La straordinaria esperienza di un chimico in Antartide
Il caso del piombo

Piano Nazionale
Lauree Scientifiche
Scienze Naturali e Ambientali

UNIVERSITÀ - ANCONA

ANTARTIDE 2005-06

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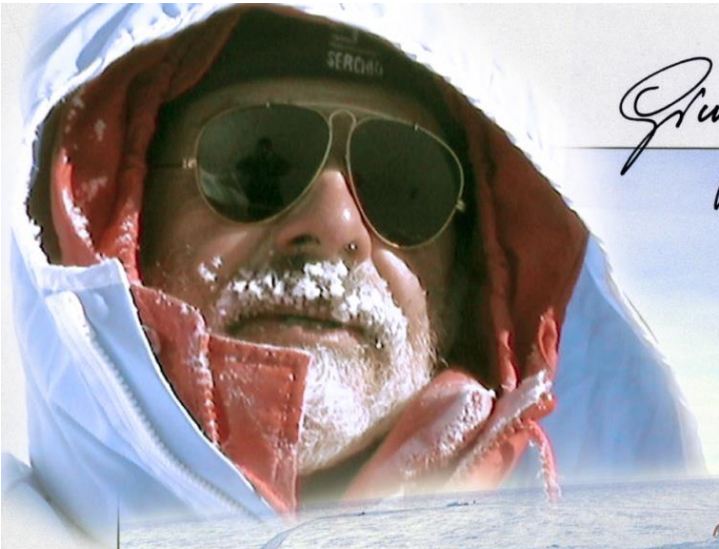
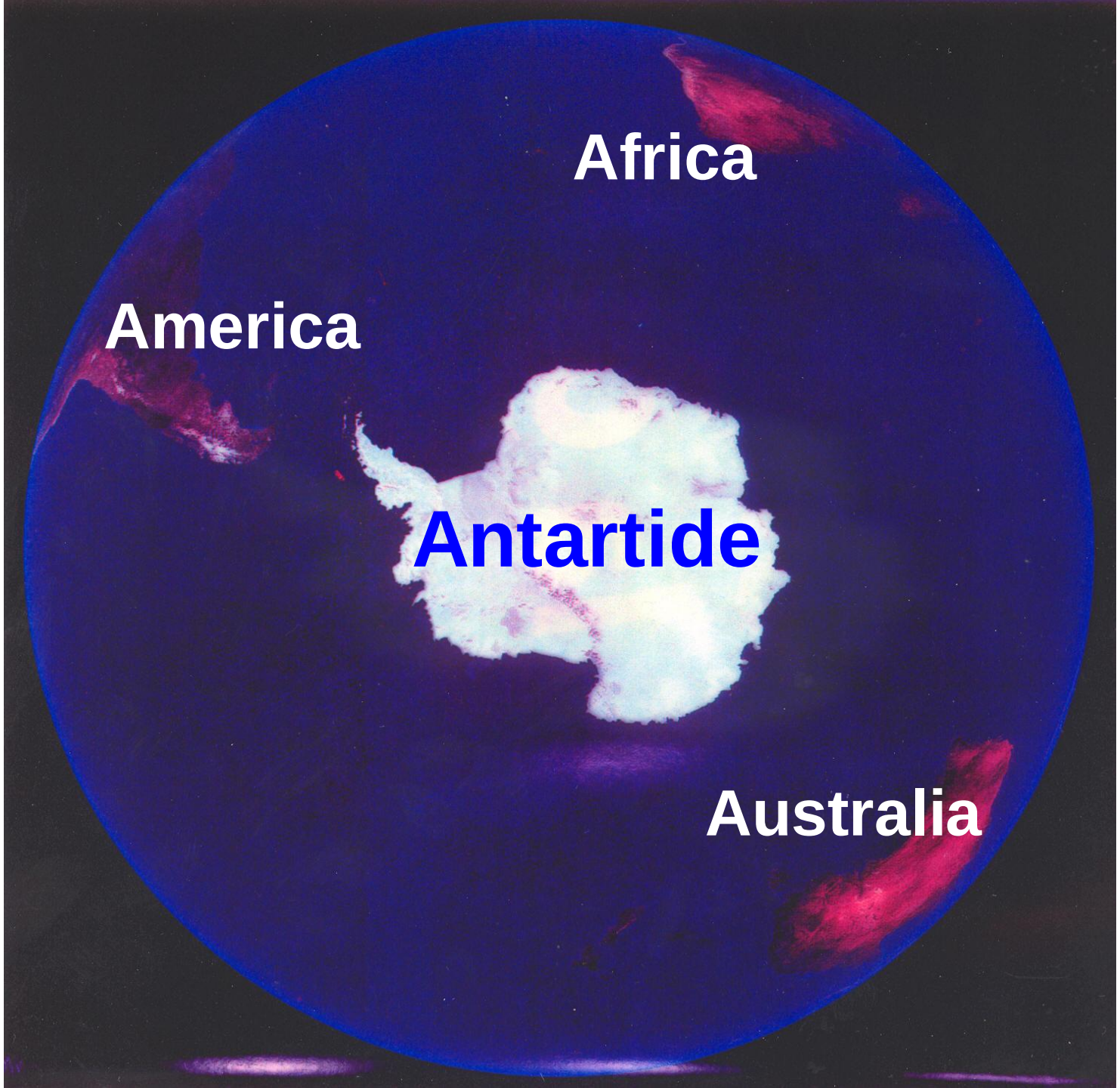
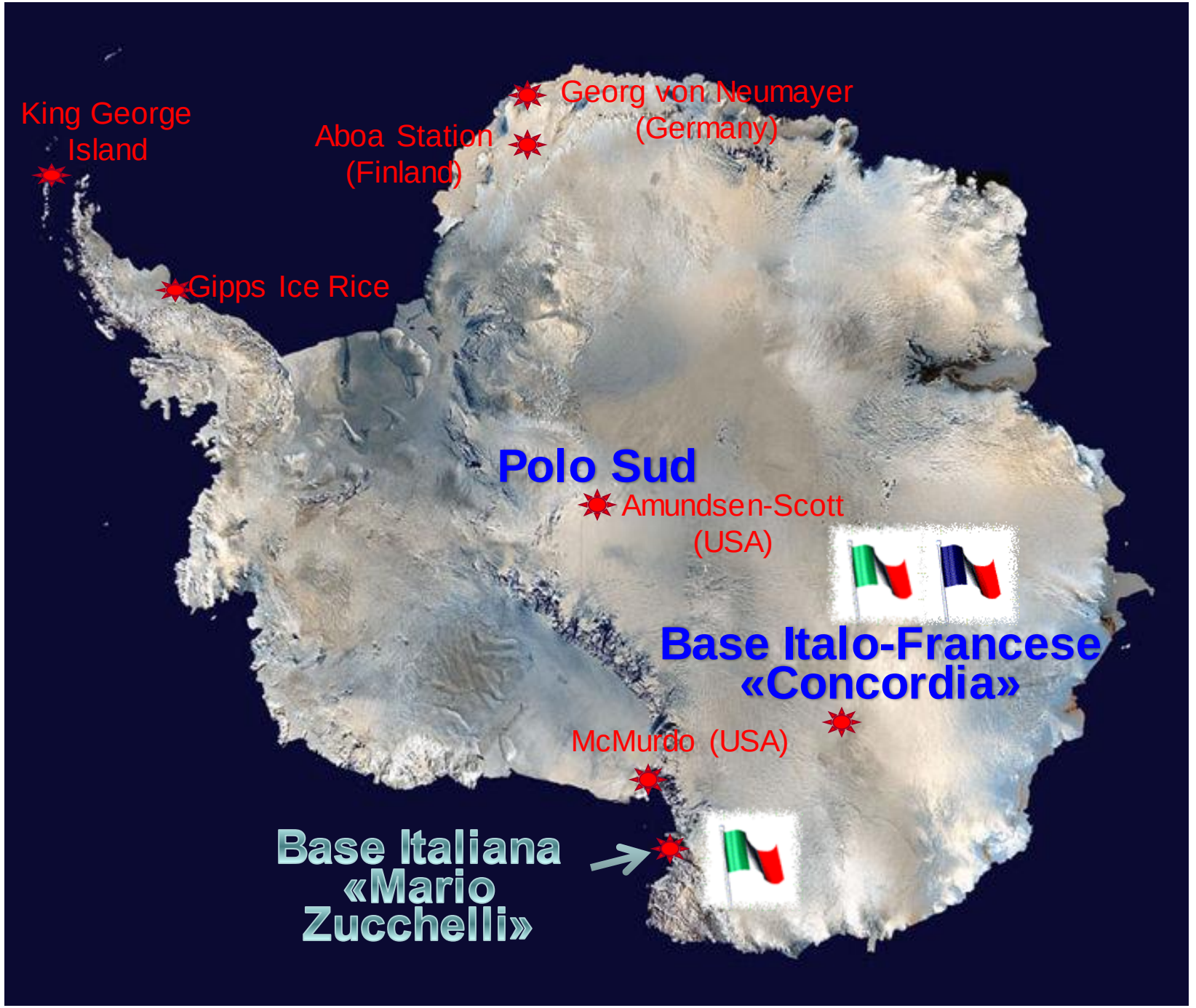
Il caso del piombo



Base Italo-Francese "Concordia"


Africa
America
Antartide
Australia


King George Island
Aboa Station (Finland)
Georg von Neumayer (Germany)
Gipps Ice Rice
Polo Sud
Amundsen-Scott (USA)
Base Italo-Francese «Concordia»
McMurdo (USA)
Base Italiana «Mario Zucchelli»

