

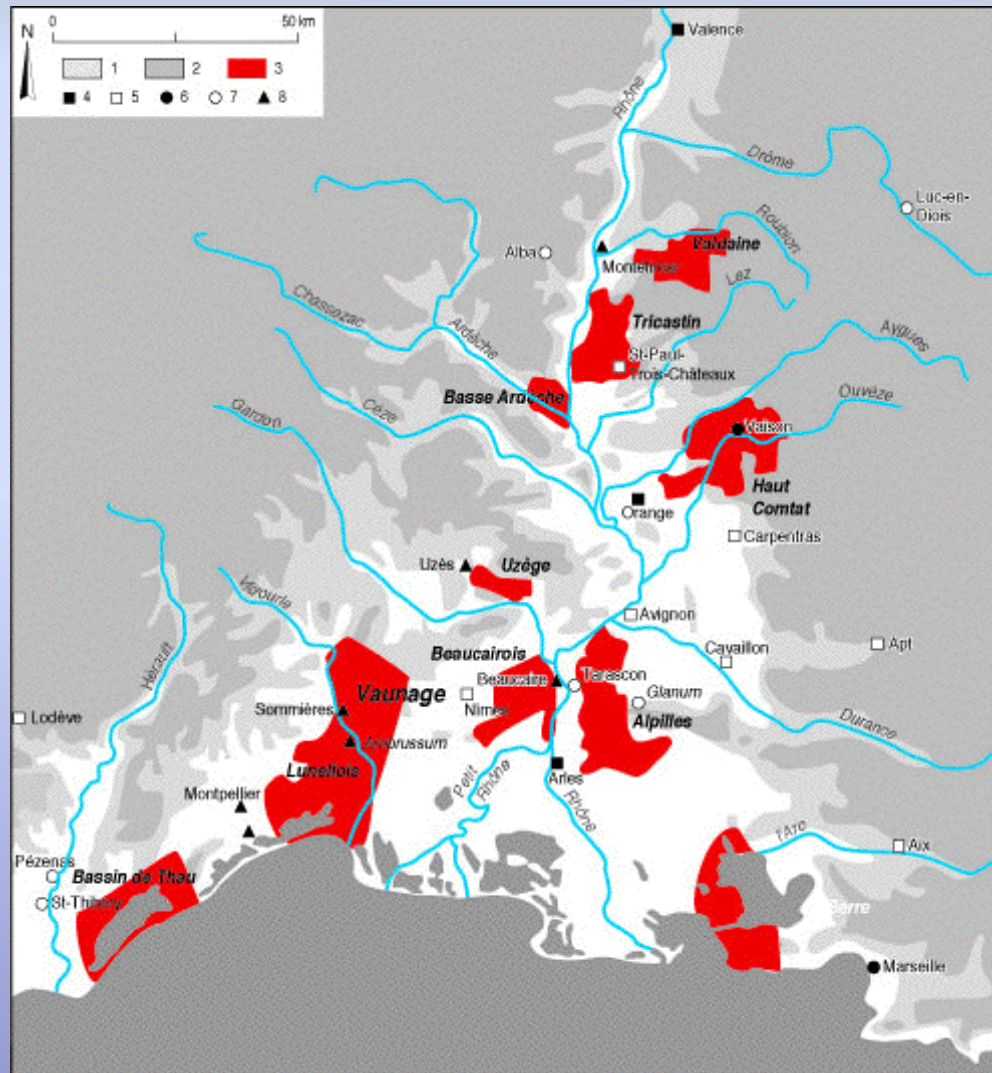
Understanding land degradation
abandonment: the role of the very long
term

Sander van der Leeuw
Department of Anthropology,
Arizona State University

Reasons for very long-term research

- Increasingly, we are dependent on scenario's to plan a very complex future
 - These are based on the last 50-200 years
 - That is a very high risk strategy
- If you don't take the longer term into account:
 - you miss the long time-scales (millennia)
 - you overlook many instances of the dynamic
 - your sample is biased towards the present
 - you overlook the change of change
 - you overlook the role of legacies

