



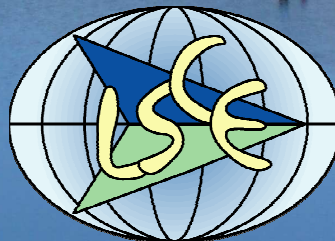
The scientific and societal usefulness of recent (< 250 years) Alpine lake sediment studies

An overview on LSM – Université de Savoie joint scientific progresses in paleolimnology

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Charline Giguet-Covex
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Jean-Louis Reyss

Marie-Elodie Perga



Concept

Fieldwork

Results

Perspectives

Conclusion

The concept of “retro-observatory”

Having a look on yesterday to manage tomorrow challenges

An underestimated tool to
make natural areas management policies better
and to evaluate the impact of current global changes

Concept

Fieldwork

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In Europe, even remote mountain landscapes are man-made



Chalets d'Ecuelle, 1872 m,
commune de Passy (Haute Savoie)

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In Europe, even remote mountain landscapes are man-made

Noisetier

Epicéa

Pollen data, Villy, Haute Savoie, 2250m asl

Pin cembro

Sapin

**Open space:
deforestation**

**First forest
opening
(human or
climate?)**

**Closing of the
forest space**

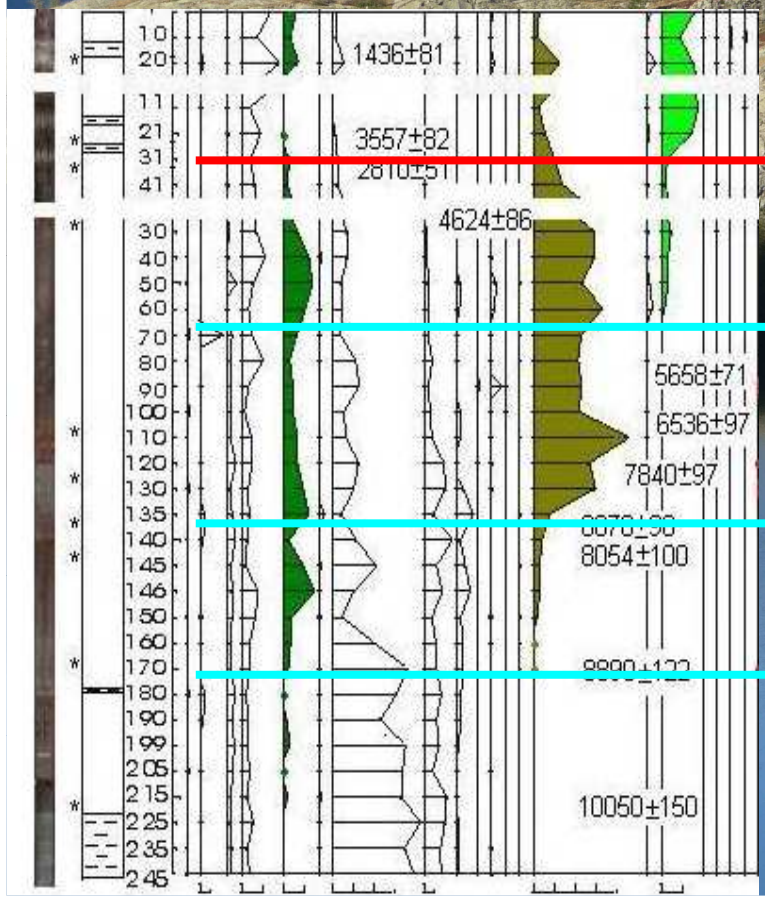
**Forest
reconquest**

3600 cal. BP

5600 cal. BP

8000 cal. BP

8900 cal. BP



Epicéa

Pin cembro
Epicéa Sapin

Pin cembro
Sapin

Pin cembro

Noisetier

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Traces of Bronze Age land-use in the vicinity of Ecuelle pollen study site



Concept

Fieldwork

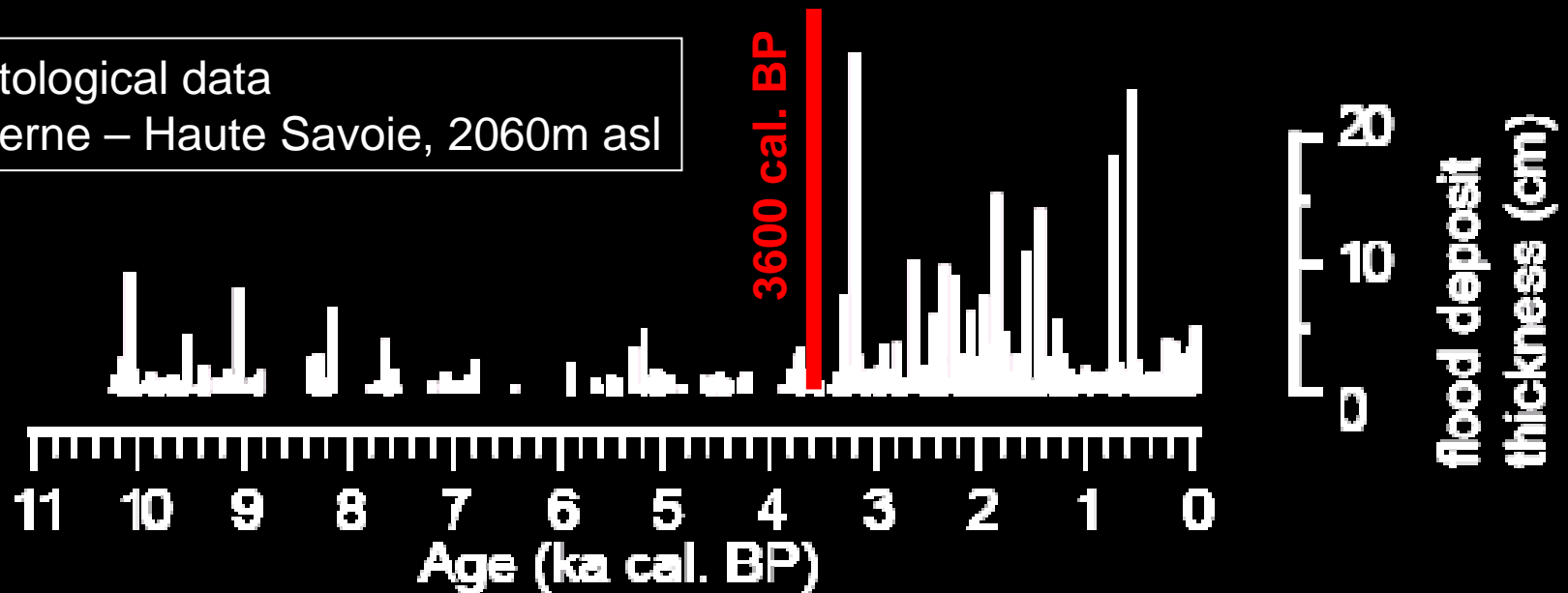
Results

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In Europe, even remote mountain landscapes are man-made

