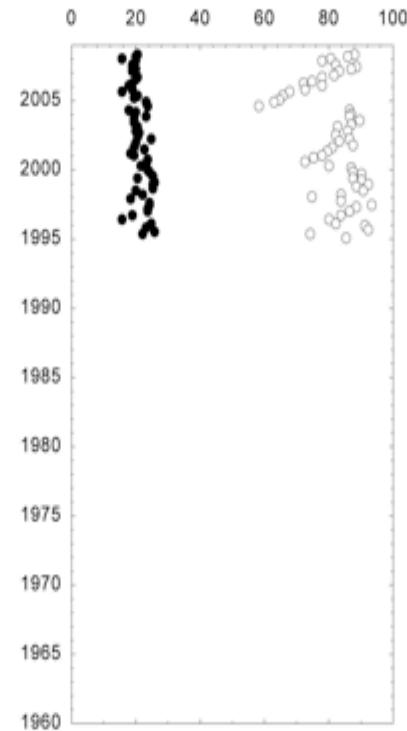


Annual evolution of Lead concentration

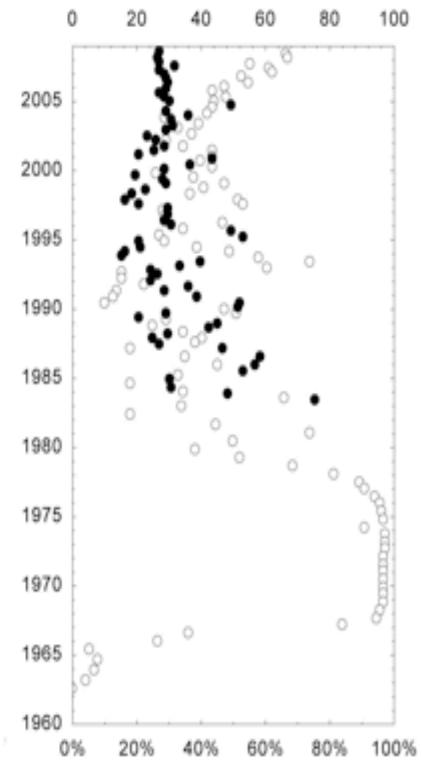
Evidence of the upstream/downstream gradient