Arrivo in aereo alla Base Italiana: atterraggio sul ghiaccio marino

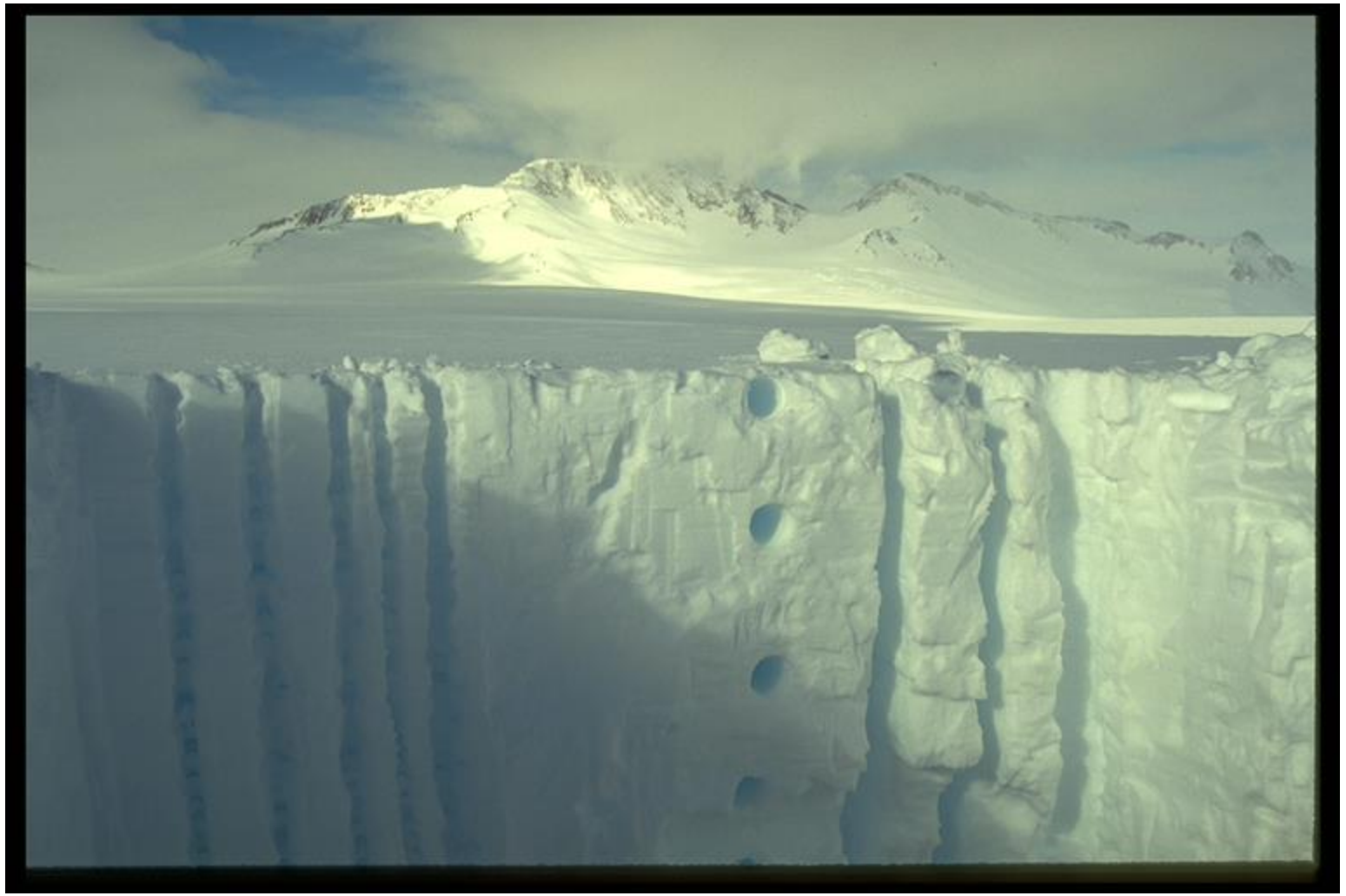
Base Italiana «M. Zucchelli»

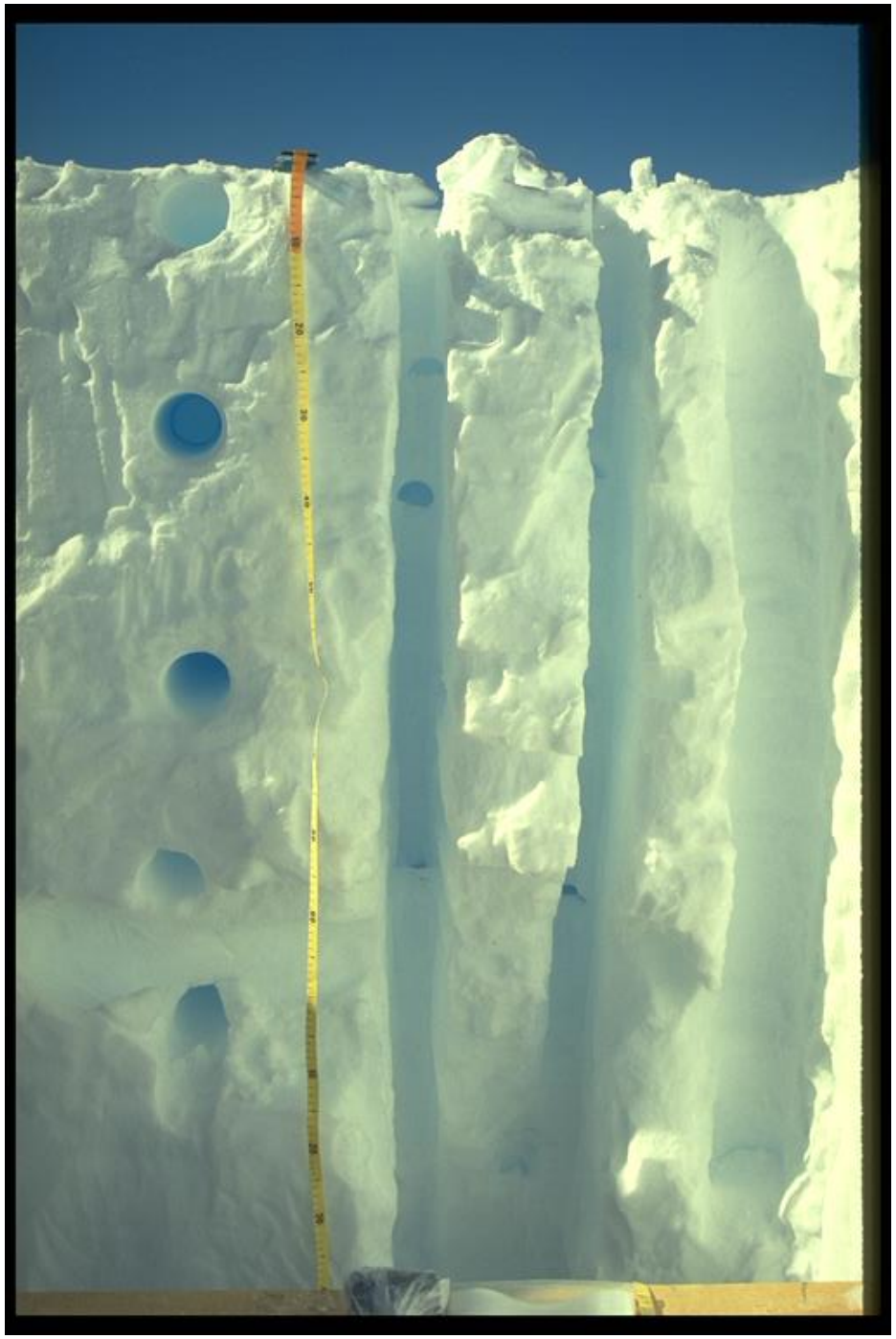
Partenza per la Base «Concordia»

Atterraggio alla Base Italo-Francese «Concordia»

Prelievo di neve in «trincea»


Temperatura in
«trincea»
- 40 °C

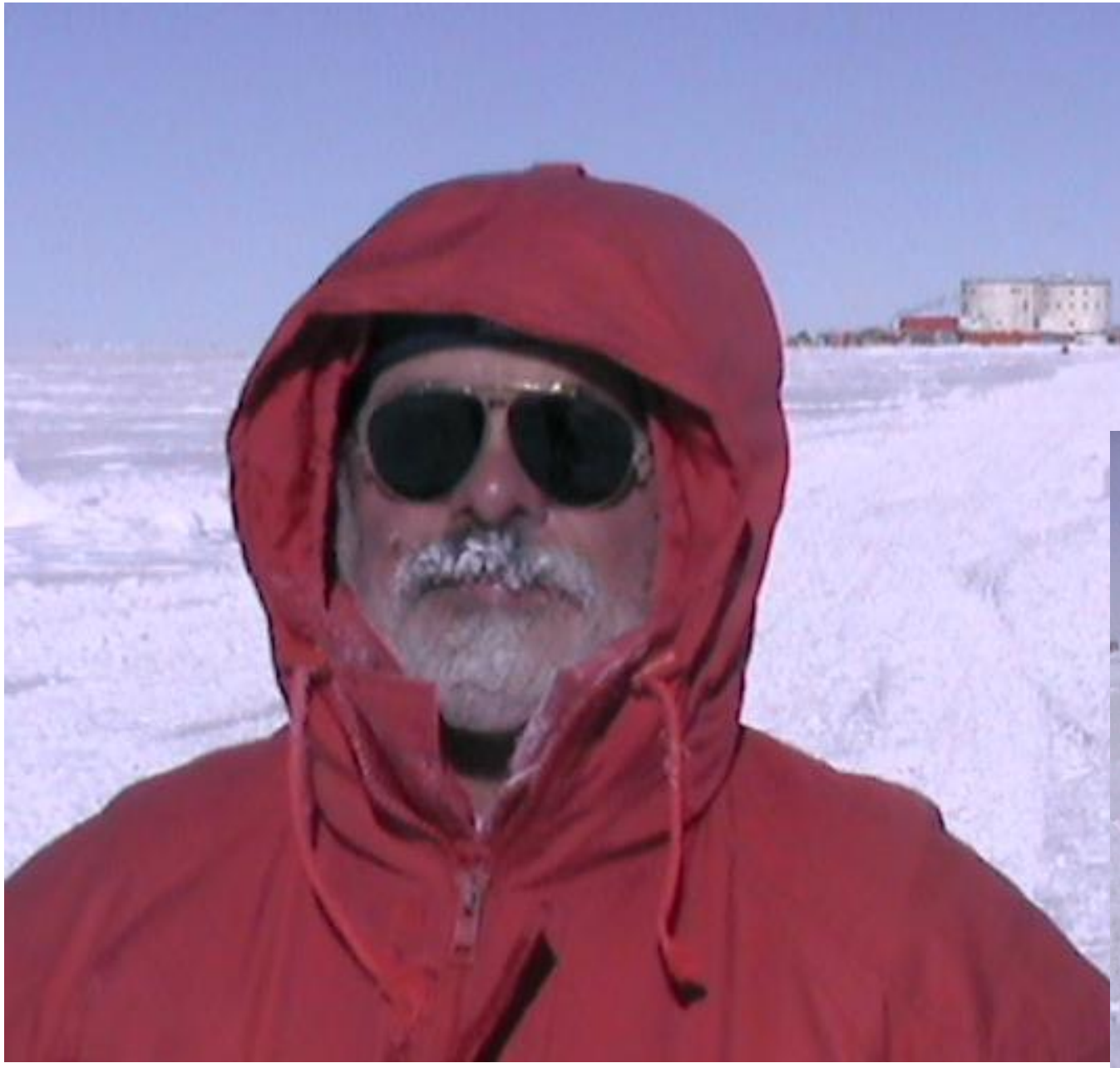




Una «trincea» dopo il prelievo di campioni di neve

Prelievo di Aerosol atmosferico

Polveri sottili PM10



… vicino alla Base «Concordia»