The Lower Rhone valley

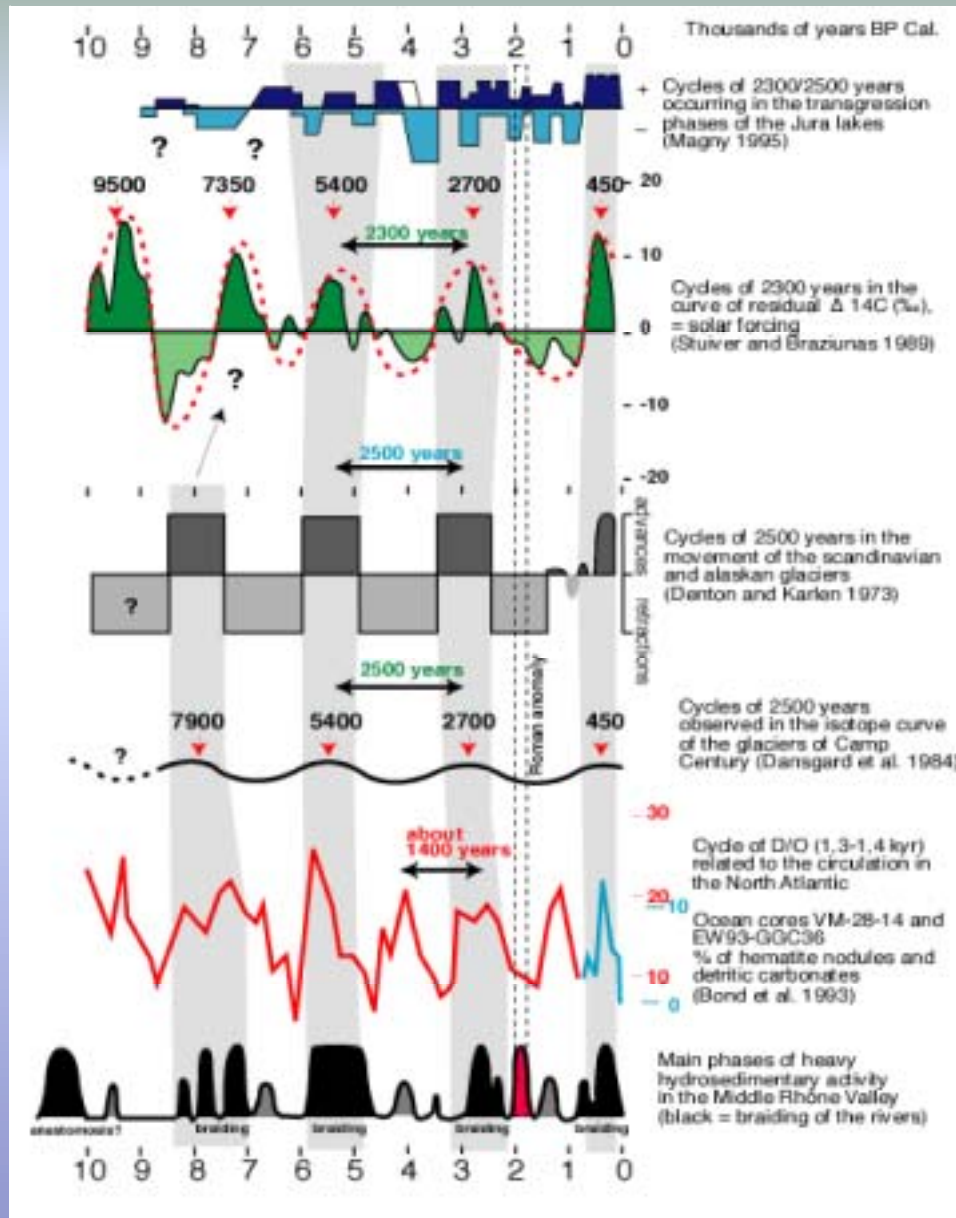


The main environmental events

- **The beginnings of the Holocene:** diffuse erosion under an expanding vegetation cover, dominated by bio-climatic parameters (10300-7500 bp)
- **The Atlantic and the “climatic optimum”** (7.500-4.500 bp): biostasis and the first crises of the landscape in the Neolithic and the Chalcolithic
- **Later prehistory** (4.400-2.200 bp): strong contrasts between the human and the climatological dynamics.
- **The end of the Iron Age and the Roman period** (2.200-1.500 bp): extensive fragilisation of the geosystem with different morphogenetic consequences.
- **The Middle Ages** (1500 - 500 bp): Relative stability of the landscape, followed by delayed morphogenetic activity due to earlier human pressure on the vegetation.
- **The modern and contemporaneous periods** (500-0 bp): the conjunction of a multiseular climatic deterioration and the holocene maximum in human pressure on the environment.

Different kinds of degradation

- **Erosive crises rejuvenate the soil more or less regularly** (Middle Neolithic, Late Neolithic, Middle Iron Age, Roman period (third century ad), modern period)
- **Degradation due to overintensive agriculture** (Early Roman Empire (first and second centuries, modern period))
- **Degradation of the drainage system of the soil** due to a rise in water table and river/lake levels (Late Neolithic, Chalcolithic, Middle Iron Age, Late Antiquity, Early Middle Ages)
- **Drying out of the soils** contemporaneous with incision of the rivers and a deficit in the annual water balance (Early/Middle Mesolithic, Late bronze Age, Late Iron Age)
- **Regeneration of the organic and mineral compounds in the soil**, and of the soil structure, at the end of long periods which were favourable to pedogenesis wherever the soil was covered by vegetation (trees or grasses/shrubs) (Early neolithic, Late bronze Age, High Middle Ages (10-12th century ad)).