Sedimentological data
Lake Anterne – Haute Savoie, 2060m asl



Bronze Age land-use resulted in a major change in vegetation cover as well as in soil stability

Concept

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Current global changes are hard to assess
due to lack in monitoring data

Lake sediment may have archived some environmental variables (climate, trophic state, pollutant inputs, erosion etc.)

Their study may thus bring useful information to evaluate the effect of past land-use and the efficiency of management policies

From a scientific point of view, such a “retro-observation” is crucial to assess the intensity and kinetics of global changes compared to a **measured (i.e. **non-hypothetical**) “reference state”**

Concept

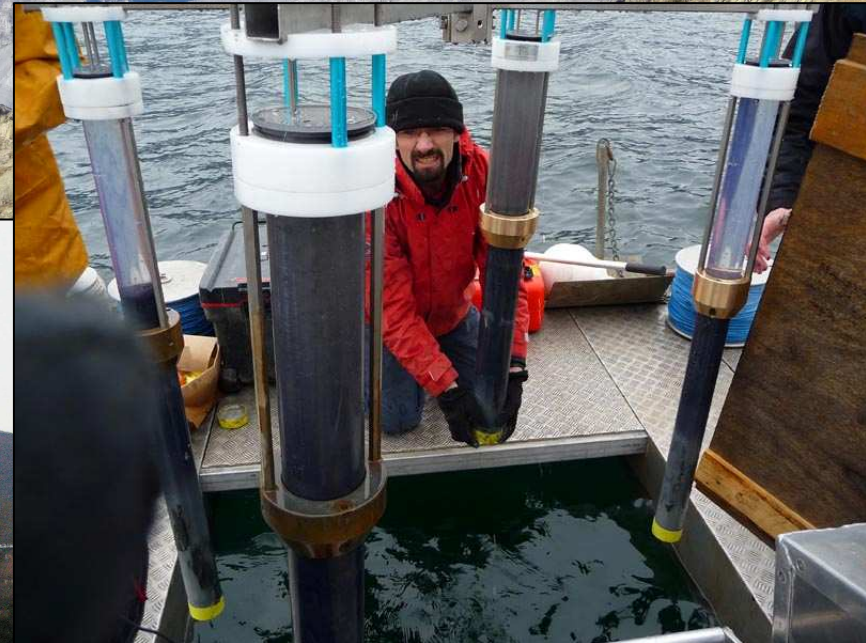
Fieldwork

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Coring operations..



... great perialpine lakes

Coring operations..



... remote high alpine lakes

Water masses management

The Iper-Retro research program aims at evidencing the effect of the three major human-triggered forcings of lake ecosystems disturbances :

- Fish introduction
- Nutrient contamination
- Climatic change

Time-span: 150 years

It relies on a pluridisciplinary approach of lake sediment studies (biology, molecular biochemistry, geochemistry, sedimentology).

In such an approach dating questions are crucial for the project to be a success

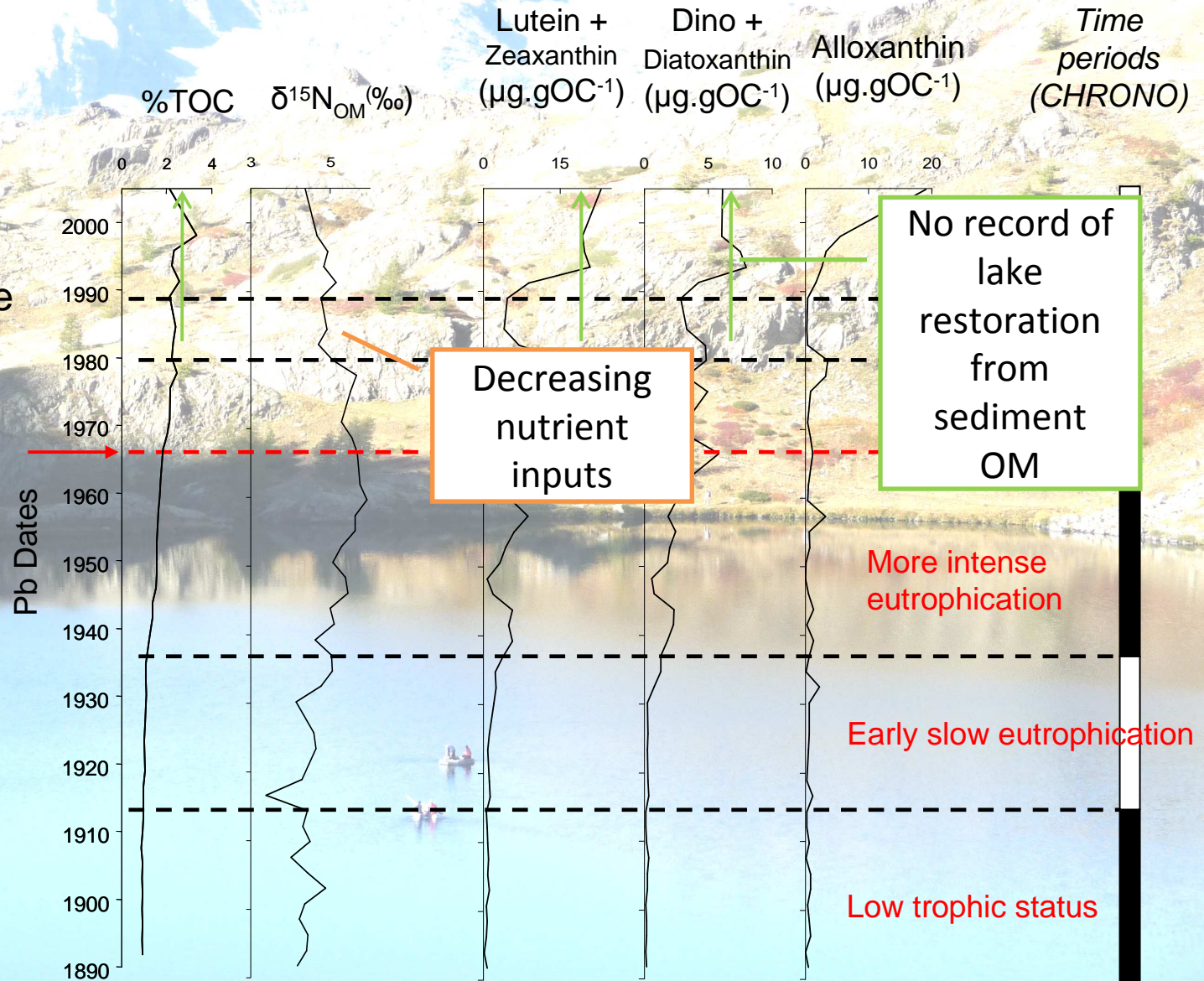
All of radiometric data have been/will be acquired at the LSM