Prelievo di aerosol atmosferico …
… lontano

In laboratorio

… e vicino la Base

Recanati
Città della Poesia

Ecco dove siamo

A volte
il tempo può
essere
veramente
brutto
… anche per
molti giorni

Si verificano
tormente di
neve dove
… non si
distingue lo
stacco fra cielo
e superficie

Il prelievo di ghiaccio marino

Un iceberg…

… col buco

Il ritorno in nave «Italica»

Il ritorno in nave «Italica»

… il gruppo di chimica analitica da quattro università italiane

Il ritorno… passando per la Base Francese di *Dumont D'Urville*

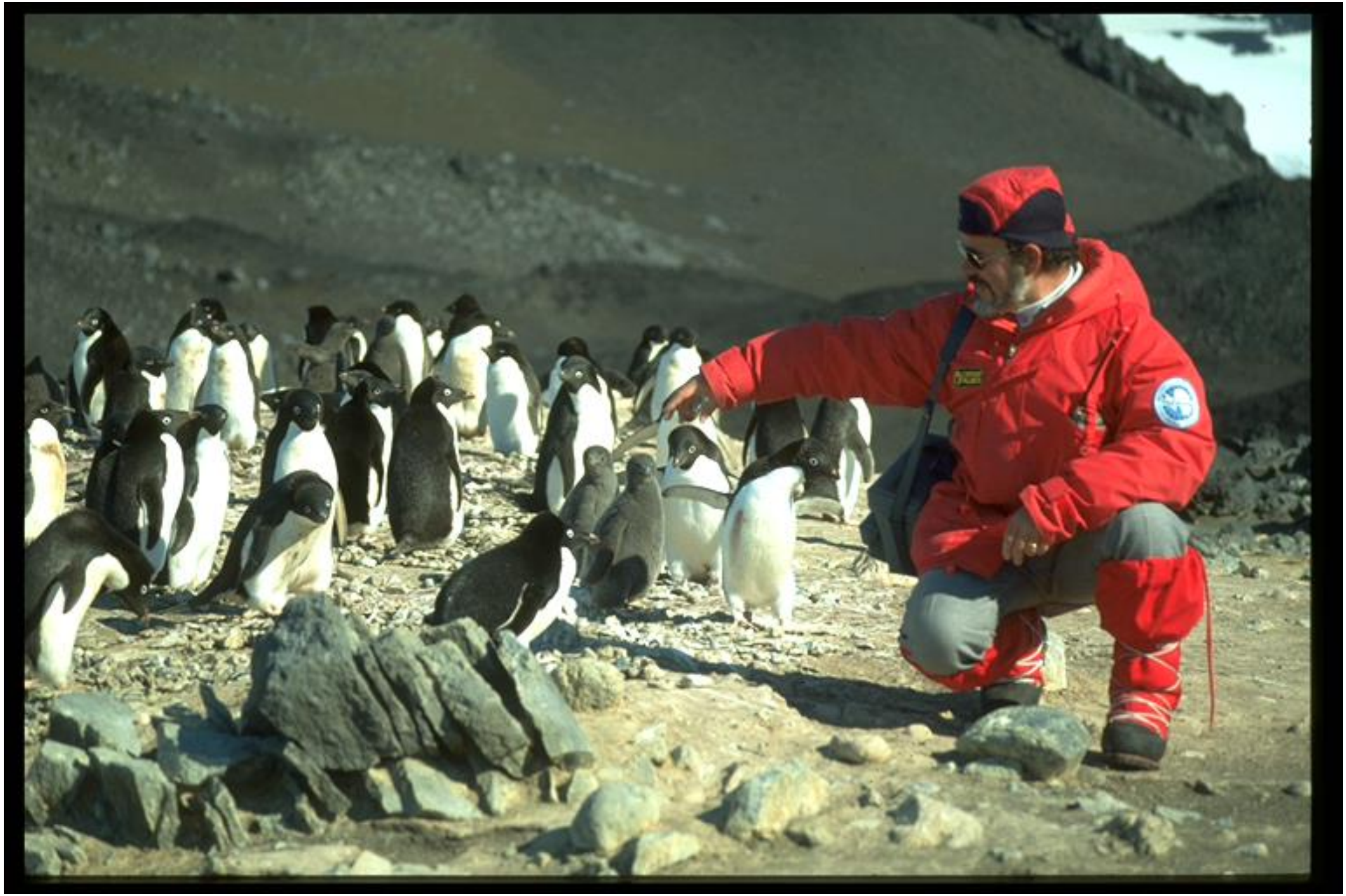
I pinguini di *Doumont D'Urville* (Francia)

I pinguini di *Doumont D'Urville* (Francia)

I pinguini di *Doumont D'Urville* (Francia)

I pinguini di *Doumont D'Urville* (Francia)

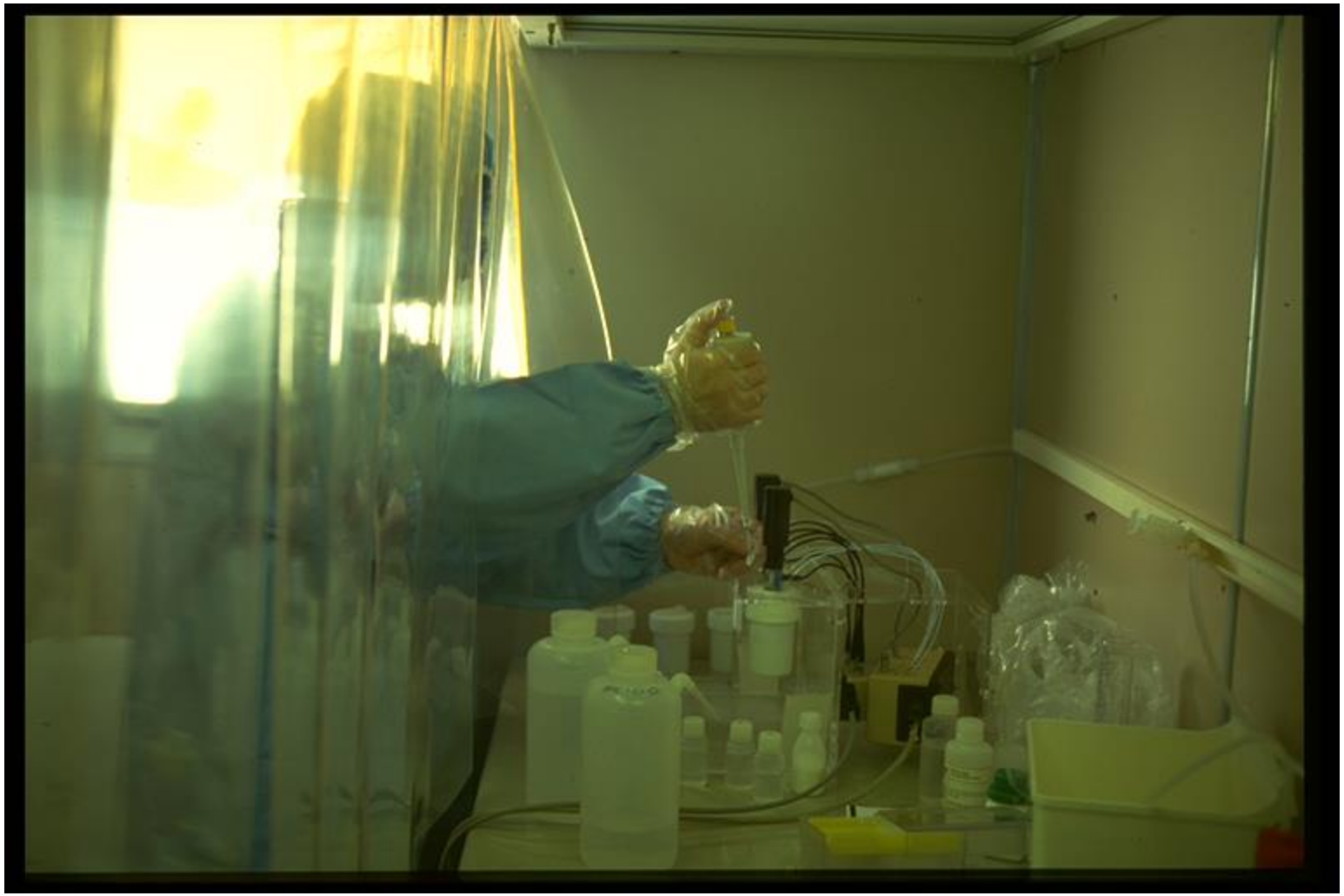
Pinguini a *Baia Terra Nova* (Italia)



Il laboratorio pulito *Clean Room* nella base italiana

Il lavoro nella *Clean Room* della base italiana «Polarografia»

Il lavoro nella *Clean Room* della base italiana «Polarografia»



Ed anche nella nave oceano-grafica «Italica»

