



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DST

Dipartimento di
Scienze della Terra

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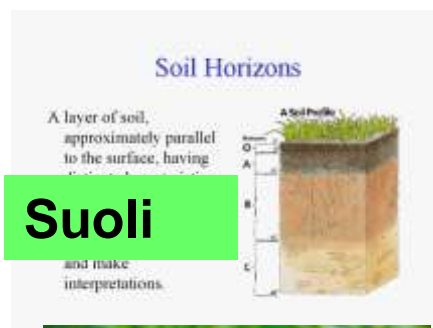
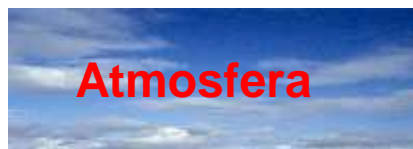
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Geochimica



Scienza che studia la composizione chimica della Terra e le leggi che regolano la distribuzione spaziale e temporale degli elementi e degli isotopi nelle sue varie parti

Materiali naturali oggetto di studio



Perchè è importante conoscere i cicli degli elementi e/o di specie chimiche?

L'impatto dell'agricoltura industrializzata sui cicli dell'N e del P



PLANETARY BOUNDARIES				
Earth-system process	Parameters	Proposed boundary	Current status	Pre-industrial value
Climate change	(i) Atmospheric carbon dioxide concentration (parts per million by volume)	350	387	280
	(ii) Change in radiative forcing (watts per metre squared)	1	1.5	0
Rate of biodiversity loss	Extinction rate (number of species per million species per year)	10	>100	0.1-1
Nitrogen cycle (part of a boundary with the phosphorus cycle)	Amount of N ₂ removed from the atmosphere for human use (millions of tonnes per year)	35	121	0
Phosphorus cycle (part of a boundary with the nitrogen cycle)	Quantity of P flowing into the oceans (millions of tonnes per year)	11	8.5-9.5	-1
Stratospheric ozone depletion	Concentration of ozone (Dobson unit)	276	283	290
Ocean acidification	Global mean saturation state of aragonite in surface sea water	2.75	2.90	3.44
Global freshwater use	Consumption of freshwater by humans (km ³ per year)	4,000	2,600	415
Change in land use	Percentage of global land cover converted to cropland	15	11.7	Low
Atmospheric aerosol loading	Overall particulate concentration in the atmosphere, on a regional basis	To be determined		
Chemical pollution	For example, amount emitted to, or concentration of persistent organic pollutants, plastics, endocrine disrupters, heavy metals and nuclear waste in, the global environment, or the effects on ecosystem and functioning of Earth system thereof	To be determined		



nature

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FEATURE

A safe operating space for humanity

Identifying and quantifying planetary boundaries that must not be transgressed could help prevent human activities from causing unacceptable environmental change, argue **Johan Rockström** and colleagues.

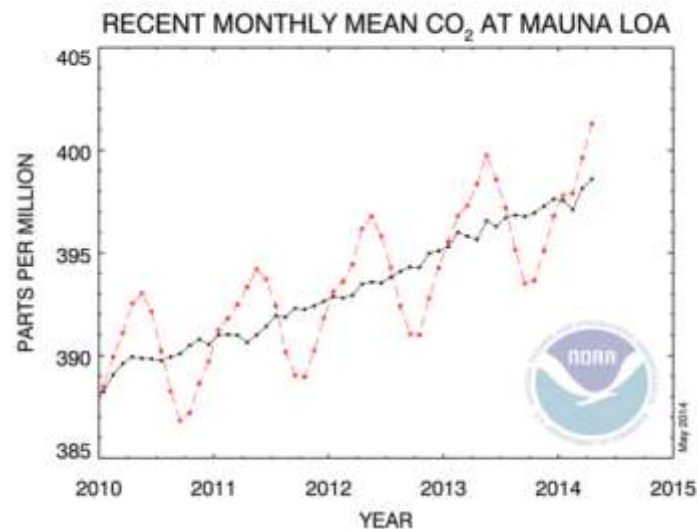
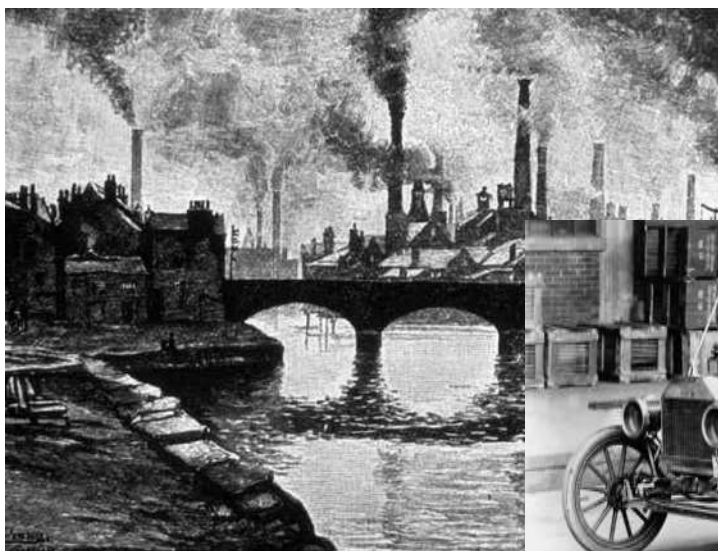
REVIEW