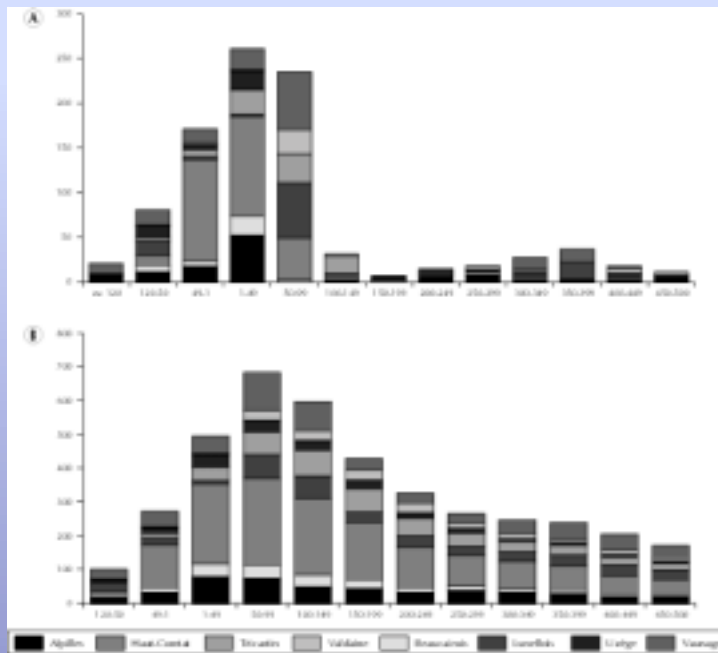


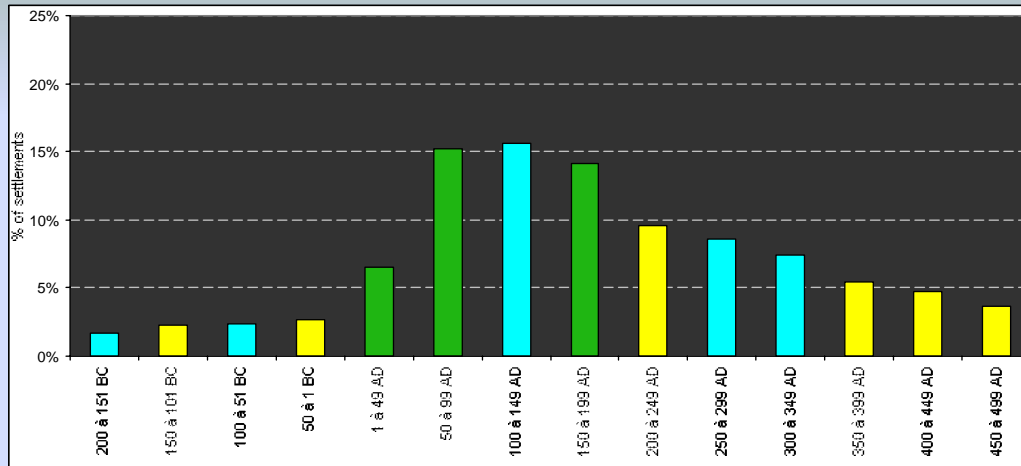
Global
climate
change ... and
a regional
anomaly!

What is special about the Roman period?

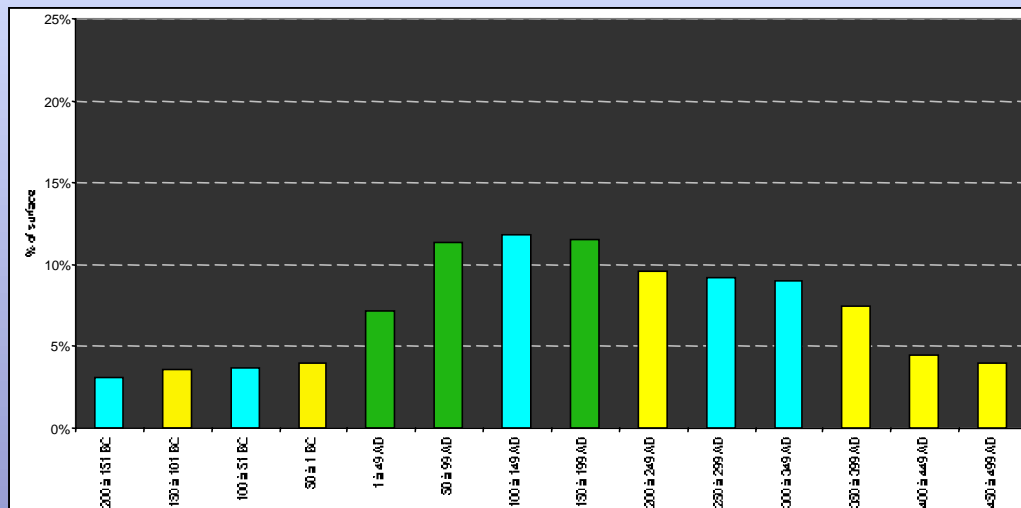
- It was experienced as a crisis
 - We have good data
 - We can study a complete cycle
- Urban perception of the landscape
 - *Centuriations* (land registers)
 - Irrigation agro-industry
 - Rectangular road systems
 - Drainage works
 - Land re-allotments
 - Aqueducts
- Very similar to our own