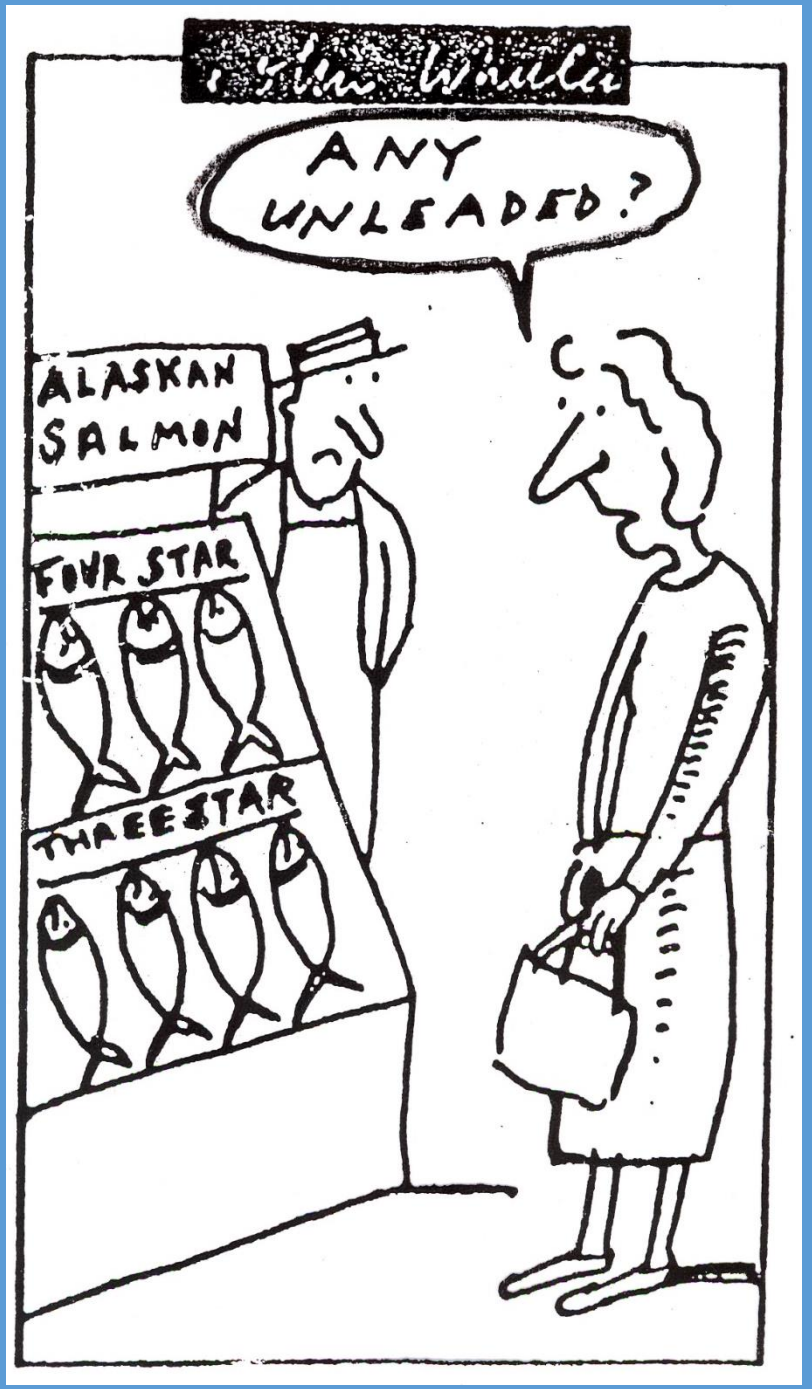
Ed anche nella nave oceanografica «Italica»

Lead in the environment - Signals of reduction from the Antarctic and the Adriatic

G. Scarponi, A. Annibaldi, S. Illuminati, C. Truzzi

Marche Polytechnic University, Ancona, Italy

Problems with lead



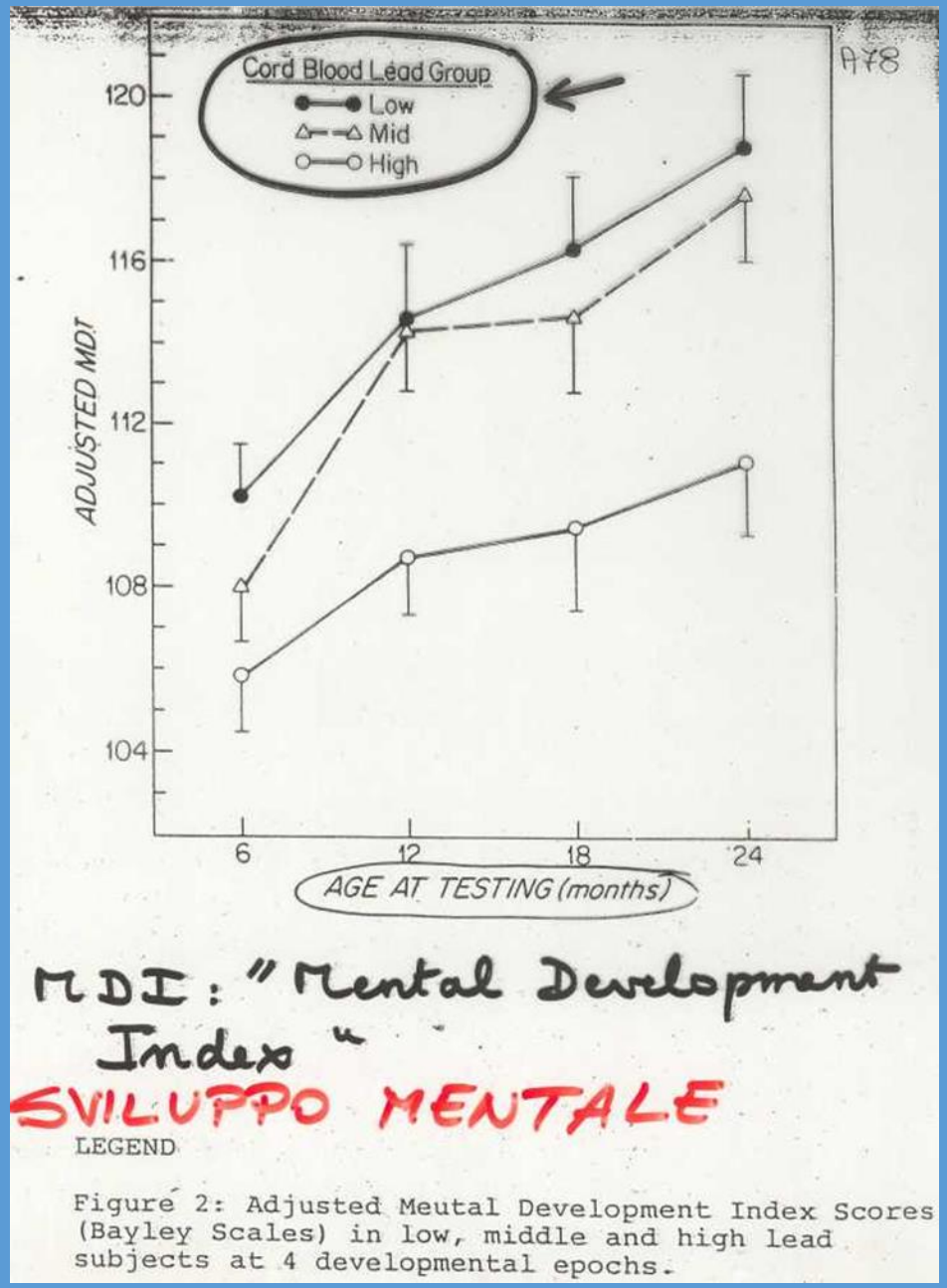
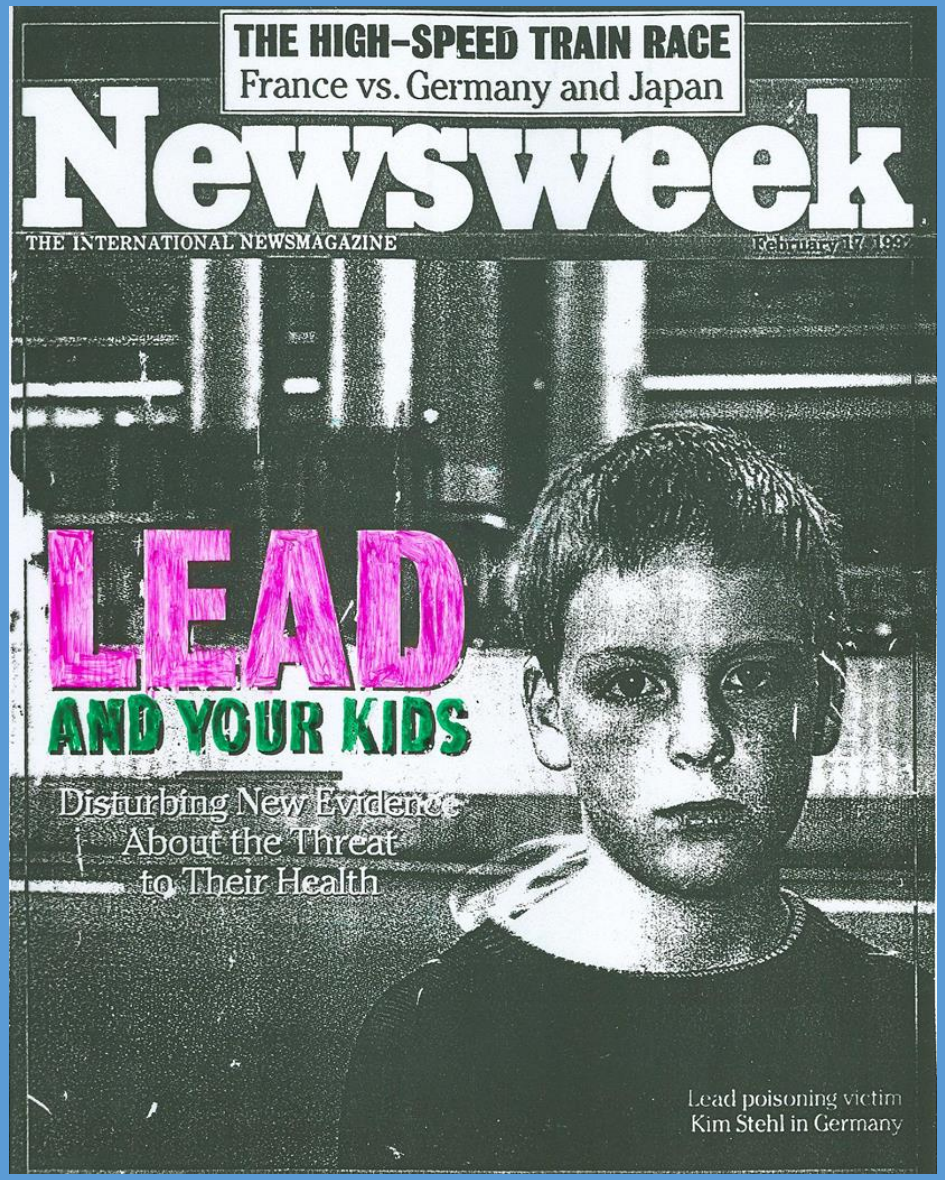


Figure 2: Adjusted Meutal Development Index Scores (Bayley Scales) in low, middle and high lead subjects at 4 developmental epochs.