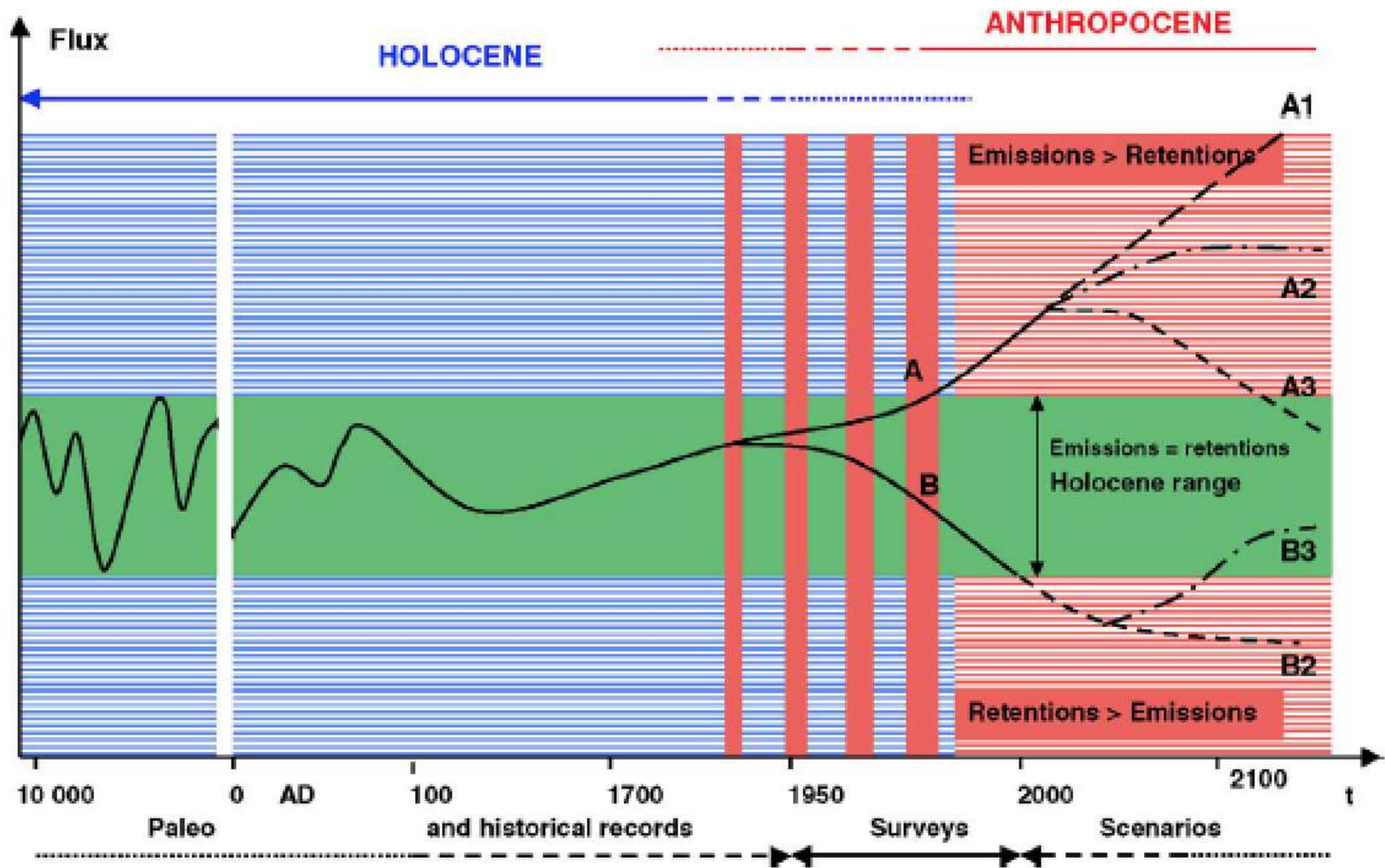
Open Access

The cost of living in the Anthropocene

Michael R Gillings^{1*} and Elizabeth L Hagan-Lawson²

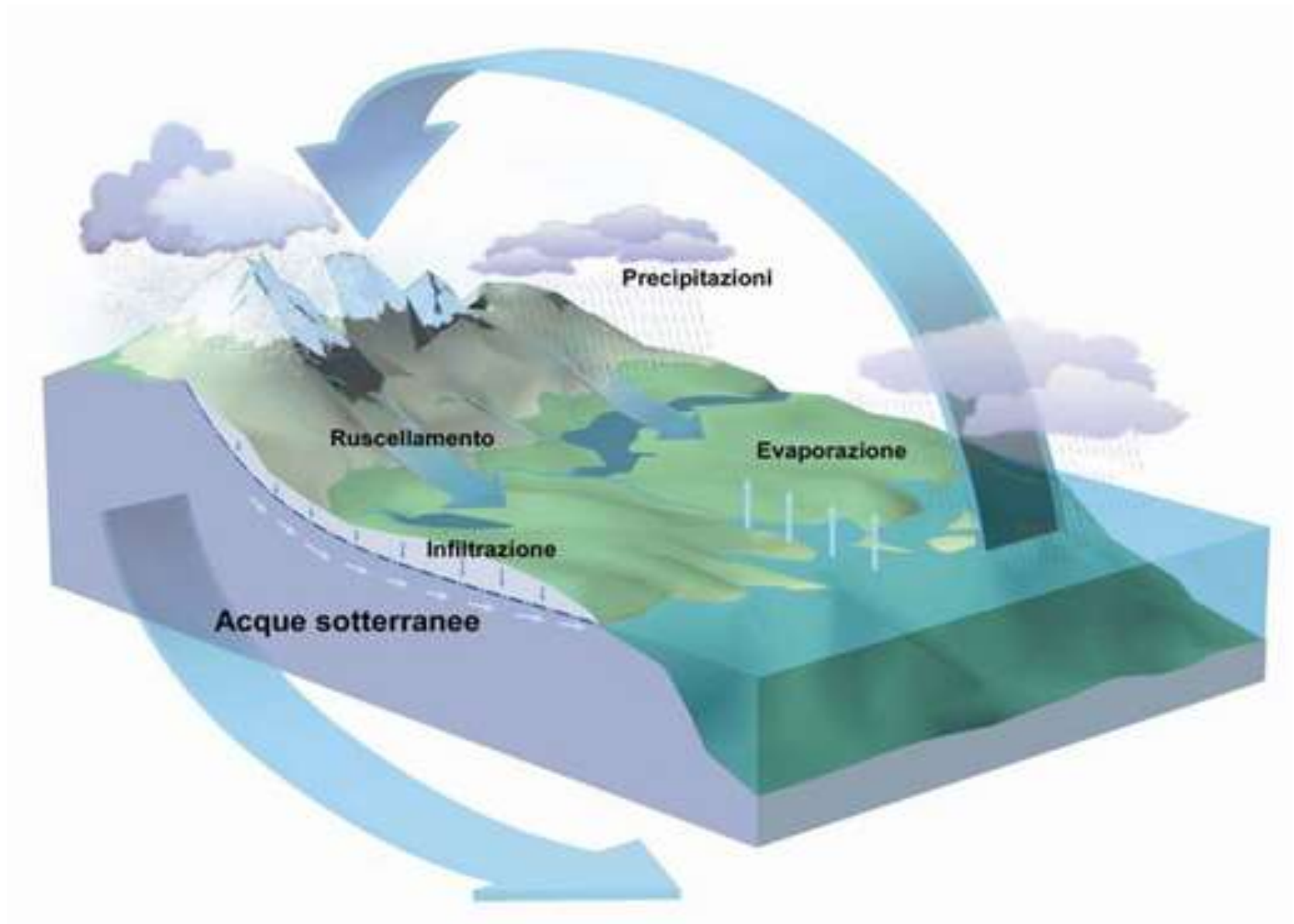
18° secolo → oggi



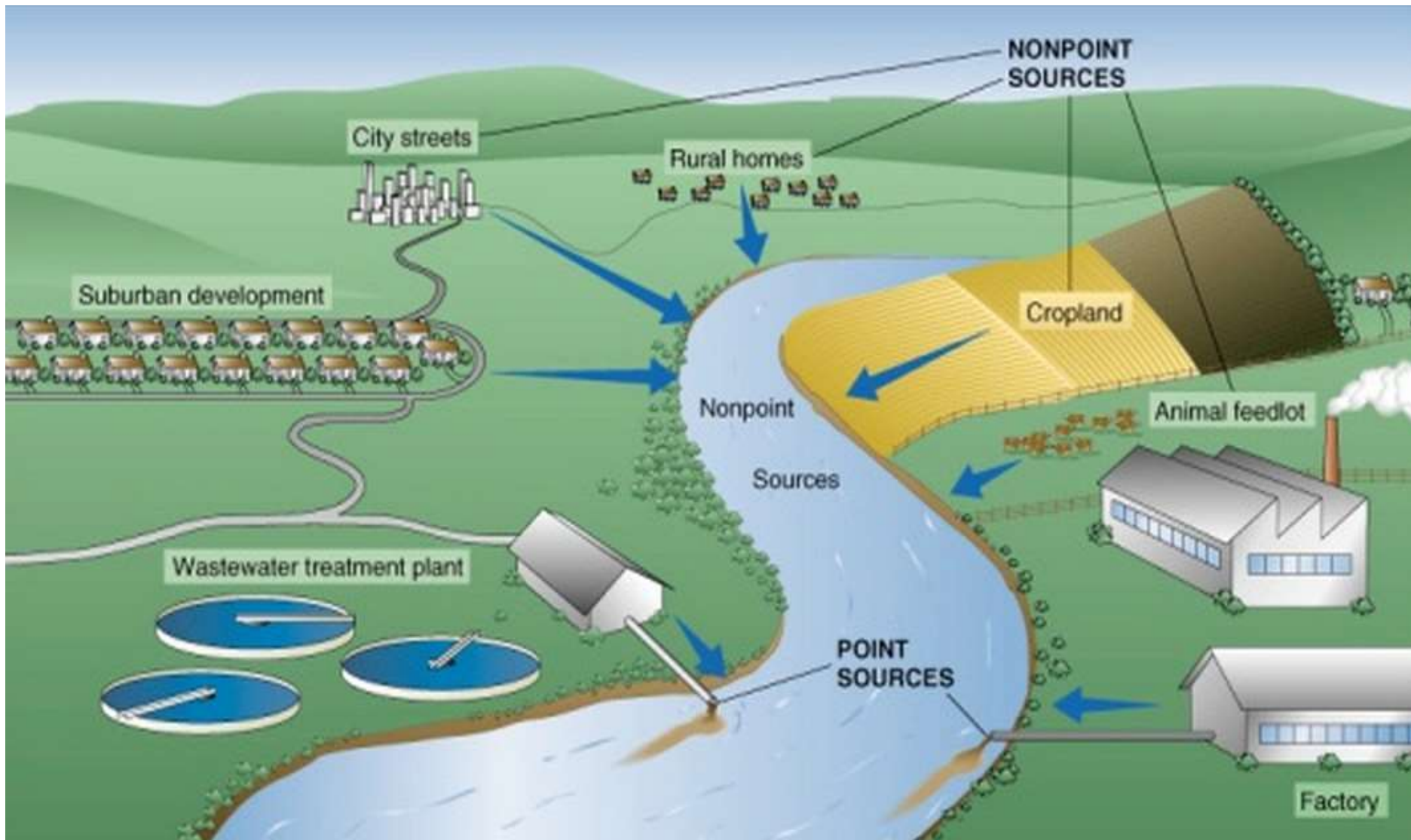


Input di origine antropica superano la capacità dei sistemi fluviali di mantenere i cicli naturali degli elementi (P, N, trends osservati di tipo A). Trend inversi (B) si osservano per il materiale in sospensione (Meybeck and Vörösmarty, 2005).