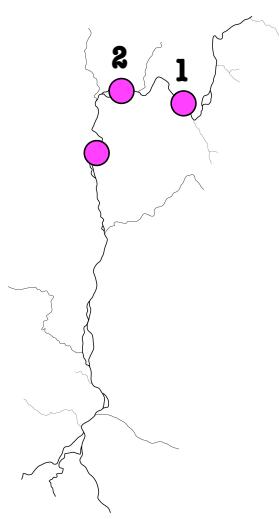
1



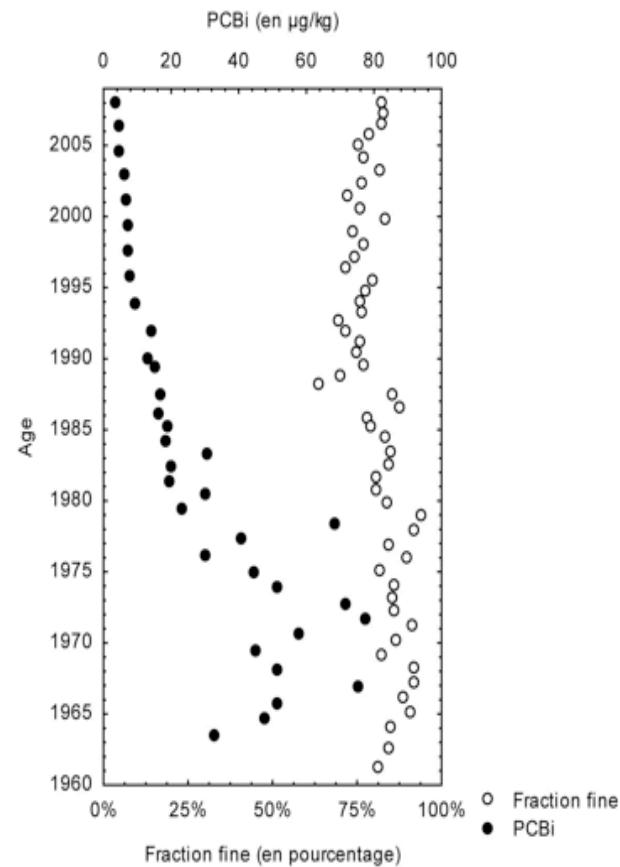
2



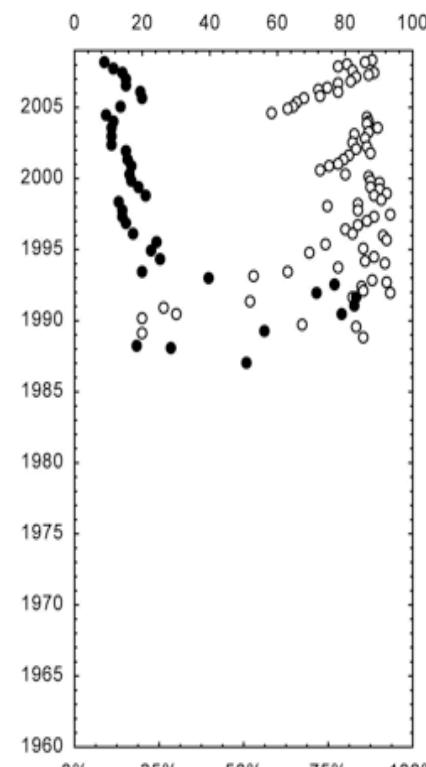
3



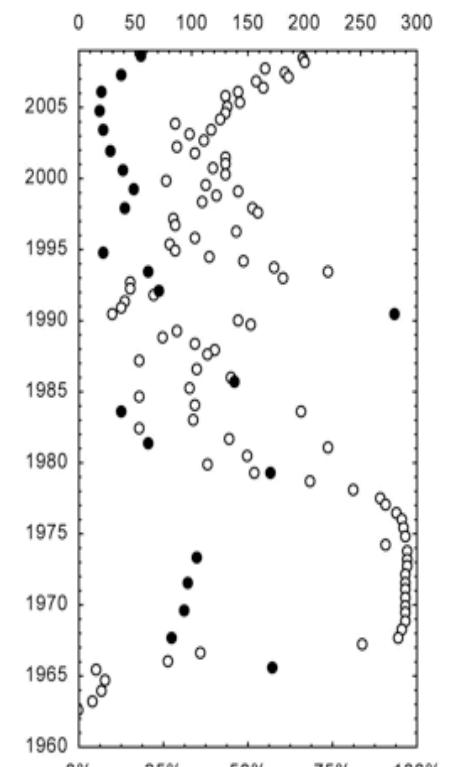
PCBs Trends and patterns



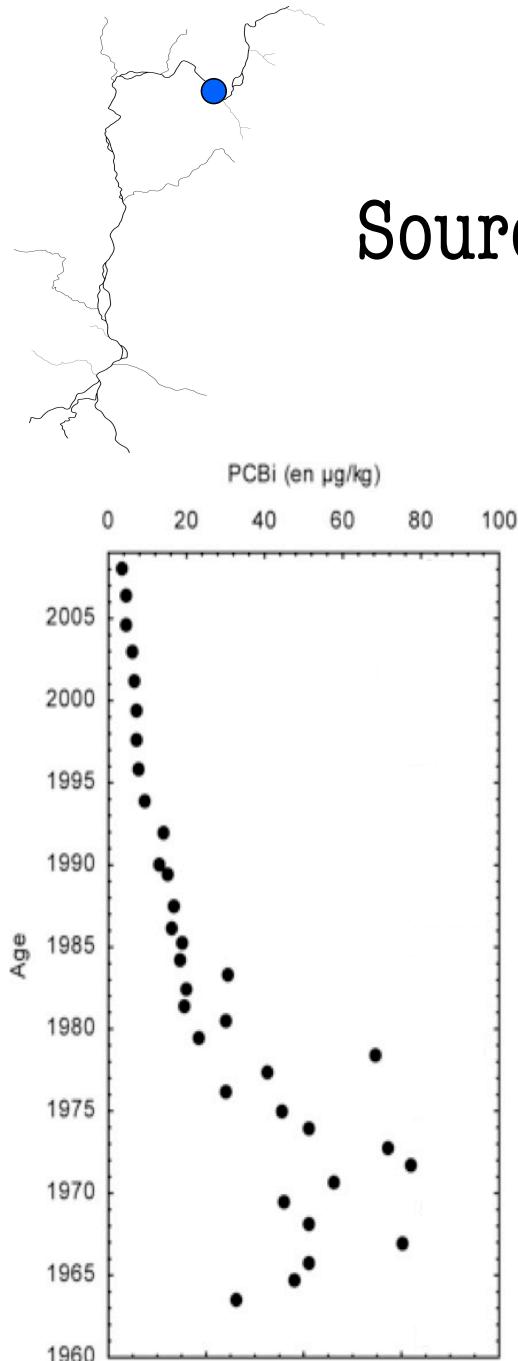
1