Lead poisoning victim in Germany (1992)

Clair C. Patterson

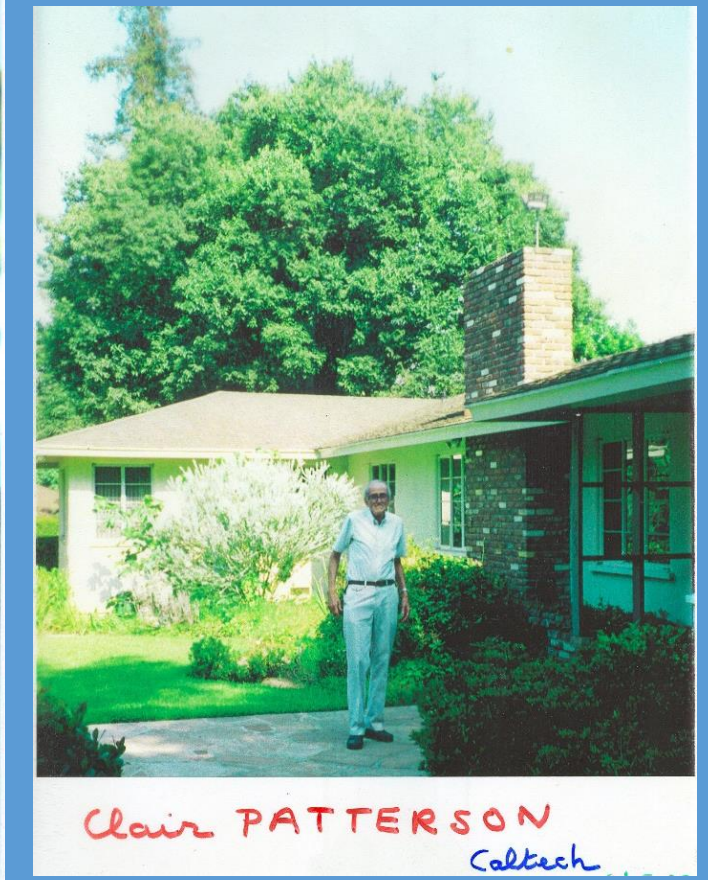
Lead-Free Gasoline and Clair C. Patterson

June 2, 1922–December 5, 1995

Best scientists lack the comfort of peers
Their science is always at first incredible,
Even though later it teaches more. . . .
Why do they struggle so?

Because in each discovery of new knowledge
Lies an awareness of the beauty and worth of human life,
Which enslaves them as guardians of human destiny.

—Clair C. Patterson
August 23, 1981



Clair Patterson in his clean laboratory at CALTECH

The famous curve of Claire C. Patterson (1969)

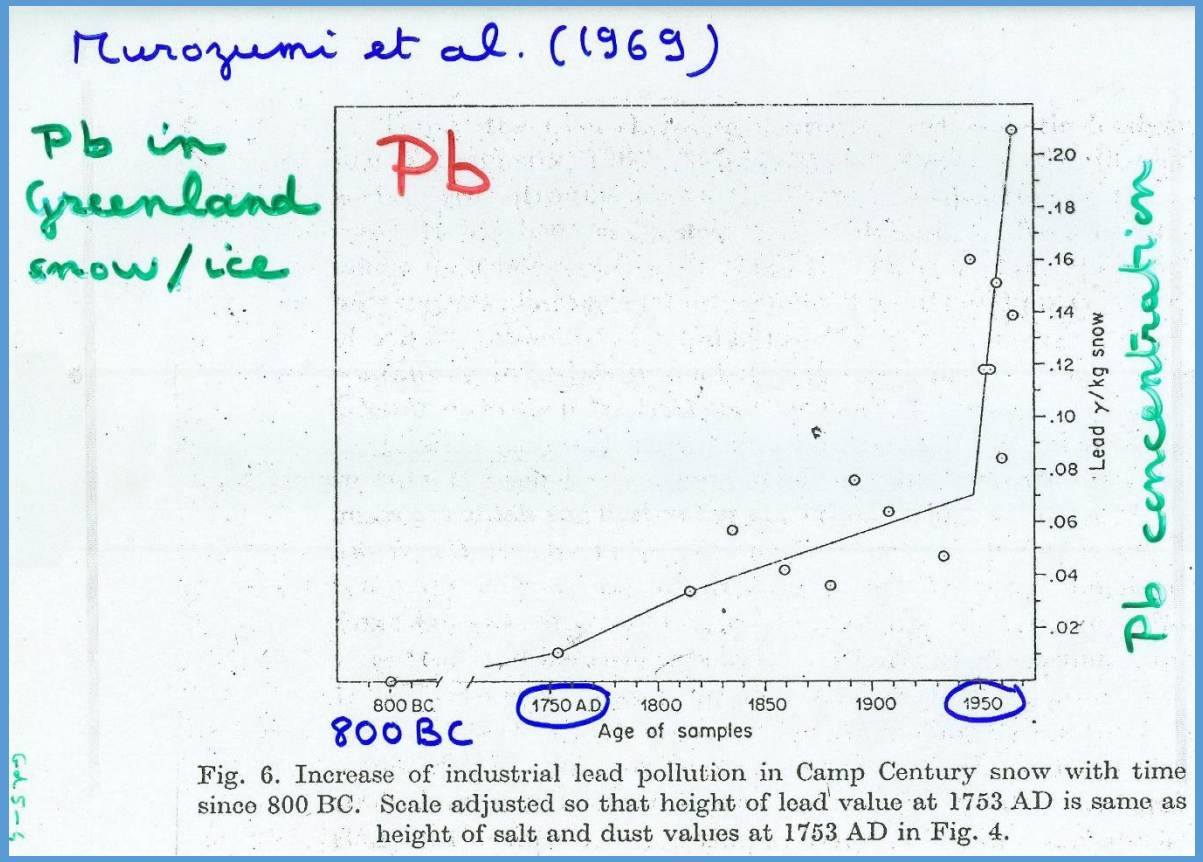
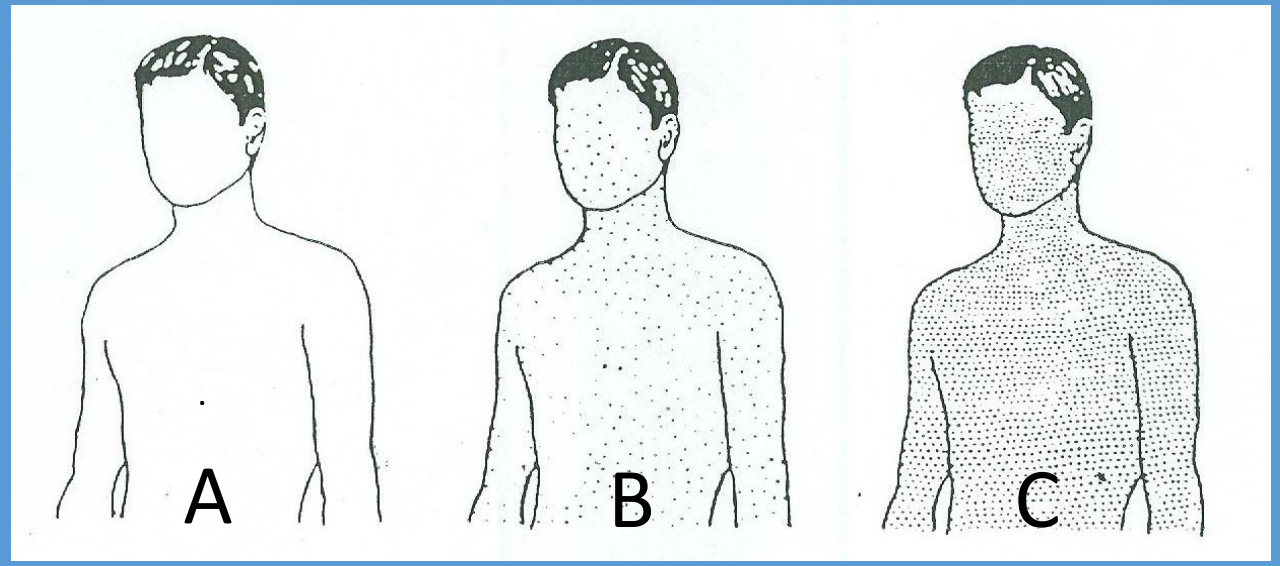


Fig. 6. Increase of industrial lead pollution in Camp Century snow with time since 800 BC. Scale adjusted so that height of lead value at 1753 AD is same as height of salt and dust values at 1753 AD in Fig. 4.