Studio della composizione chimica delle acque naturali



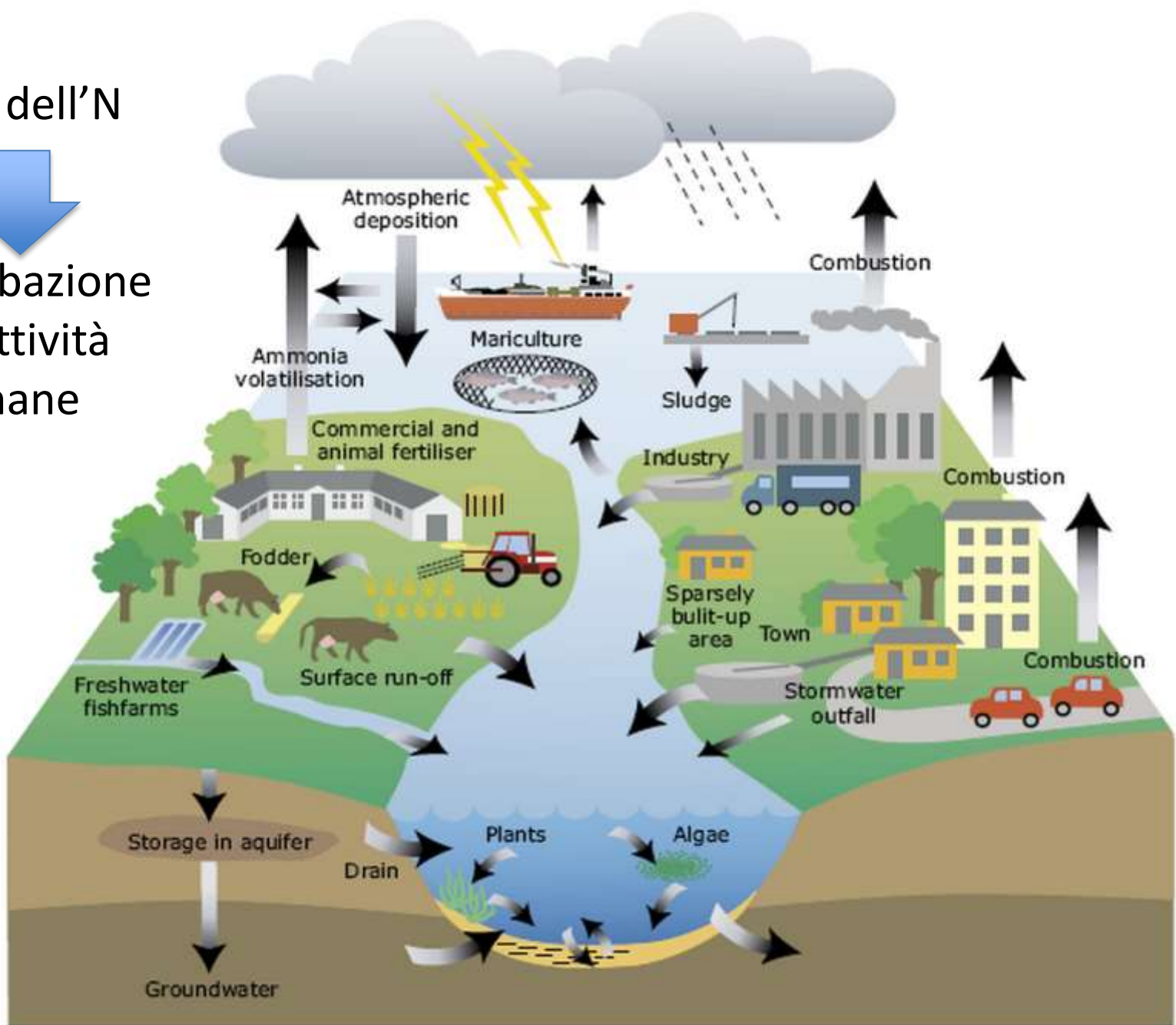
Individuazione di sorgenti di inquinamento puntuali e diffuse