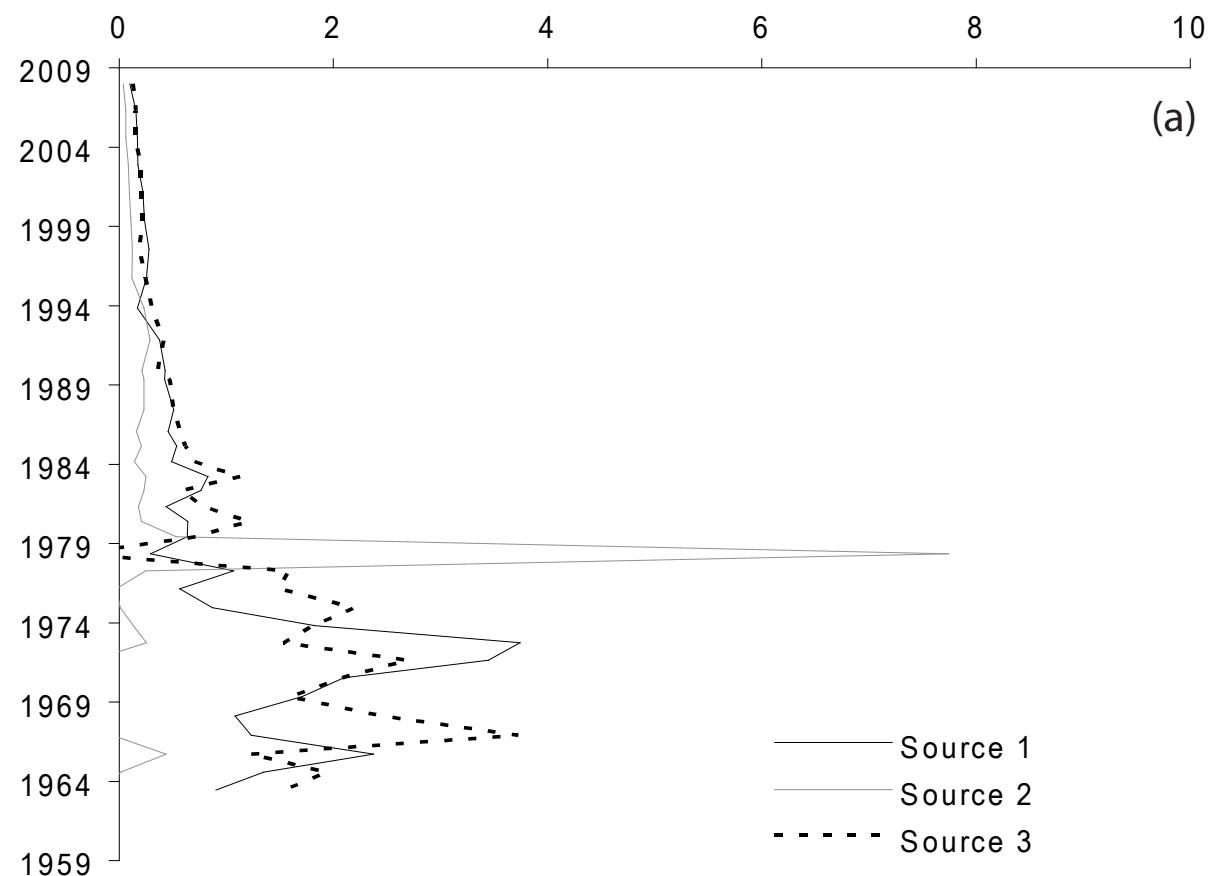
2



3



Sources contributions using Unmix model



Z A B R



HOW MANY YEARS CAN A MOUNTAIN EXIST,
BEFORE IT'S WASHED TO THE SEA !

(B. Dylan, 1962)

ZABR

ZONE ATELIER BASSIN DU RHONE
RHONE BASIN LONG TERM ENVIRONMENTAL RESEARCH