Pb increased rapidly during the industrial revolution

Relative Pb contamination in humans (Patterson 1982)



Each dot : 300 µg Pb/70 Kg person

A : natural

B : mean adult in urban environment

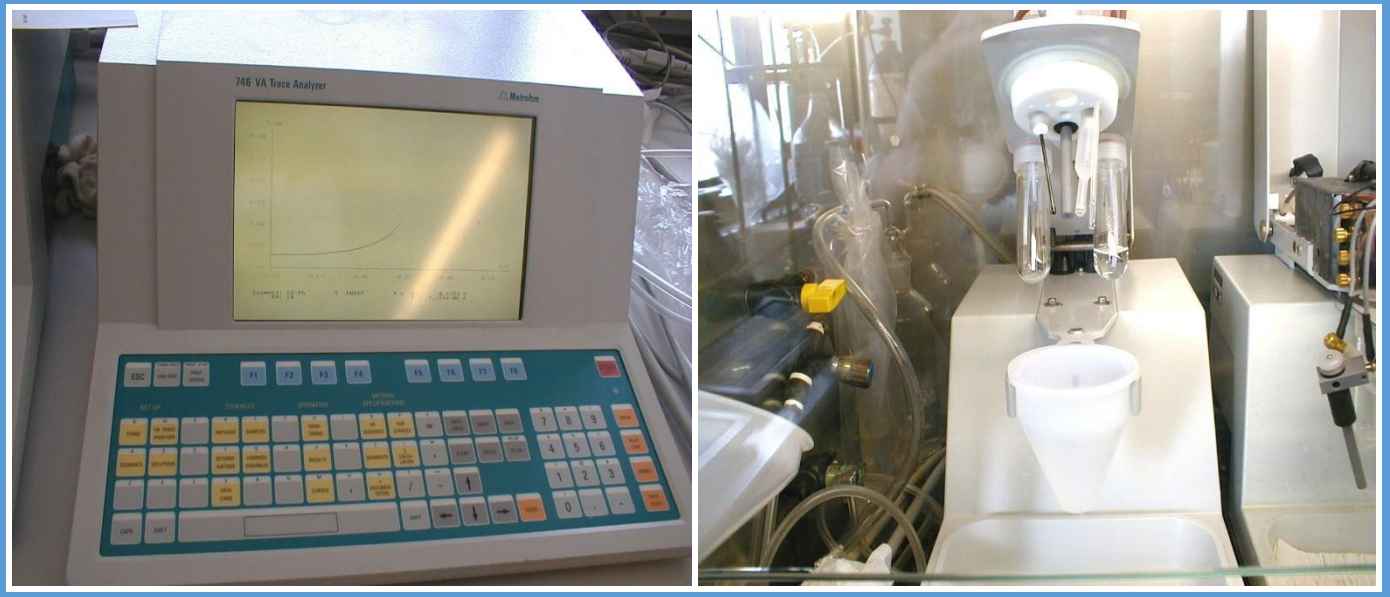
C : lead poisoned person

Il laboratorio chimico a contaminazione controllata (*Clean Room*) all'Università Politecnica delle Marche – Ancona UNIVPM

Il lavoro nella *Clean Room* all'UNIVPM

Analisi polarografica nella Clean Room all'UNIVPM

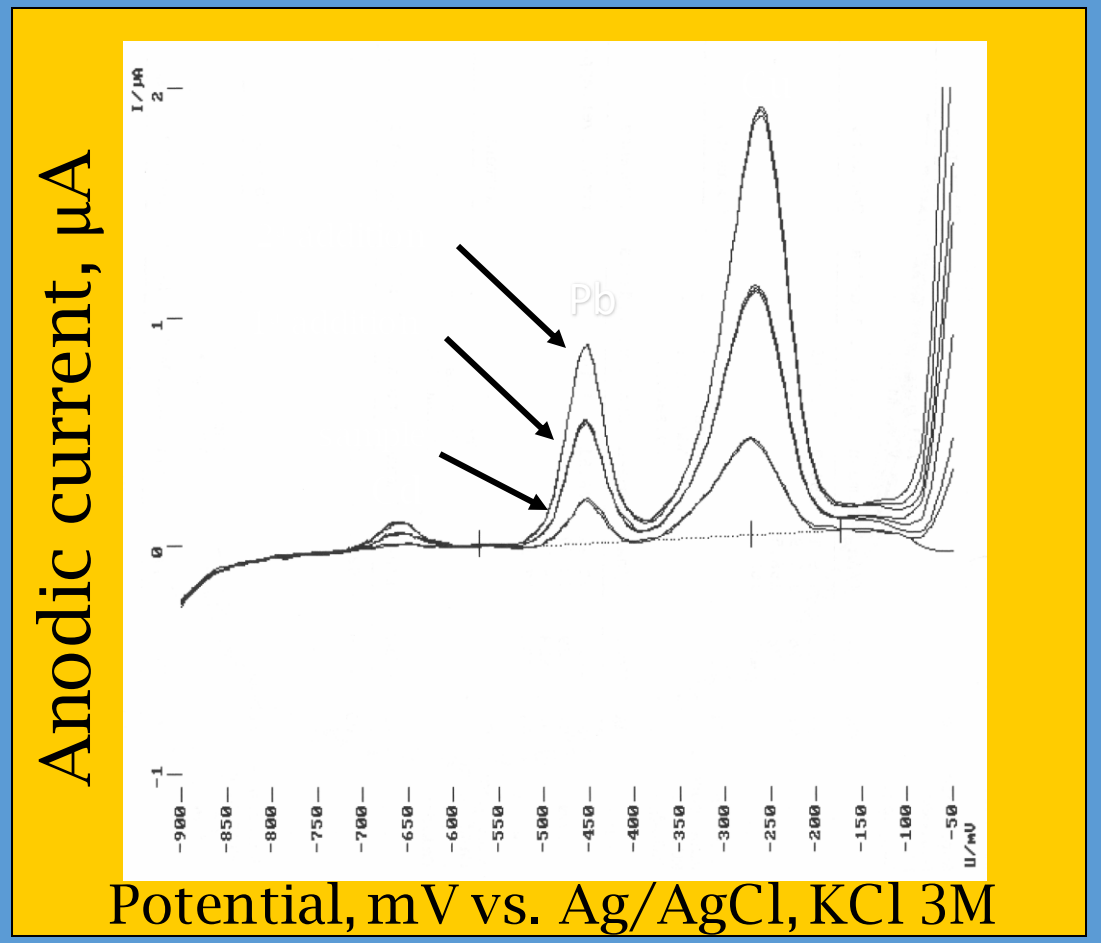
ANODIC STRIPPING VOLTAMMETRY (SWASV)



Polarographic system 746, VA Stand 747, Metrohm

- Working electrode: RDE, mercury film on carbon paste electrode
- Reference electrode: Ag/AgCl, KCl 3M
- Auxiliary electrode: graphite carbon