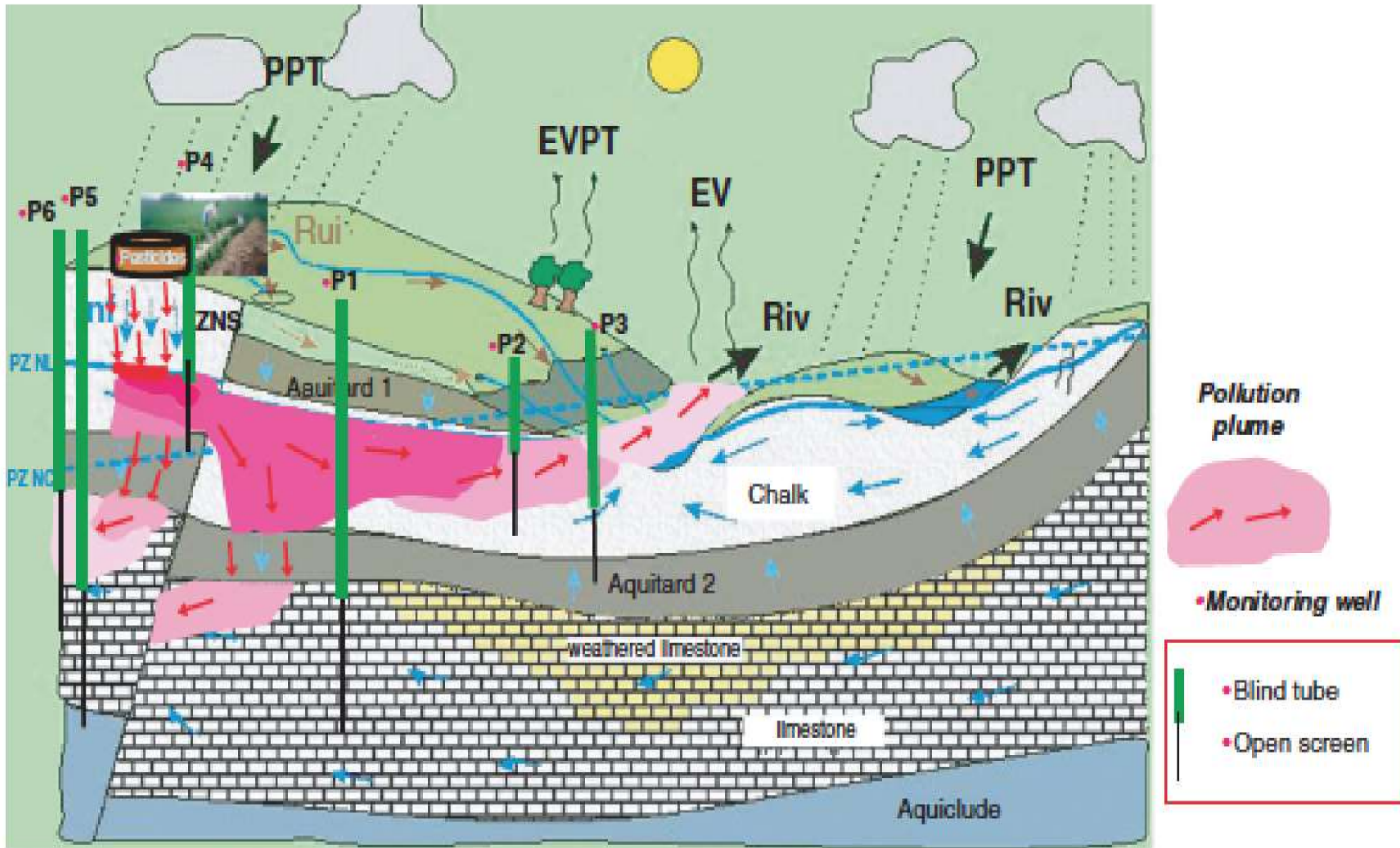
Ciclo dell'N



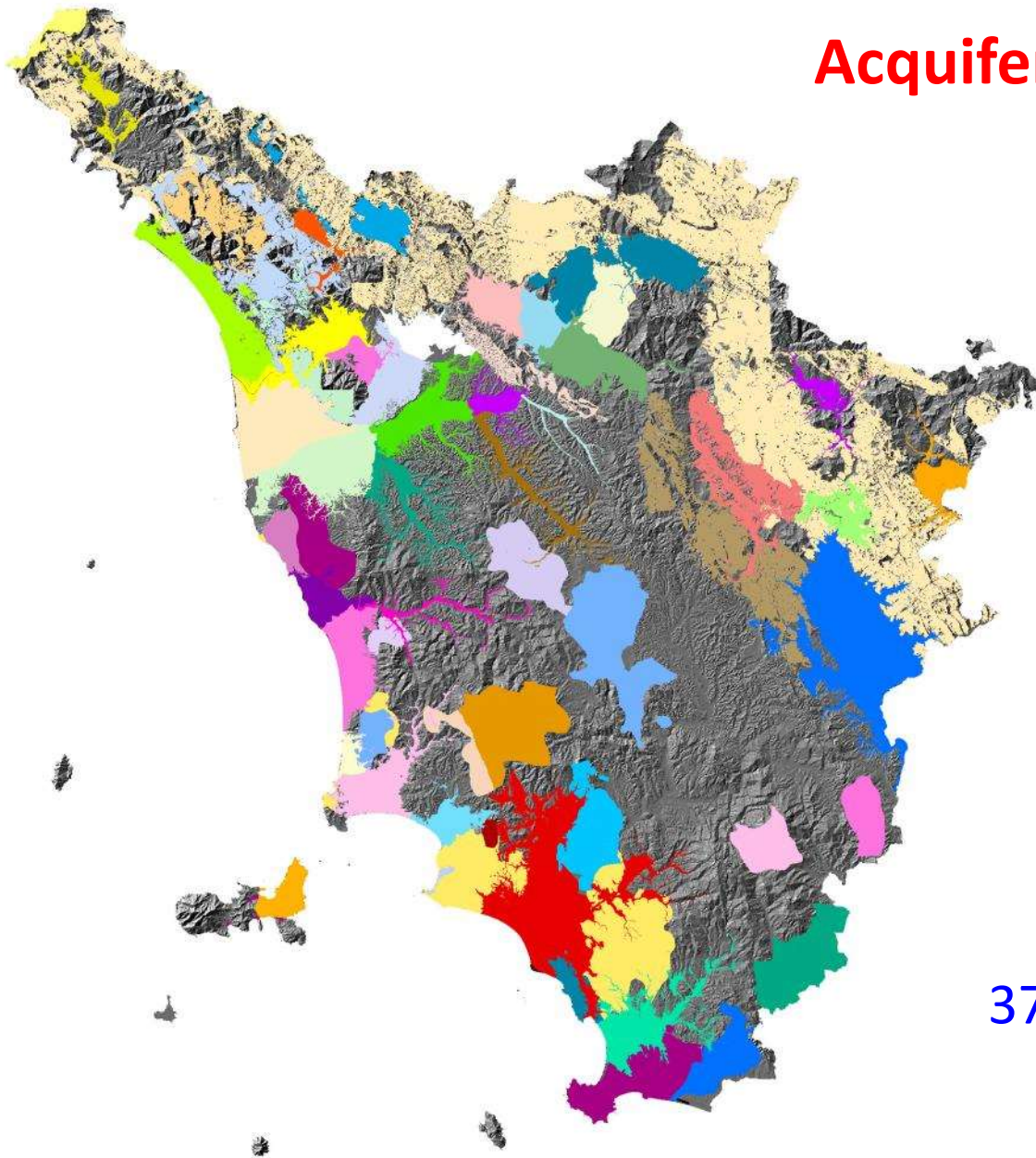
perturbazione
da attività
umane



Flusso di un inquinante nel sottosuolo e interazione con la geologia



Acquiferi principali a scala regionale

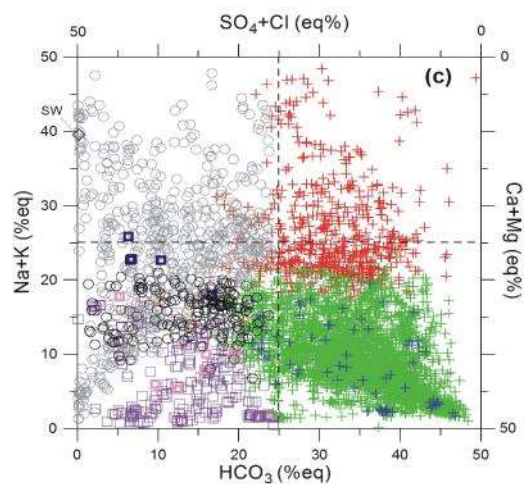
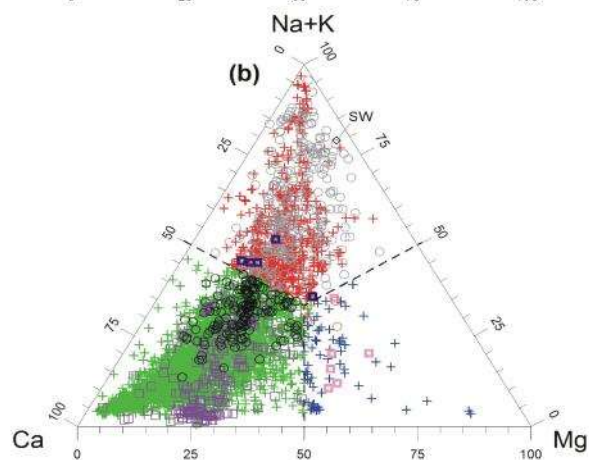