Water masses management

Physico-chemical record of Lake Annecy eutrophication and restoration over the last 100 years

Restoration measures



Water masses management

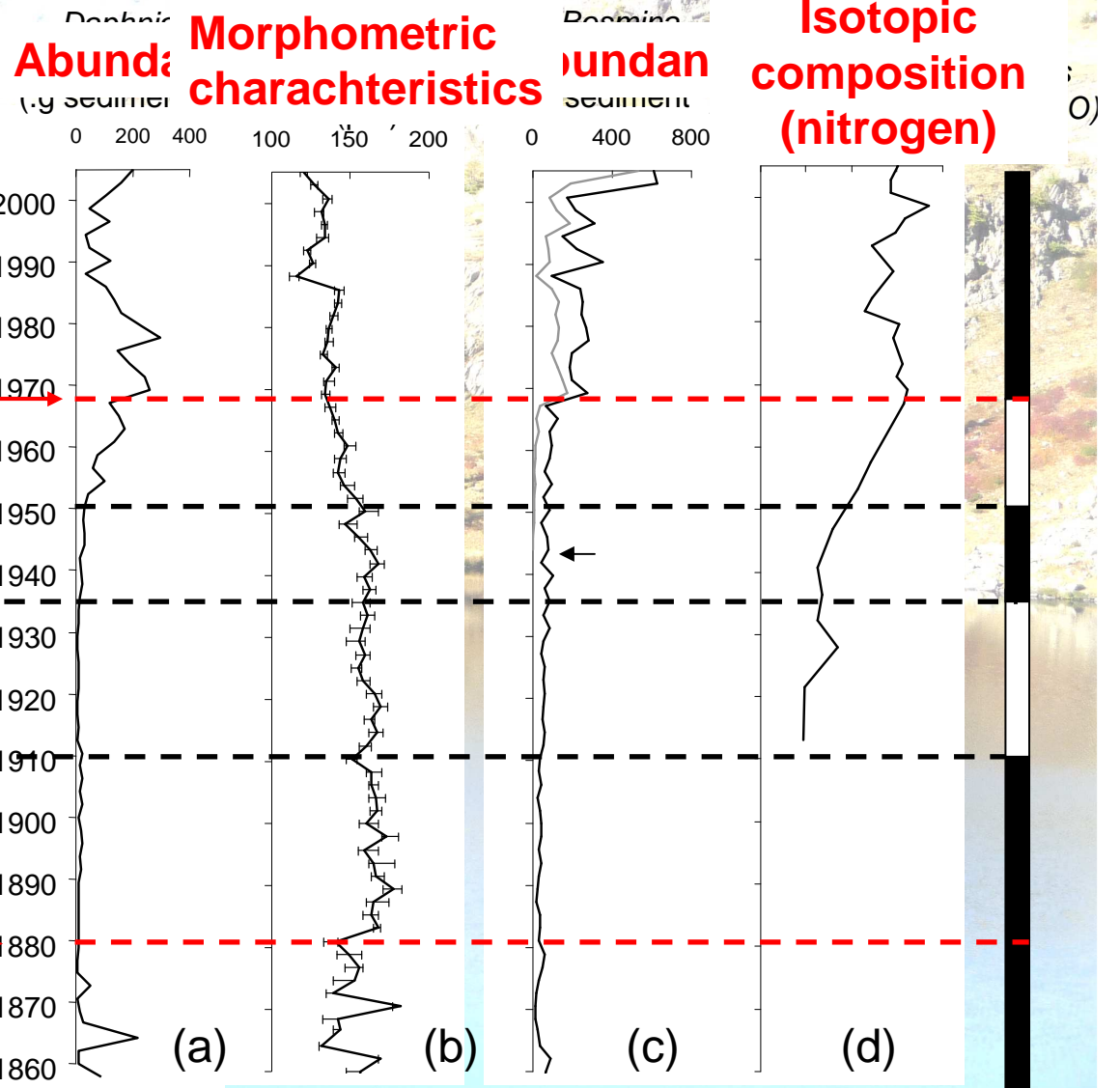
Biological record of Lake Annecy zooplankton response to fish introduction, eutrophication and restoration over the last 100 years