The Roman settlement of Southern France





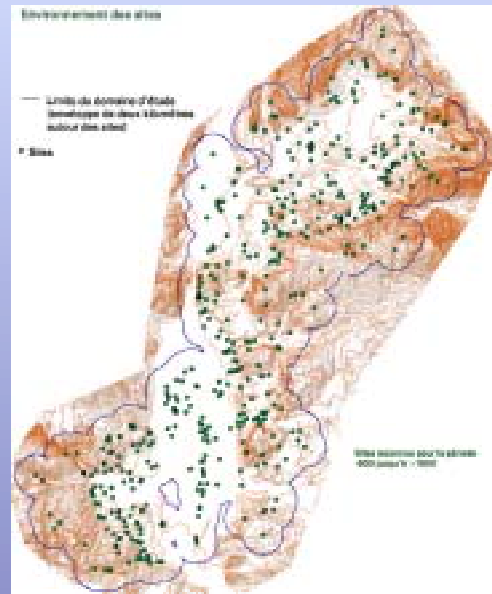
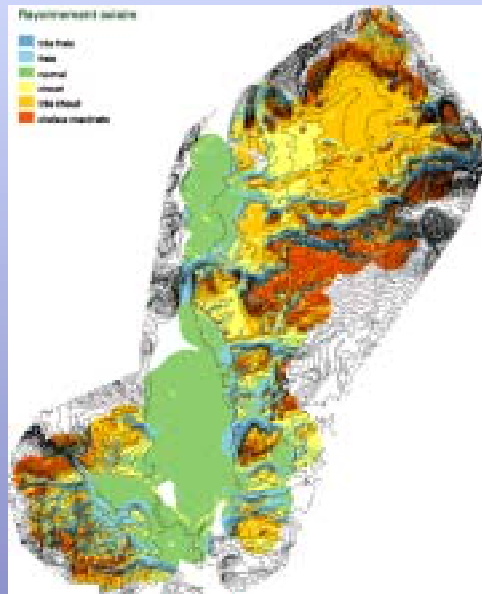
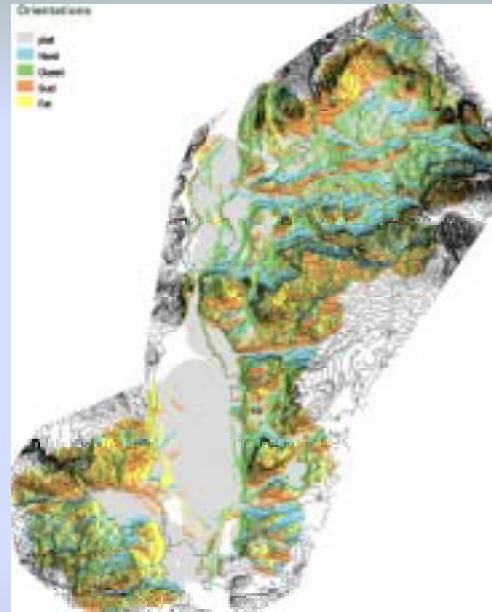
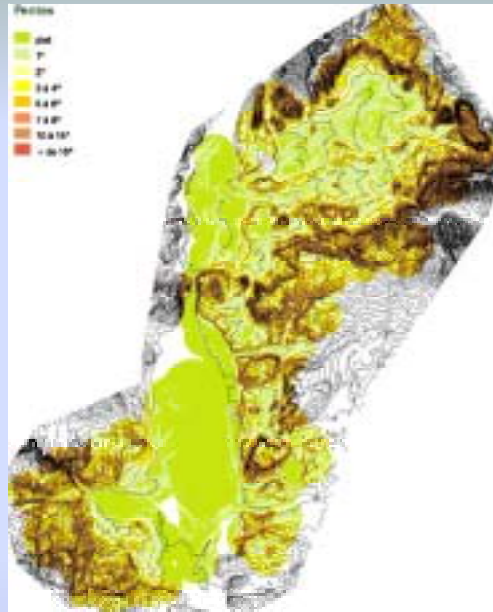
Number of sites per period of 50 years



Total surface settled per period of 50 years

Settlement and climatic stability are independent!