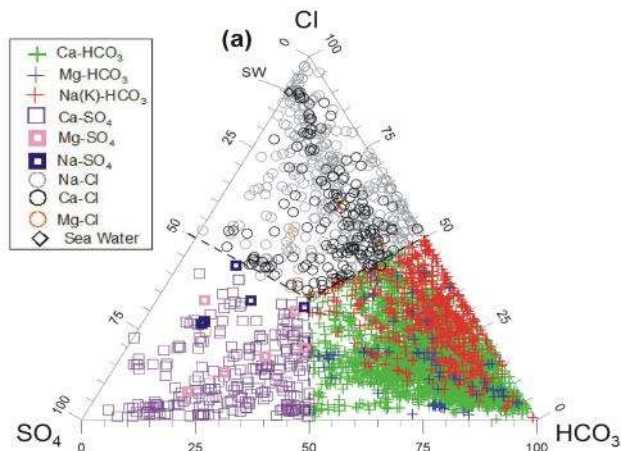


66 acquiferi principali:

37 in materiale poroso, 29 in
rocce fratturate

0 55 km

0 13,750 27,500 55,000 Metri



Composizione chimica principale

Ca-HCO₃ (69.7%)

Na-HCO₃ (11.8%)

Na-Cl (6.9%)

Ca-SO₄ (5.7%)

Ca-Cl (3.8%)

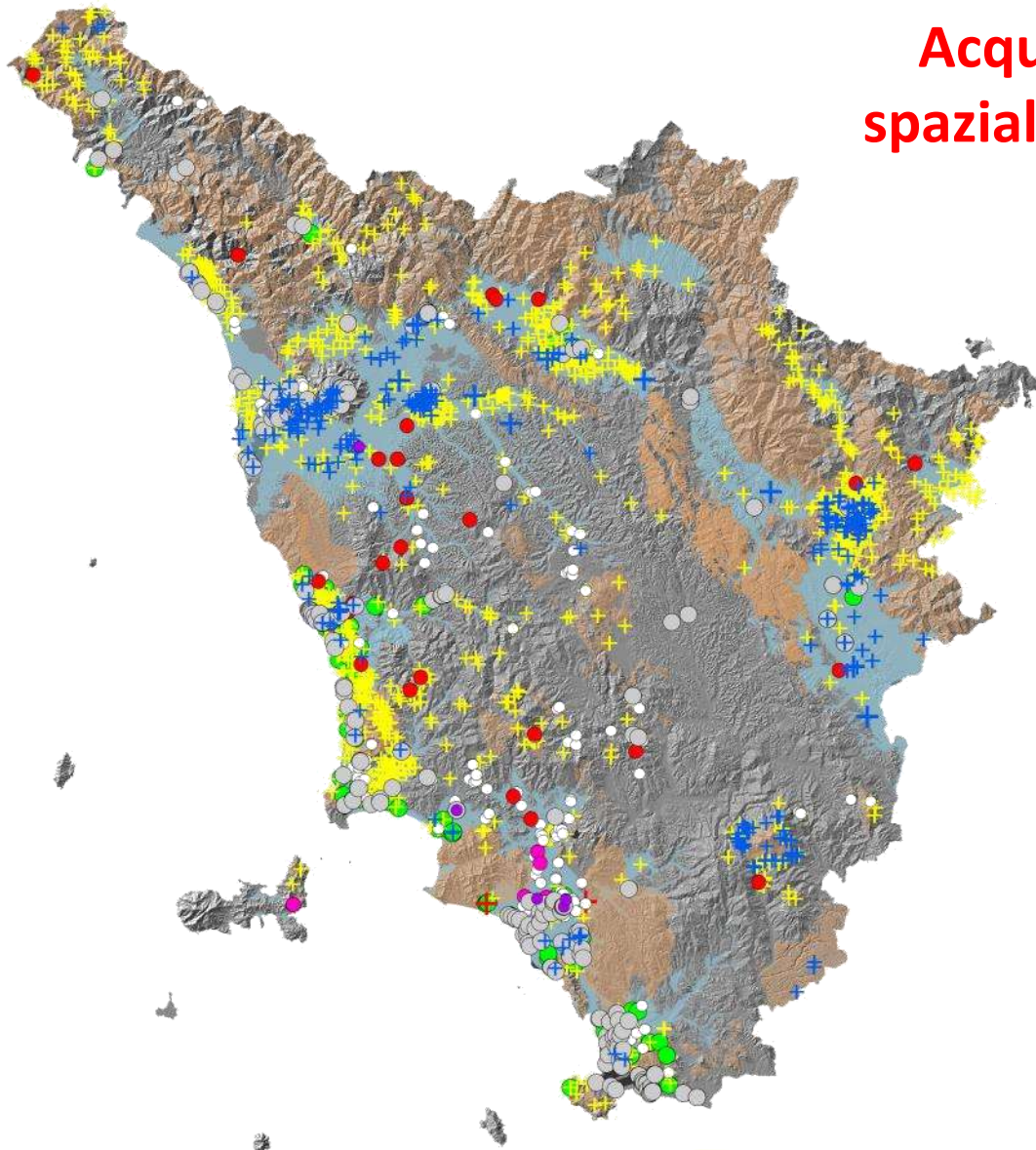
Mg-HCO₃ (1.5%)