Lake trophic status

Restoration measures

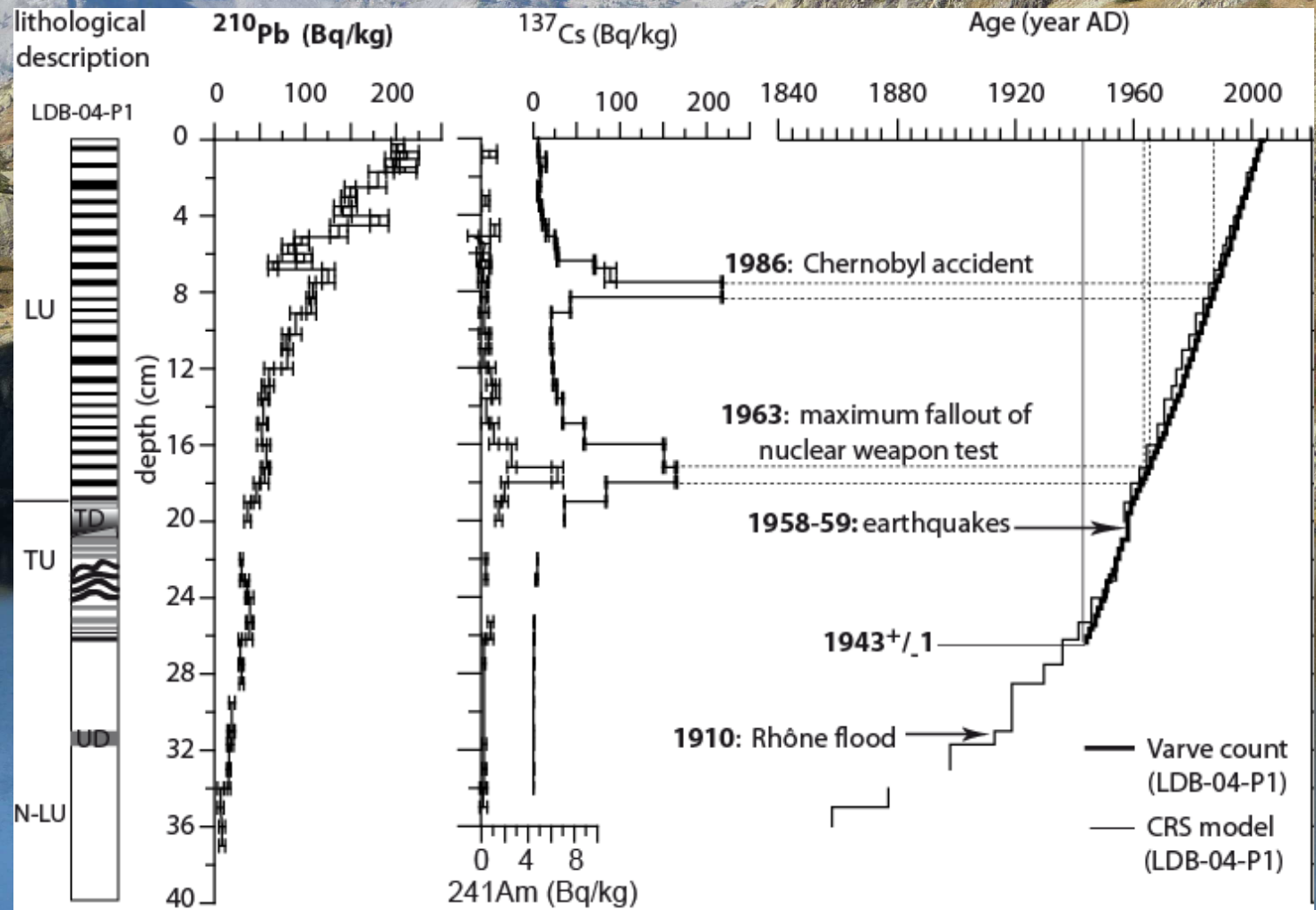
Pb Dates

Whit-fish introduction

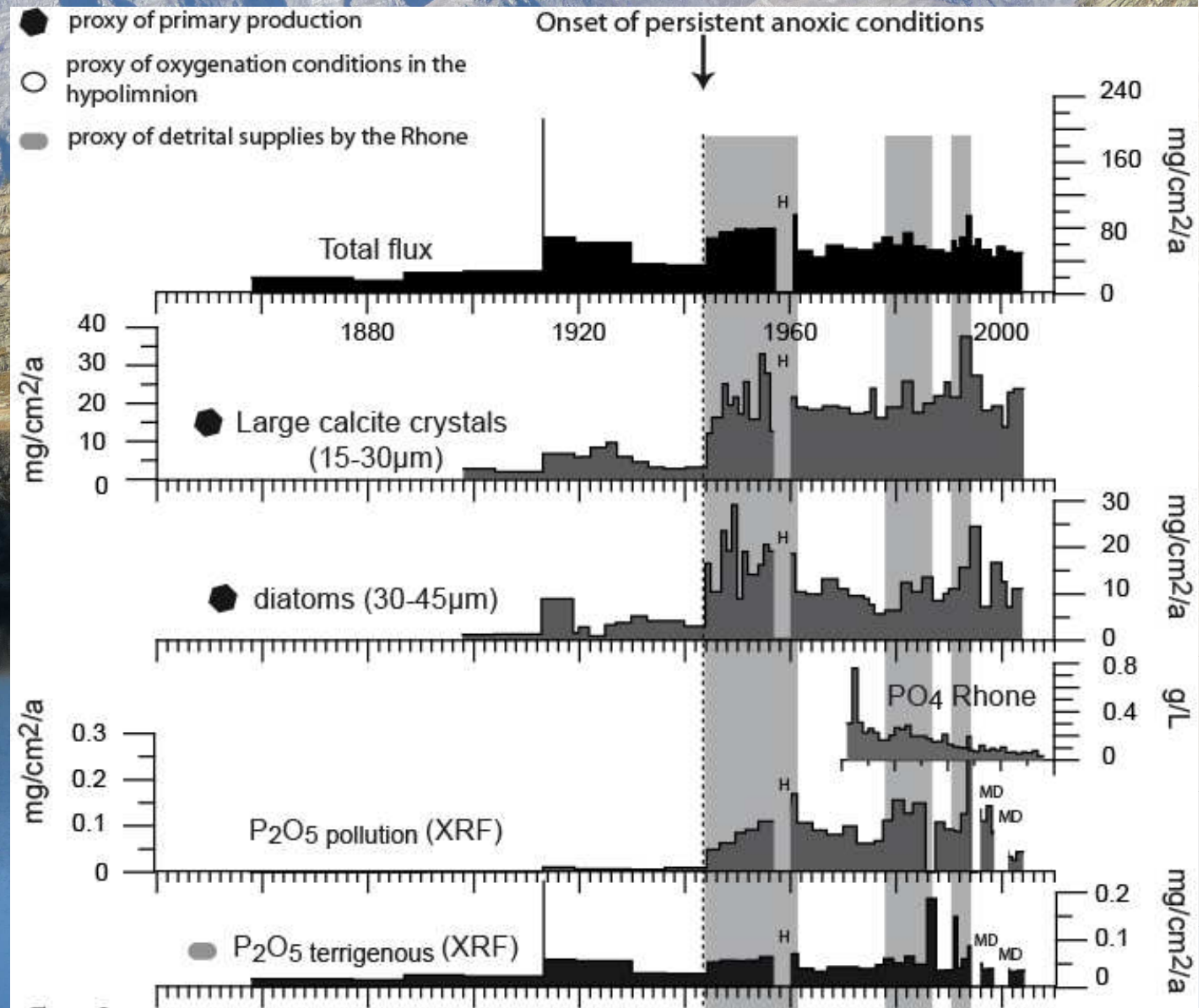


Water masses management

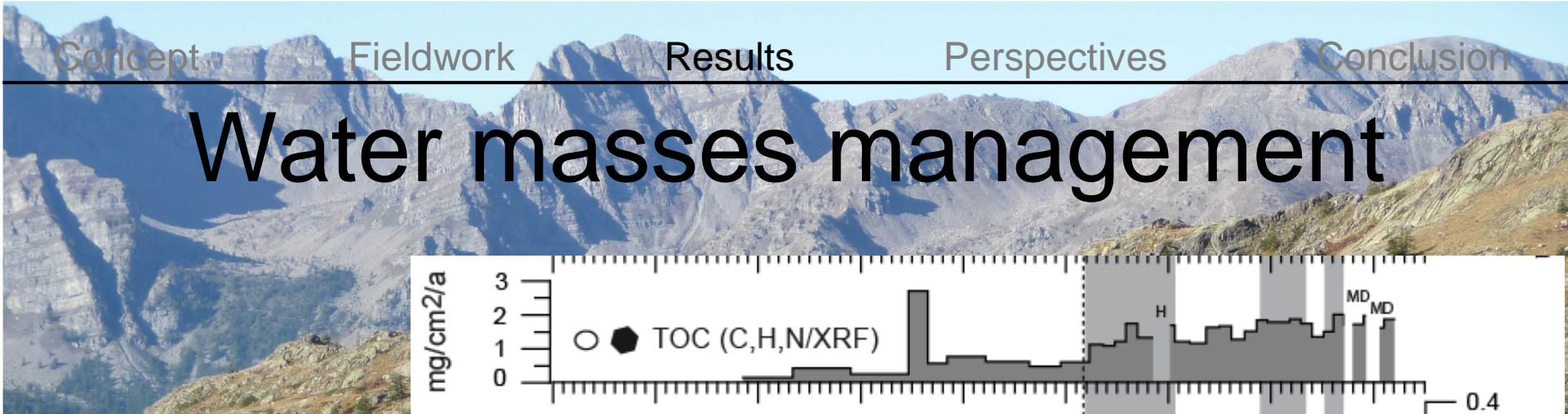