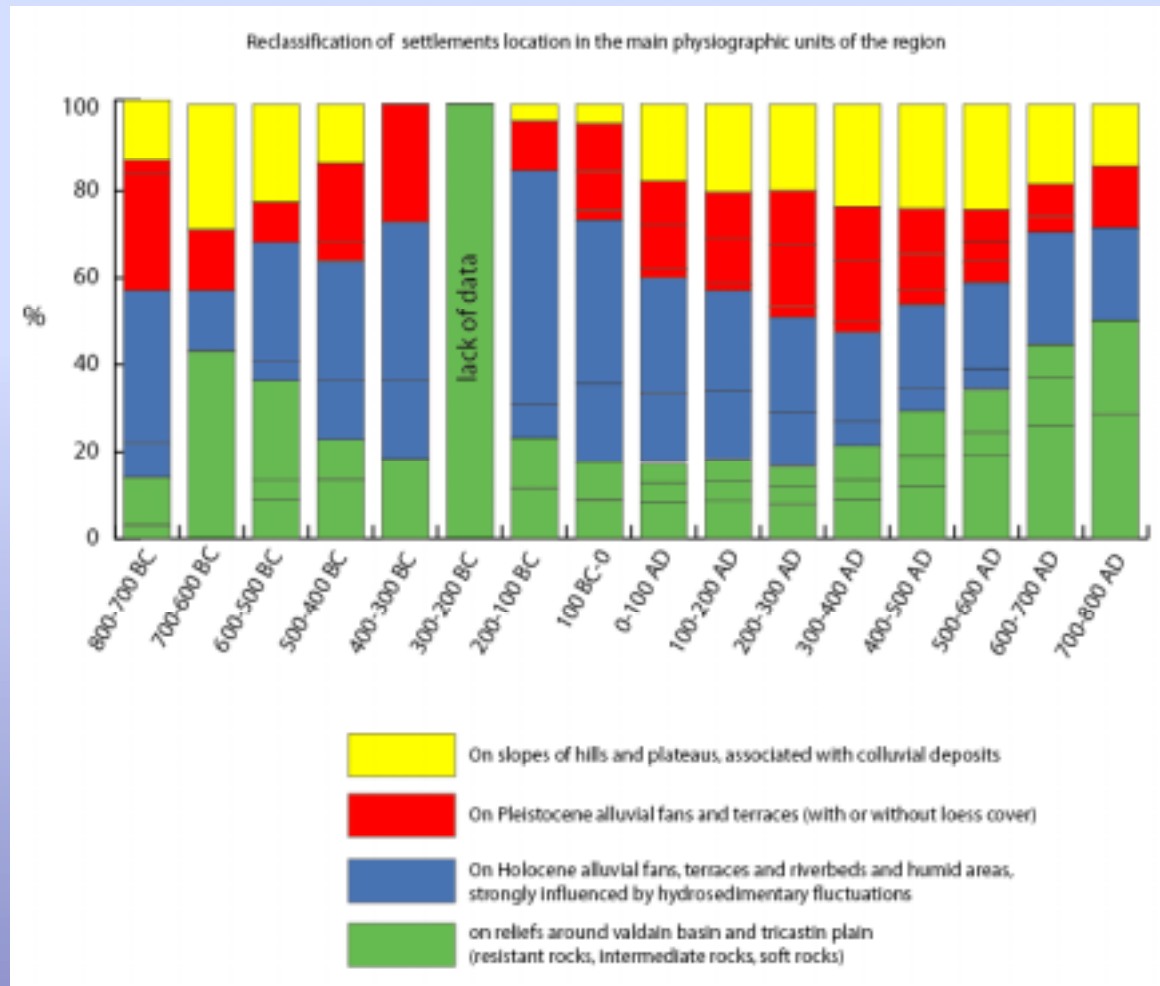
Green: Mixed
 Blue: Unstable
 Yellow: Stable