Na-SO₄ (0.3%)

Mg-SO₄ (0.1%)

Mg-Cl (0.08%)

Acqua di falda: posizione spaziale delle facies chimiche



- Determinazione dei valori di fondo naturale
- Individuazione delle perturbazioni antropiche

✚ Ca-HCO₃
● Mg-HCO₃
✚ Na(K)-HCO₃

○ Ca-SO₄
● Mg-SO₄
● Na-SO₄

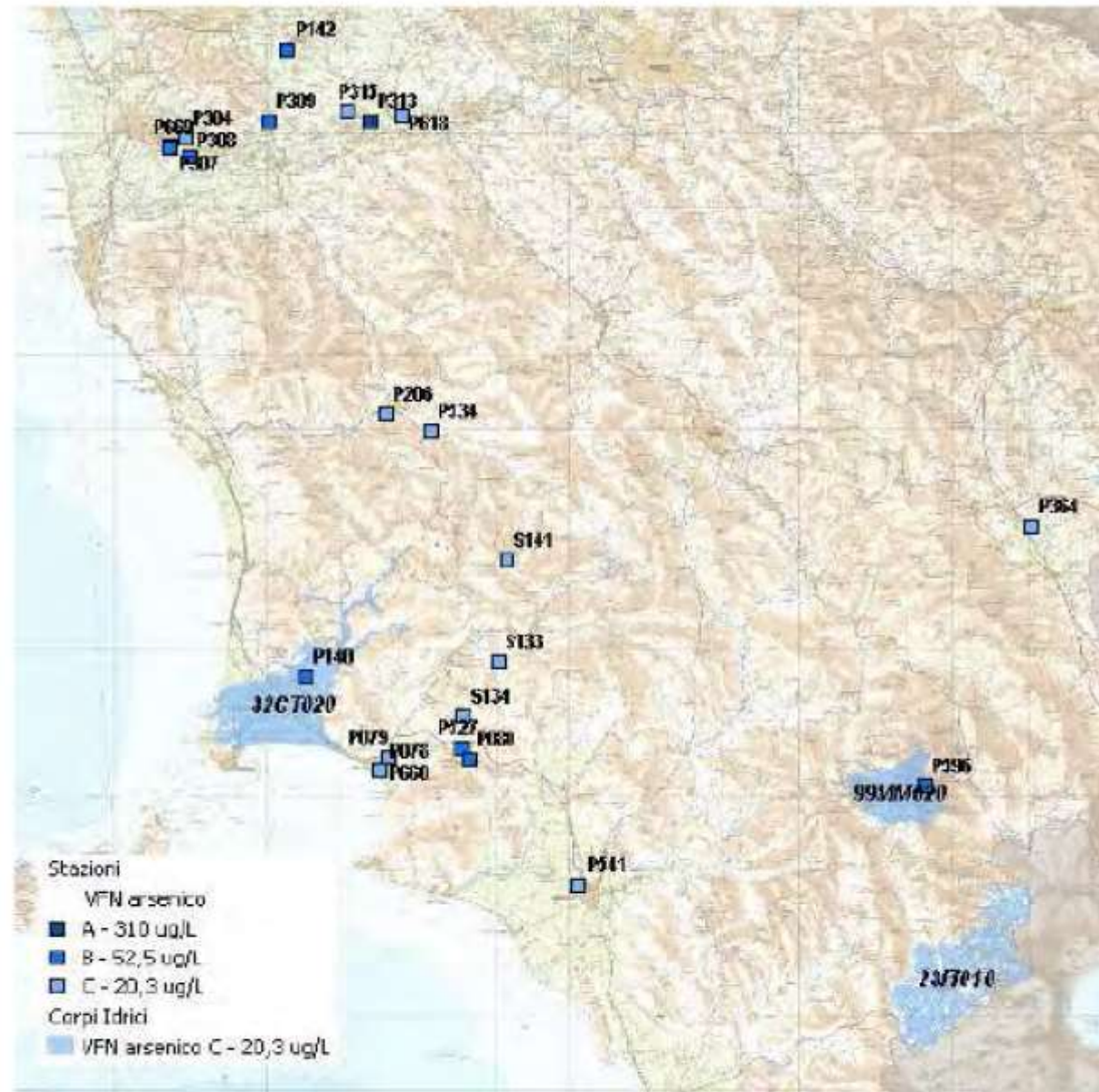
● Ca-Cl
✚ Mg-Cl
○ Na-Cl

Distribuzione
degli
elementi in
traccia e dei
metalli



Arsenico

Determinazione del
valore di fondo
naturale e delle sue
perturbazioni “non
naturali”