Radiometric measurements led to evidence Lake Bourget upper sediments are made of annually-laminated sediments



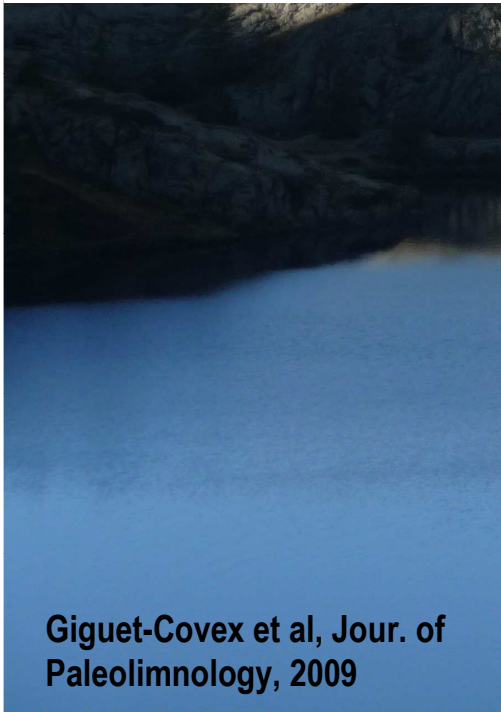
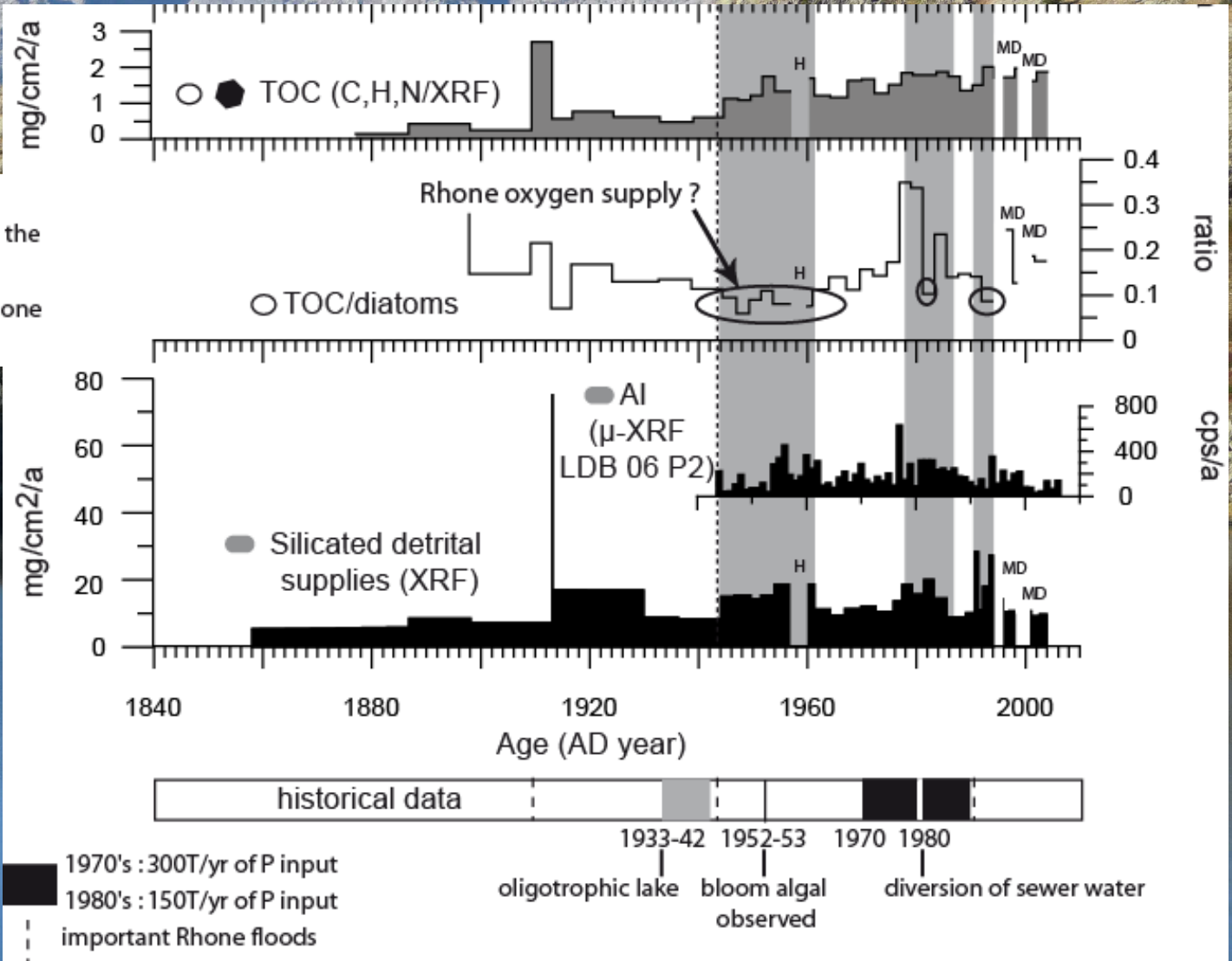
Annually-laminated sediments permit to assess fluxes instead of concentration