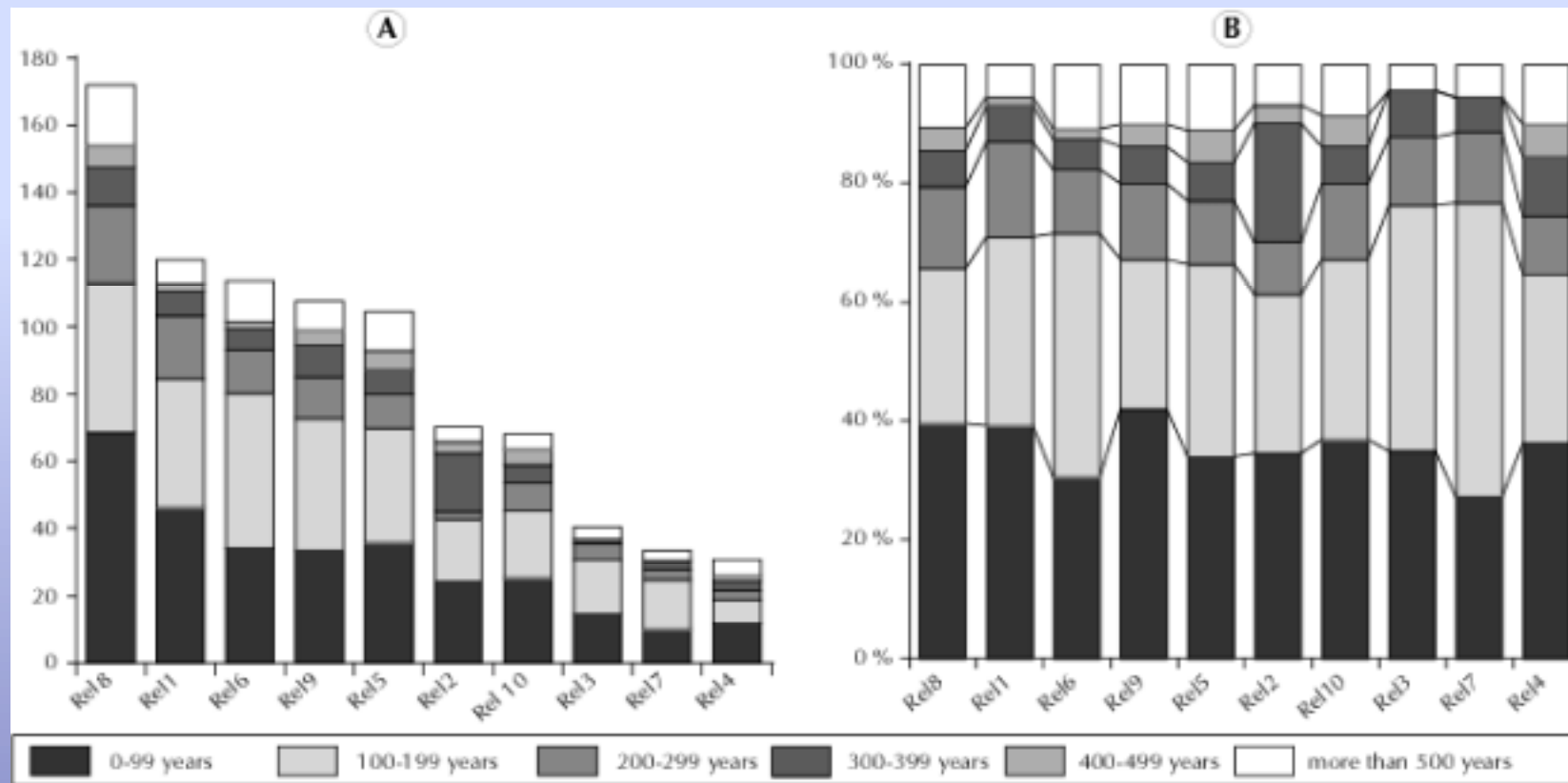
Where do the settlements go?

- Settlements reflect ancient choices about the landscape!

Settlement choices change through time ... but not with the climate!