Typical voltammogram



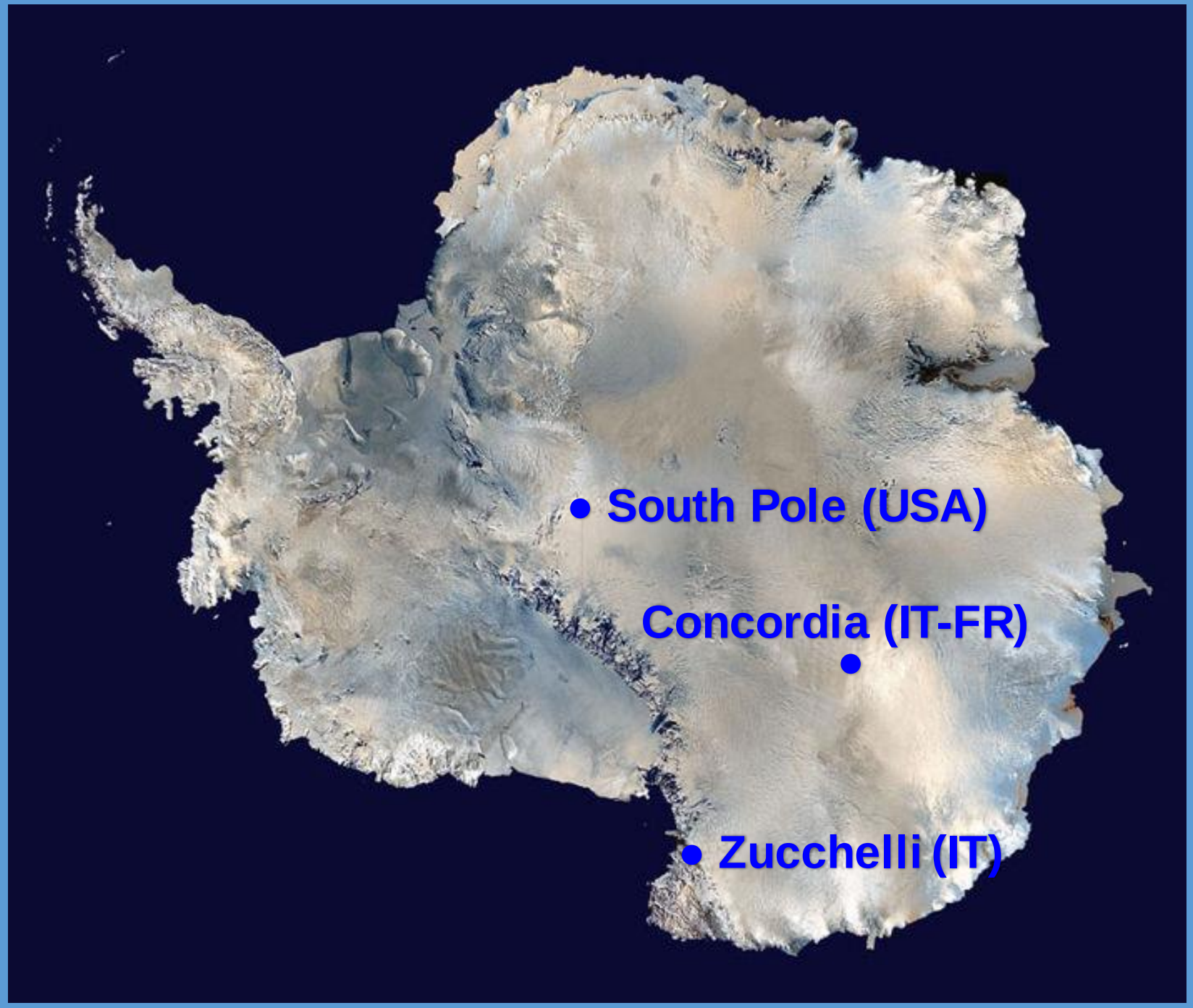
Il caso del Piombo in Antartide

↓

I nostri dati

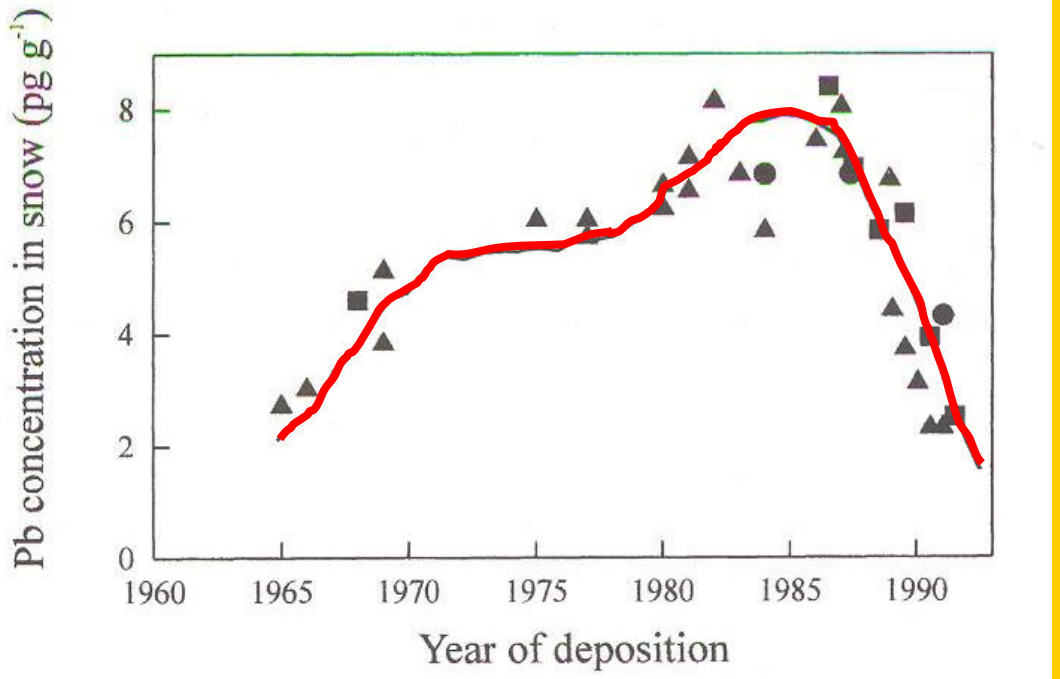
↓

Segnali di riduzione

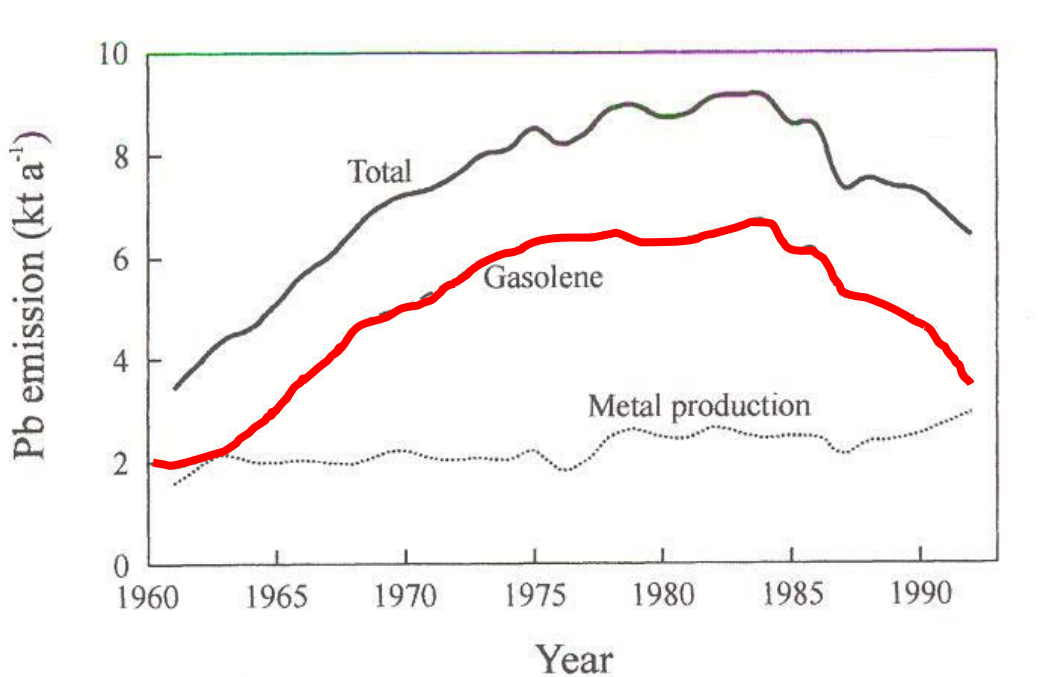


SIGNALS OF LEAD DECREASE IN THE ANTARCTIC SNOW

Pb in ice cores (Victoria Land, Antarctica)*



Pb emissions in atmosphere (Oceania, South Pacific, Sector)*

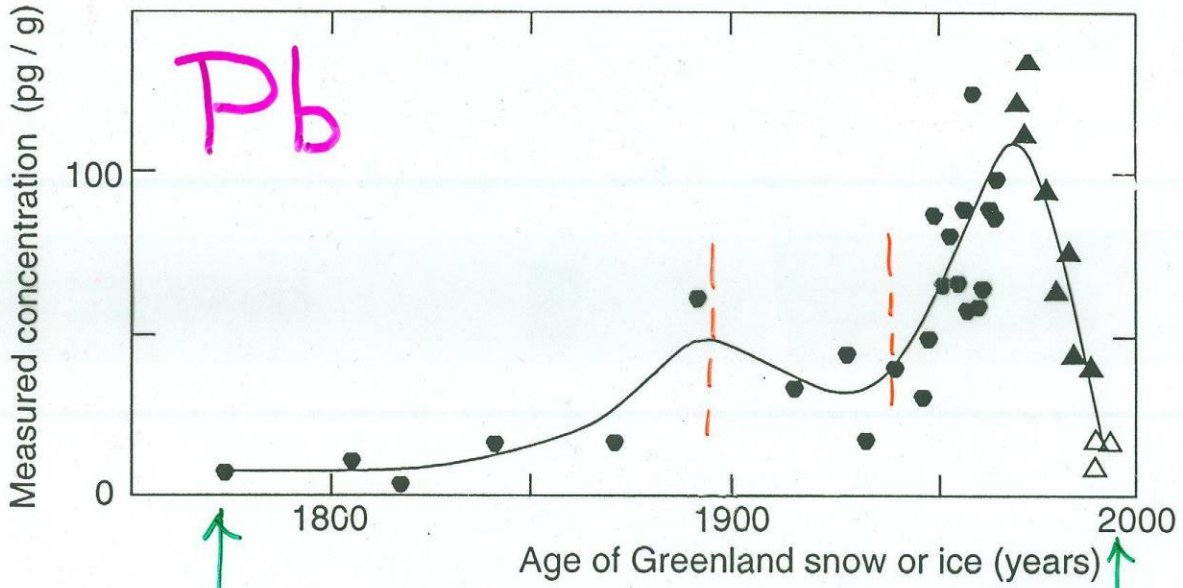


Relationship with lead emissions from leaded gasoline

* Barbante C. *et al.*, *Intern. J. Environ. Anal. Chem.*, 1997

The same observation in the Arctic

Pb, Greenland ice/snow (post Industrial Revolution period).