Water masses management



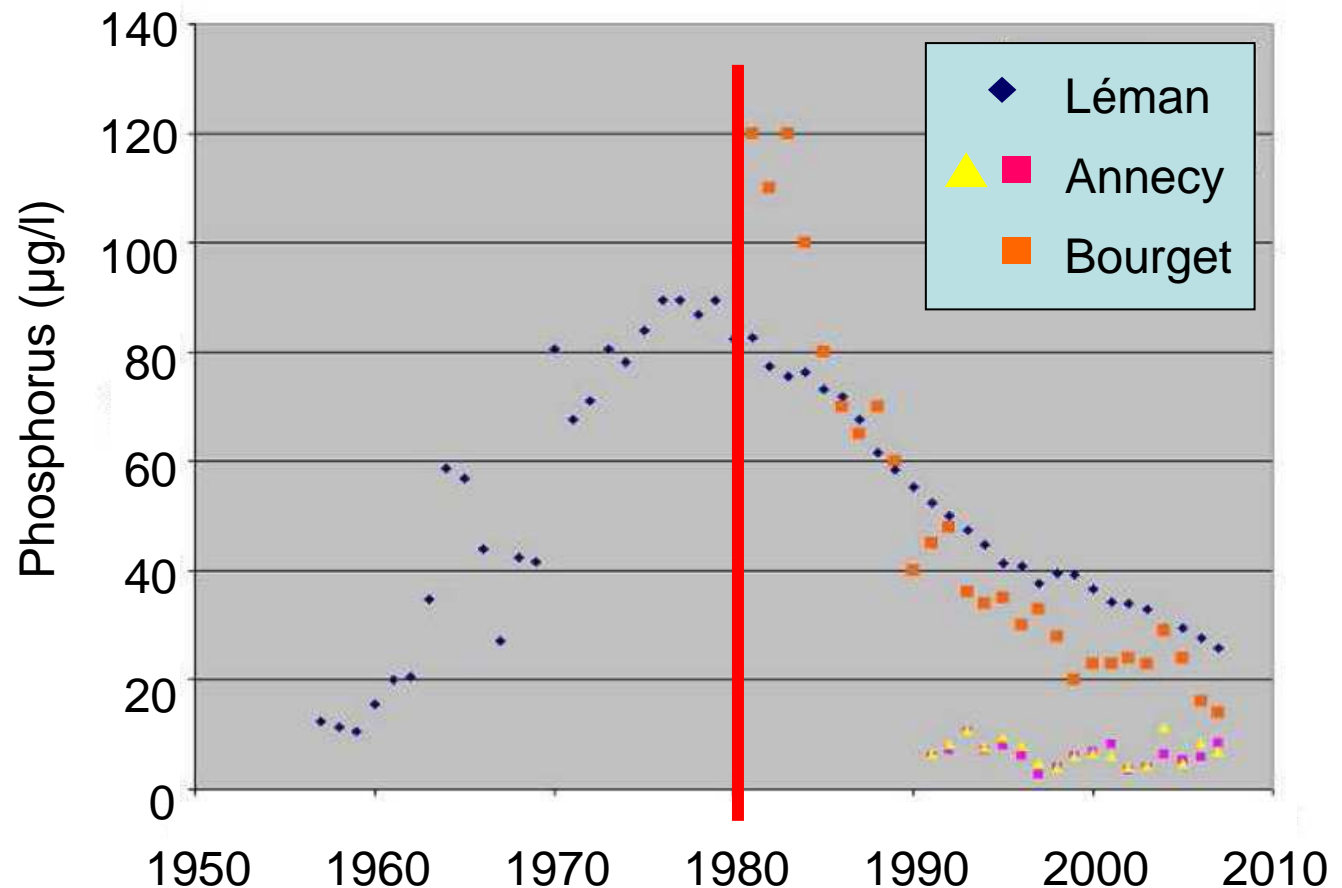
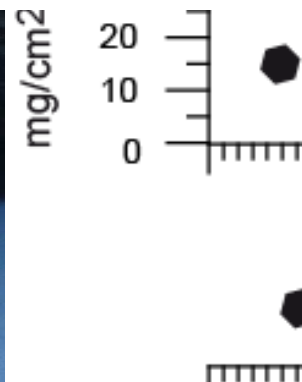
- proxy of primary production
- proxy of oxygenation conditions in the hypolimnion
- proxy of detrital supplies by the Rhone



Giguet-Covex et al, Jour. of Paleolimnology, 2009

Water masses management

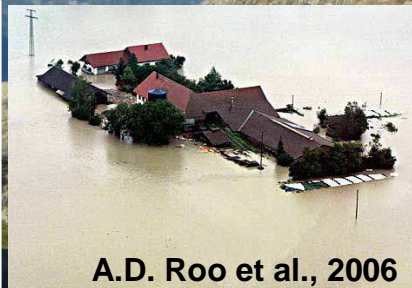
Whereas it resulted in a drastic drop in dissolved P concentration, the diversion of waste water did not permit a return to “pre-anthropogenic” trophic conditions