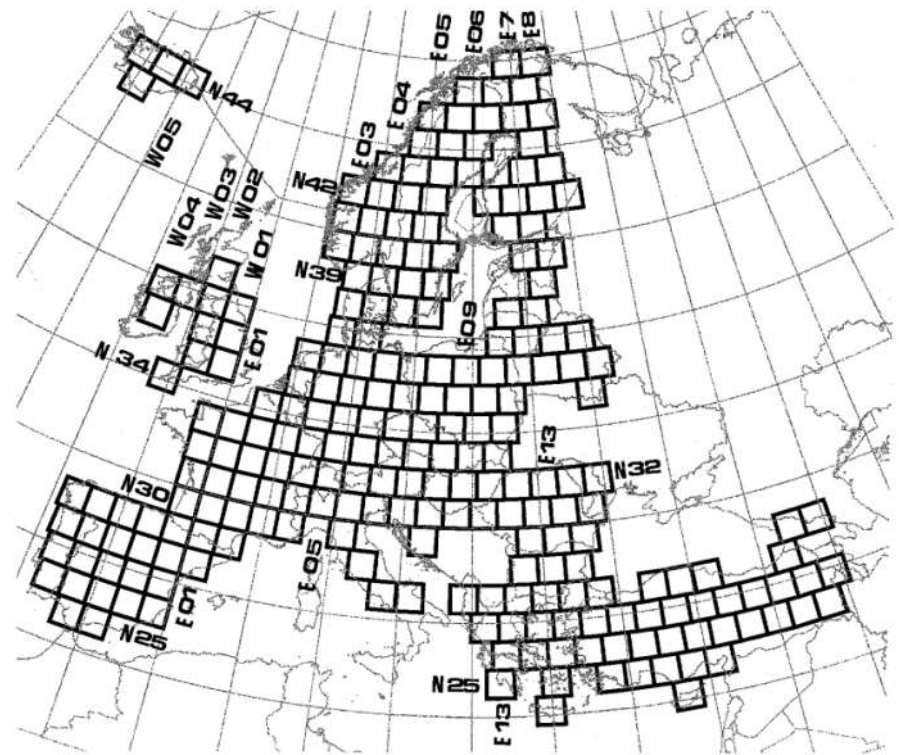
- Arsenico, VFN generali e locali superiori al VS di 10 µg/L



FOREGS (Forum of European Geological Survey)

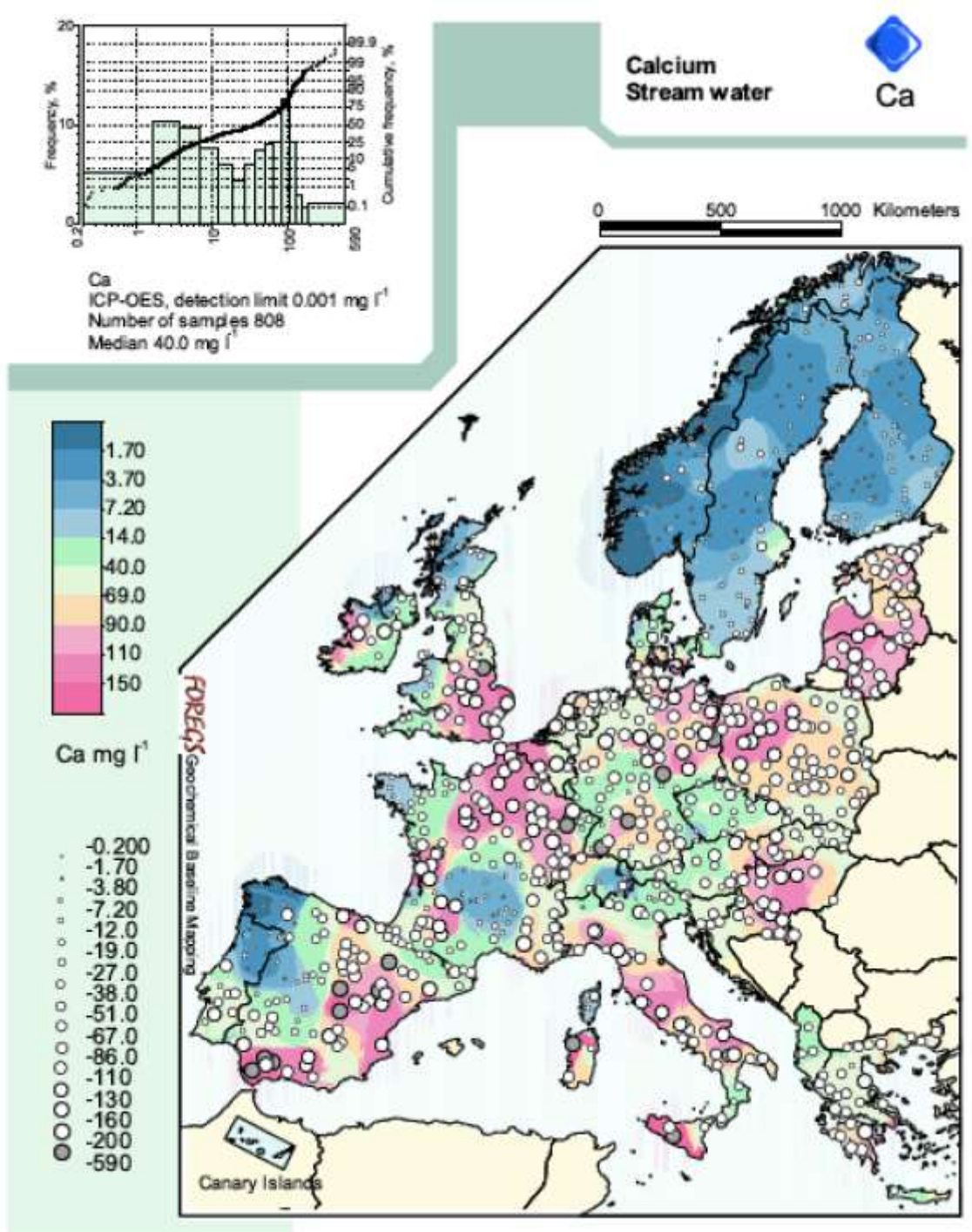
Perchè è importante
raccogliere
l'informazione
“geochimica” a differenti
scale?

“Geochemistry is the science that studies the chemistry of the Earth as a whole. Our quality of life and the potential for sustainable development depend on the geochemistry of the near-surface environment – the distribution of chemical elements in minerals, rocks, soils, sediments, water, plants and the atmosphere.”



Global Terrestrial Network (GTN) 160 km ×
160 km cells

Geochemica a scala continentale



... l'acqua non è solo nostra!