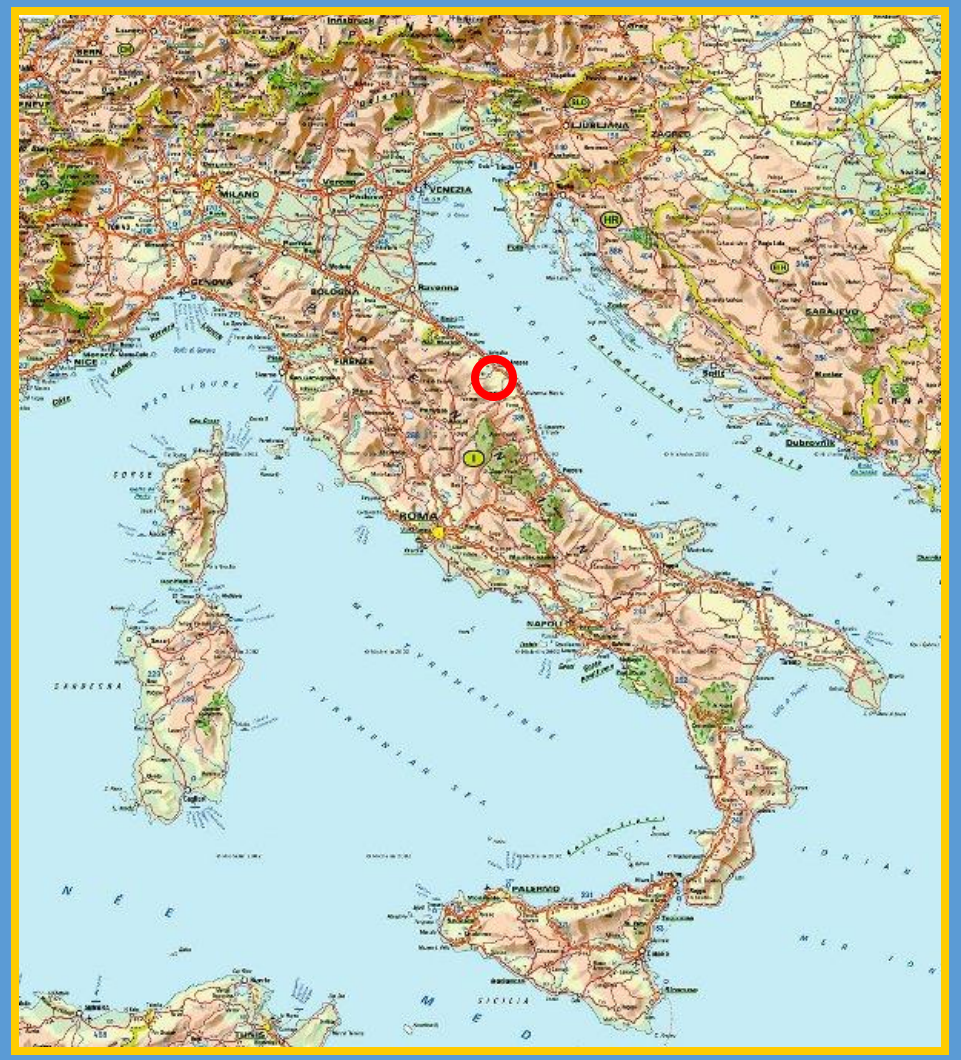
1772
≃ 70 m

1992
Surface

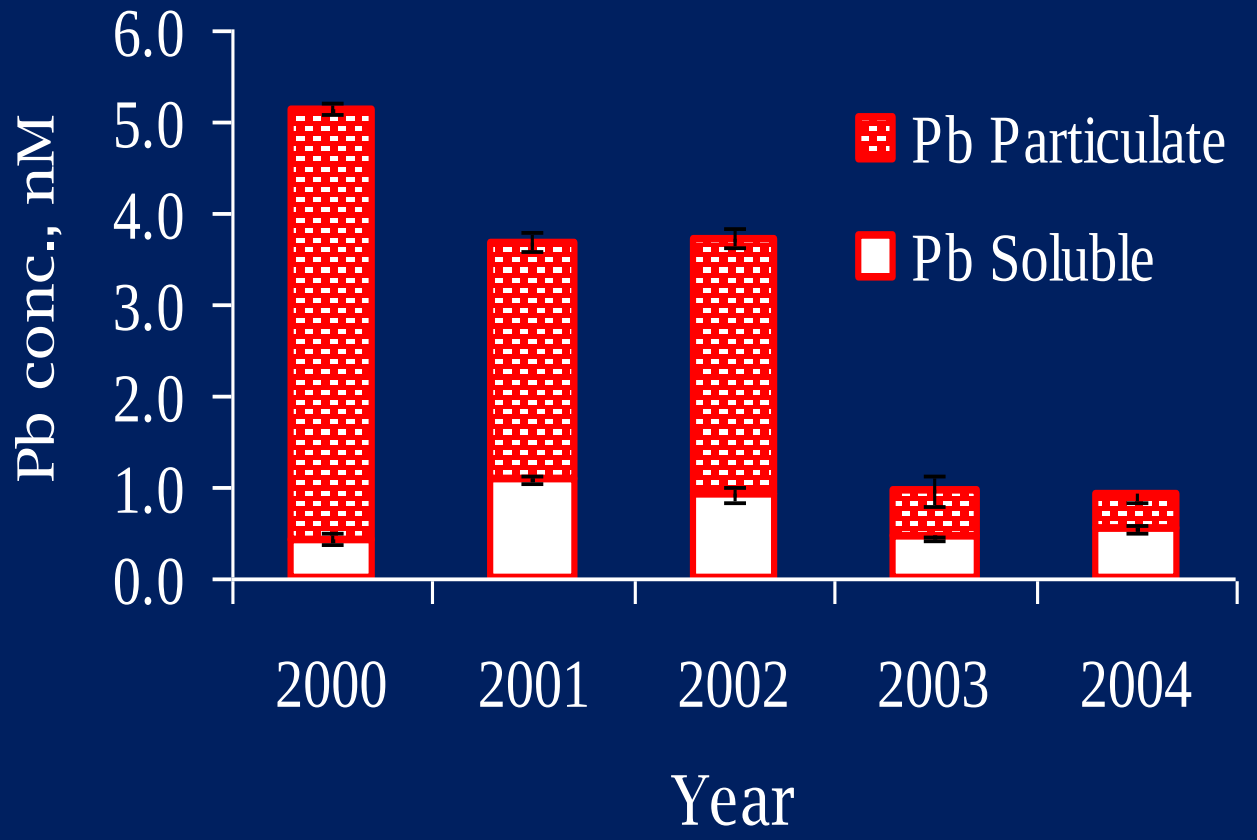
Candelone, Hong and Boutron, J. Geophys. Res., 1995

SNOW OF THE APENNINES

Samples collected during winters 2000-2004 on summit of Mount Cornaccione (1700 m asl)



LEAD IN SNOW OF THE APENNINES



Conc. variation 2000-2004	
Total concentration	~80% decrease
Particulate concentration	~90% decrease

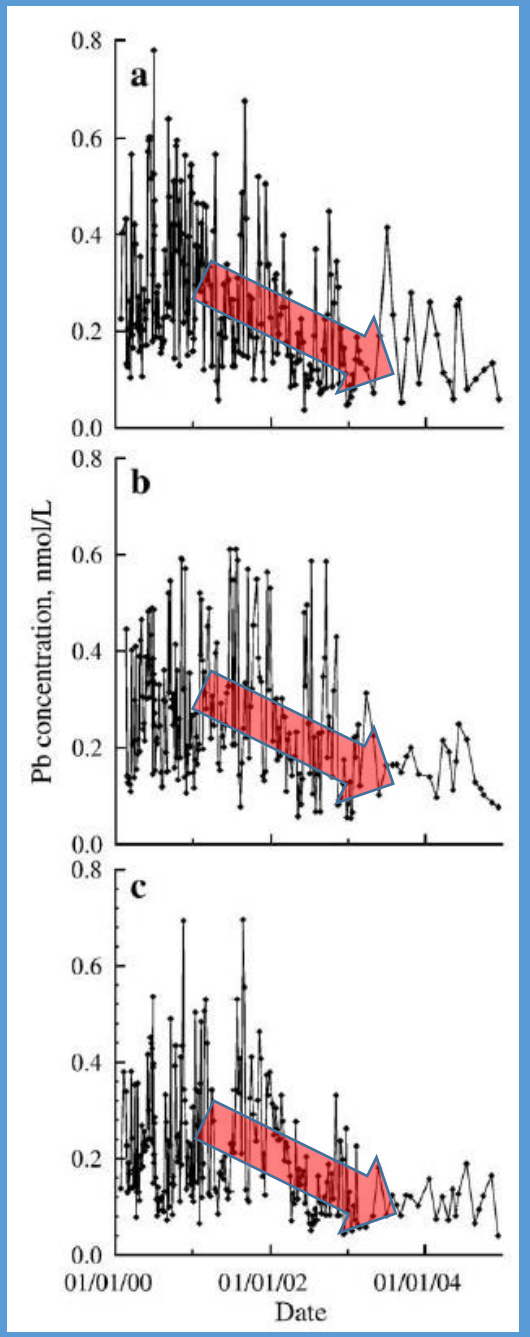
LEAD IN ADRIATIC COASTAL SEAWATER (2001-2004)

Three sites of Ancona coast

Esino

Api

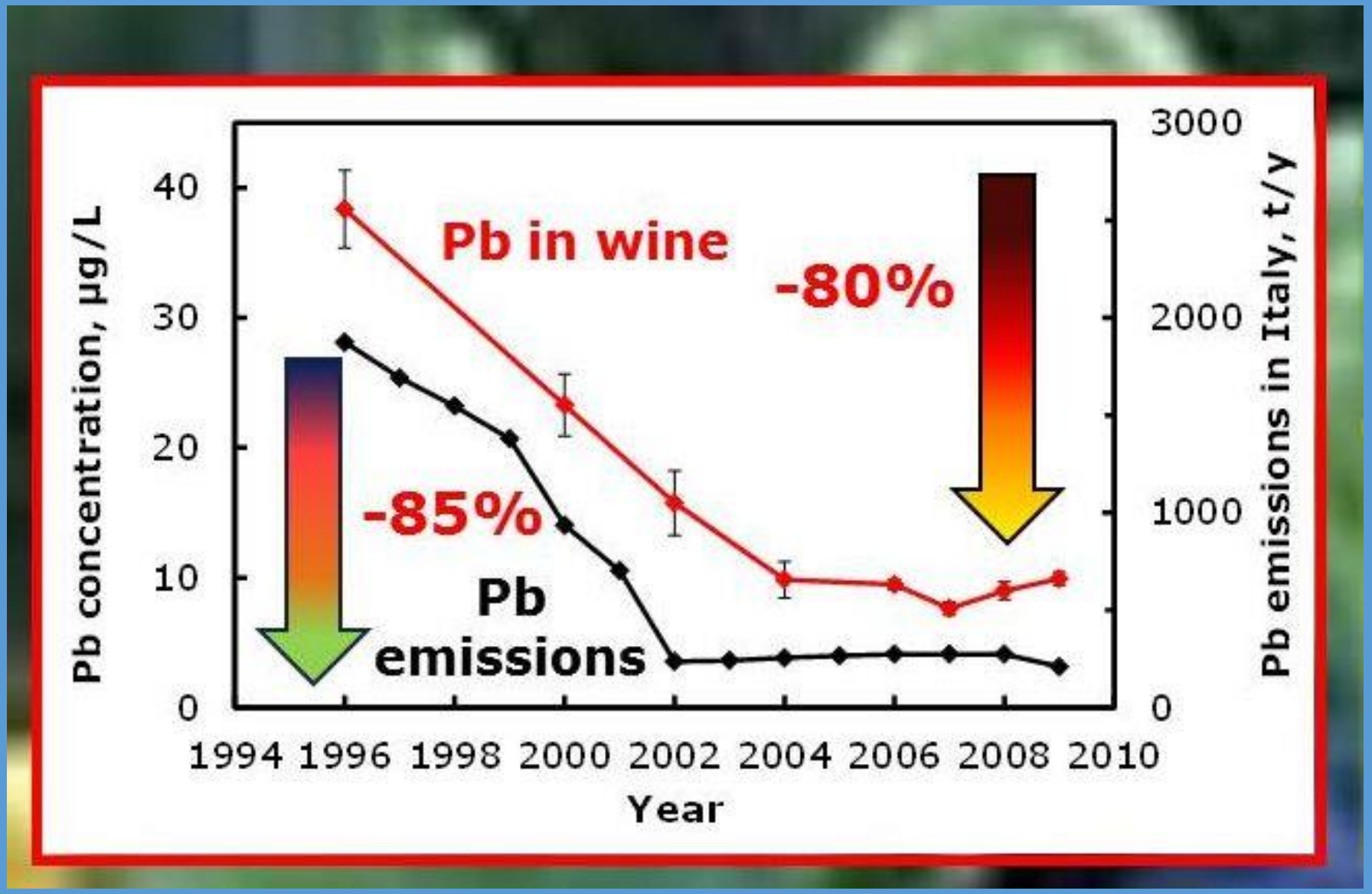
Portonovo



Time series

~50% decrease from 2000-01 to 2003-04

LEAD IN WINE



White wine:

Verdicchio dei Castelli di Jesi Classico Superiore Doc «Podium»

~80% decrease from 1996 to 2004

CONCLUSION

Signals of lead reduction in:

SNOW – from Antarctica and Apennines
SEAWATER – from Adriatic coast
WINE – from the Marche Region

Measurements in Antarctica and in Italy show recent lead reduction in snow, sea water and wine related to the elimination of lead from gasoline

This is one of the best examples which demonstrates that actions against pollution may have effect even at a global scale