**Diversion of waste water
directly to Rhône river**

Global change monitoring : assessment of natural hazards

Alpine August 2005 flood event in Central and Eastern Europe



A.D. Roo et al., 2006



Swissinfo.ch



news.bbc.co.uk

**~ 40 people killed
Several billion Euros**

August 2005 intense rainfall event in Switzerland: Not necessarily an analog for strong convective events in a greenhouse climate

Martin Beniston¹

Received 21

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**The Summer Flooding 2005 in Southern Bavaria –
A Climatological Review**

J. Grieser, C. Beck, B. Rudolf

Major flood disasters in Europe: 1950–2005

José I. Barredo

**A probabilistic view on the August 2005 floods in the upper Rhine
catchment**

S. Jaun¹, B. Ahrens², A. Walser³, T. Ewen¹, and C. Schär¹

¹Instit

²Instit

³Met

Pres

**Linking extreme climate events and economic impacts:
Examples from the Swiss Alps**

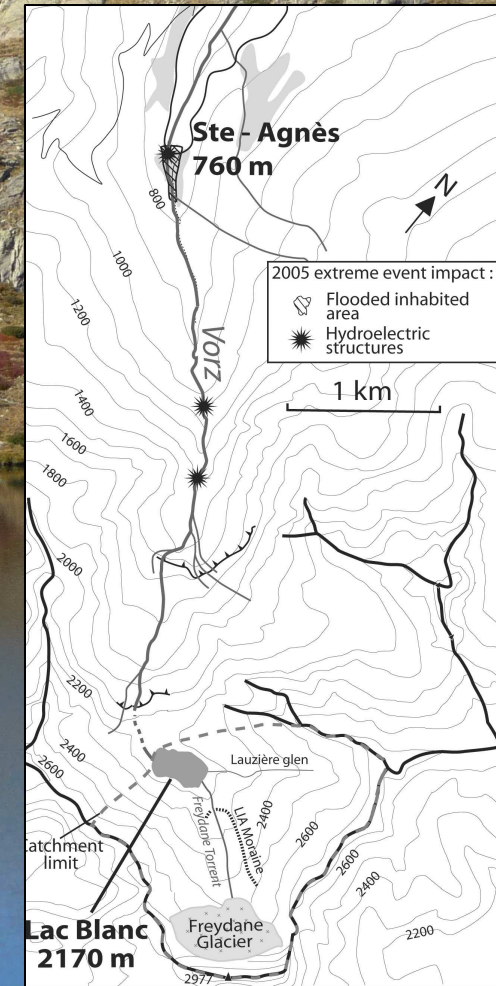
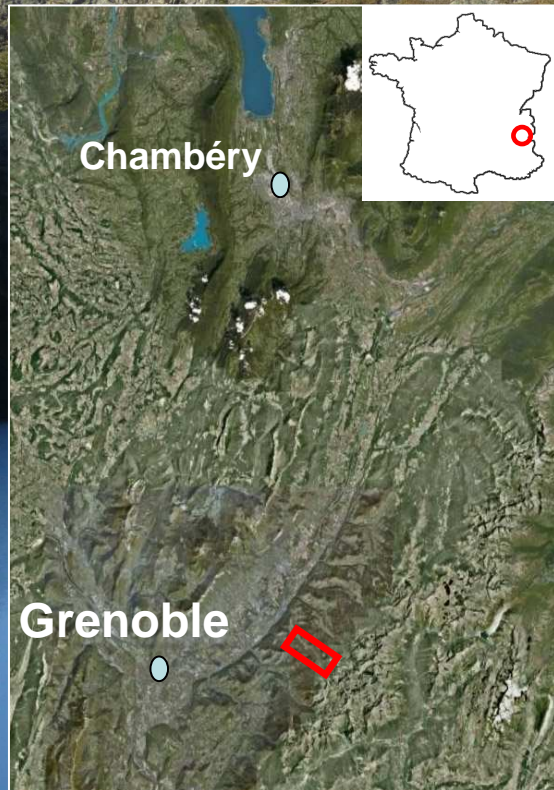
Martin Beniston*

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Global change monitoring : assessment of natural hazards

Alpine August 2005 flood event in France

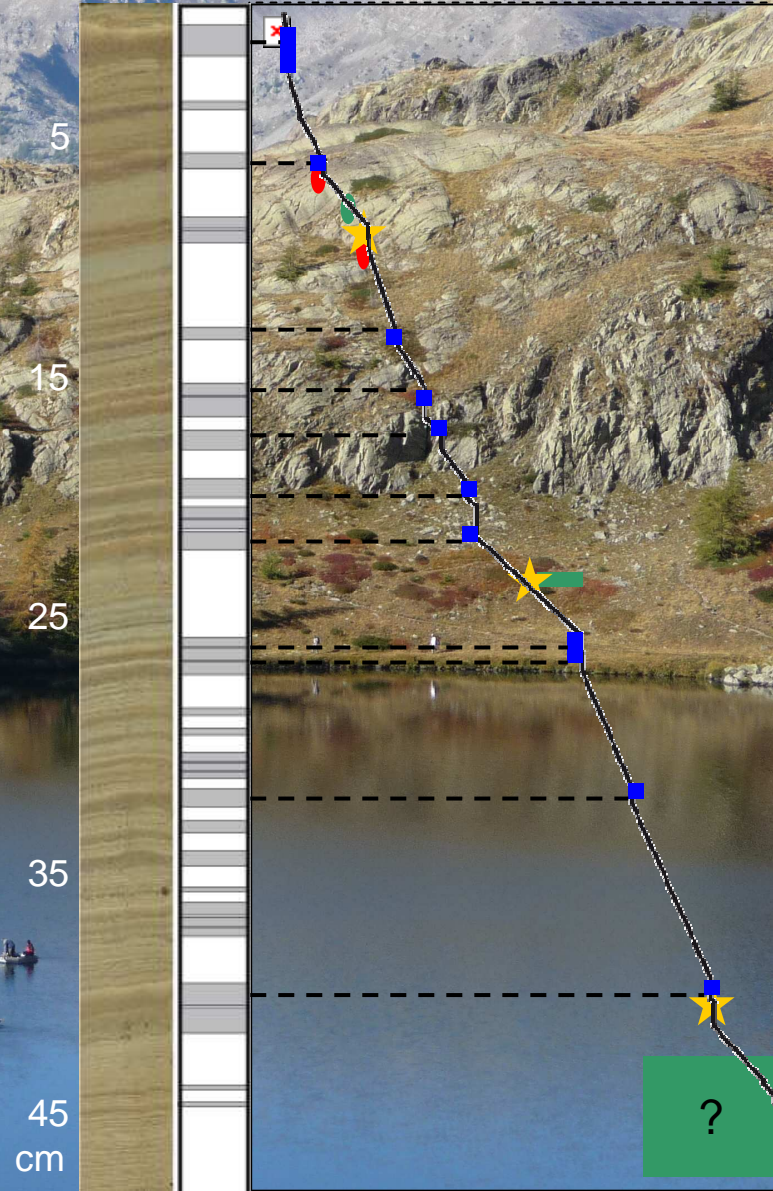
In France: floods were focused on the Belledonne massif



Multiproxy age-depth modelling

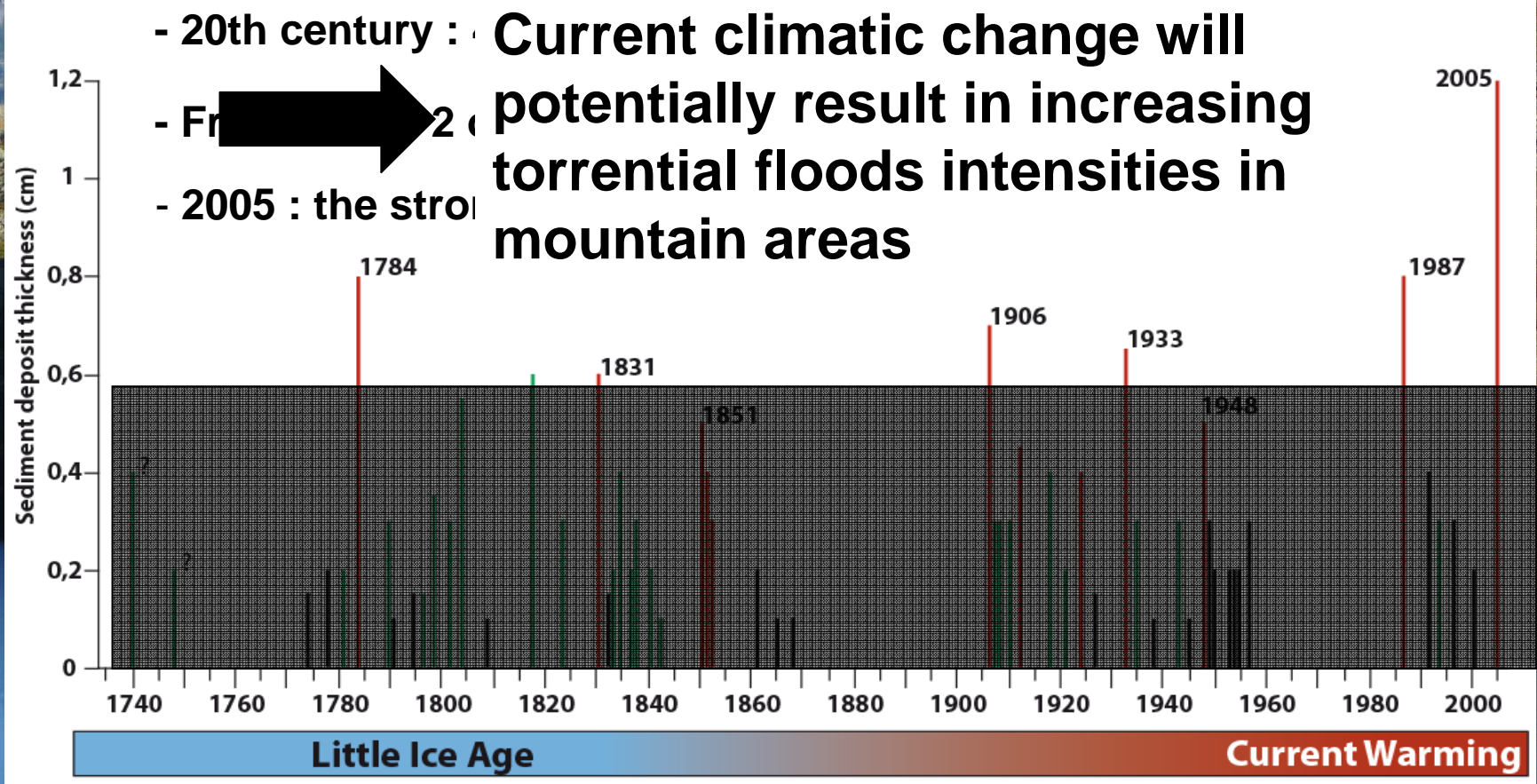
Geochemical contaminations	
Cesium Americium	Chernobyl accident 1986 Nuclear Test Weapon 1963
Lead	Lead additive 1970 Mining activity 1844-1864 and ?
Historic events	
Seisms (4) Floods (13)	

Age (years AD)
BLB0704 2000 1900 1750



Global change monitoring : assessment of natural hazards

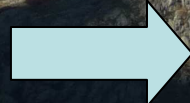
Frequency and Magnitude of Vorz river flood events over the last 250 years



Collaborations

Level 1.

A new European project is under construction in the aim of helping managers of alpine protected areas to establish the current state of water masses with regard to their recent evolution



Need of numerous measurements (20/core)...

Level 2.

We are blocked by fundamental questions (dates!! but not only..) which should be solved by further collaboration with the LSM



Need of joint fundamental projects to make current tools better and to discover new ones

Conclusion

Reconstructing past environmental parameters may help in assessing the effect of past land-use as well as the efficiency of preservation/restoration policies

To look behind helps in putting current changes in long-term perspective and thus to identify effects of current and future global changes

Consequently, it may help decision makers in improving their current and future policies

The need of new knowledge remains huge and the tasks for researchers is as well!

A reinforced collaboration between “paleo-people” and LSM would help in addressing this challenge