The 'environmental crisis' is a reorganization driven by the economy



Internal dynamics of the settlement system



1st Cty. AD



5th Cty. AD



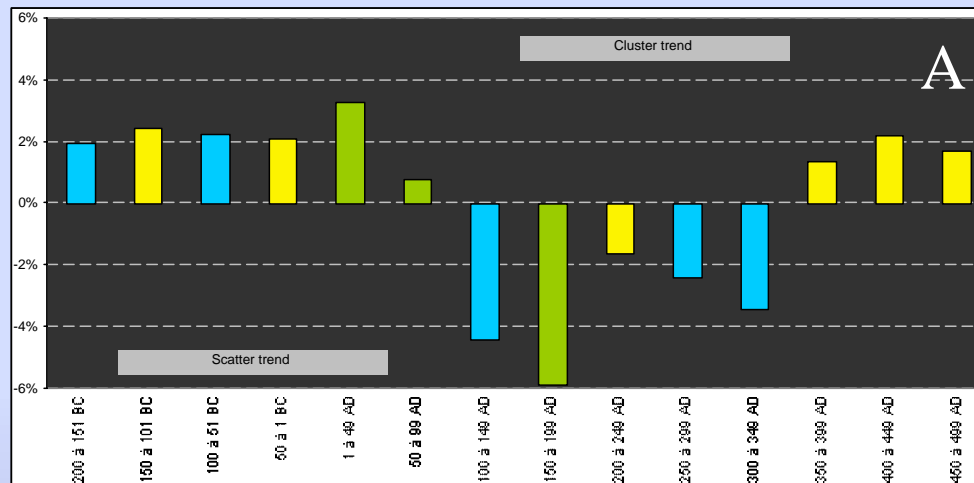
11th Cty. AD

Comparing two crises

- 2–3rd century crisis is overcome, 6th century is not
- Difference in degree of integration:
 - Before 3rd C. much looser
 - Lower overheads
- 3rd C. transformations cause different structure, increase vulnerability

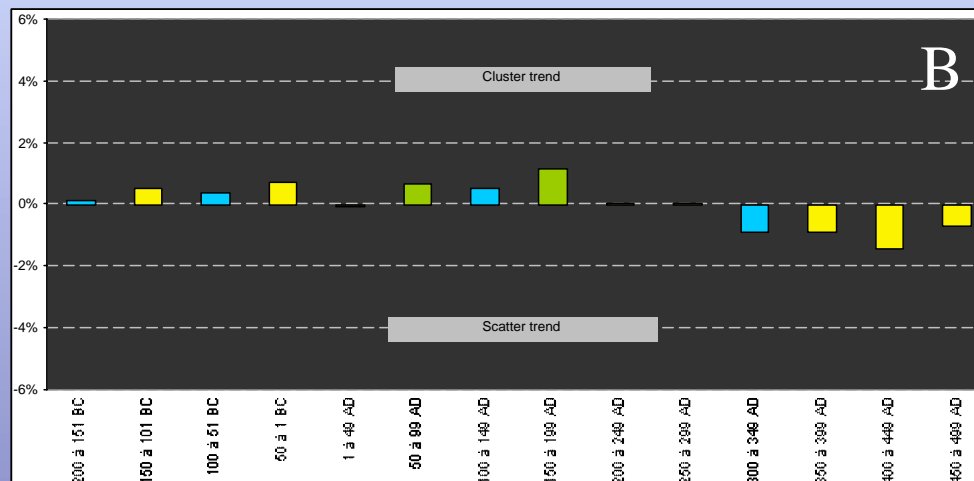
Each region reacts differently

A



A: Tricastin
(densely settled plain)
B: Valdaine
(mountainous area)

B



Green: Mixed
Blue: Unstable
Yellow: Stable

The appropriation of Nature

- Over the long term, the landscape becomes disturbance-dependent
 - In the early Holocene, crises occur only when climate and human occupation weigh in together
 - If they are out of phase, delays build up
 - At the end of the period, the slightest oscillation in either climate or anthropogenic pressure creates an immediate crisis
- The system has become hyper-coherent (an accident waiting to happen)
- Society is what keeps it stable

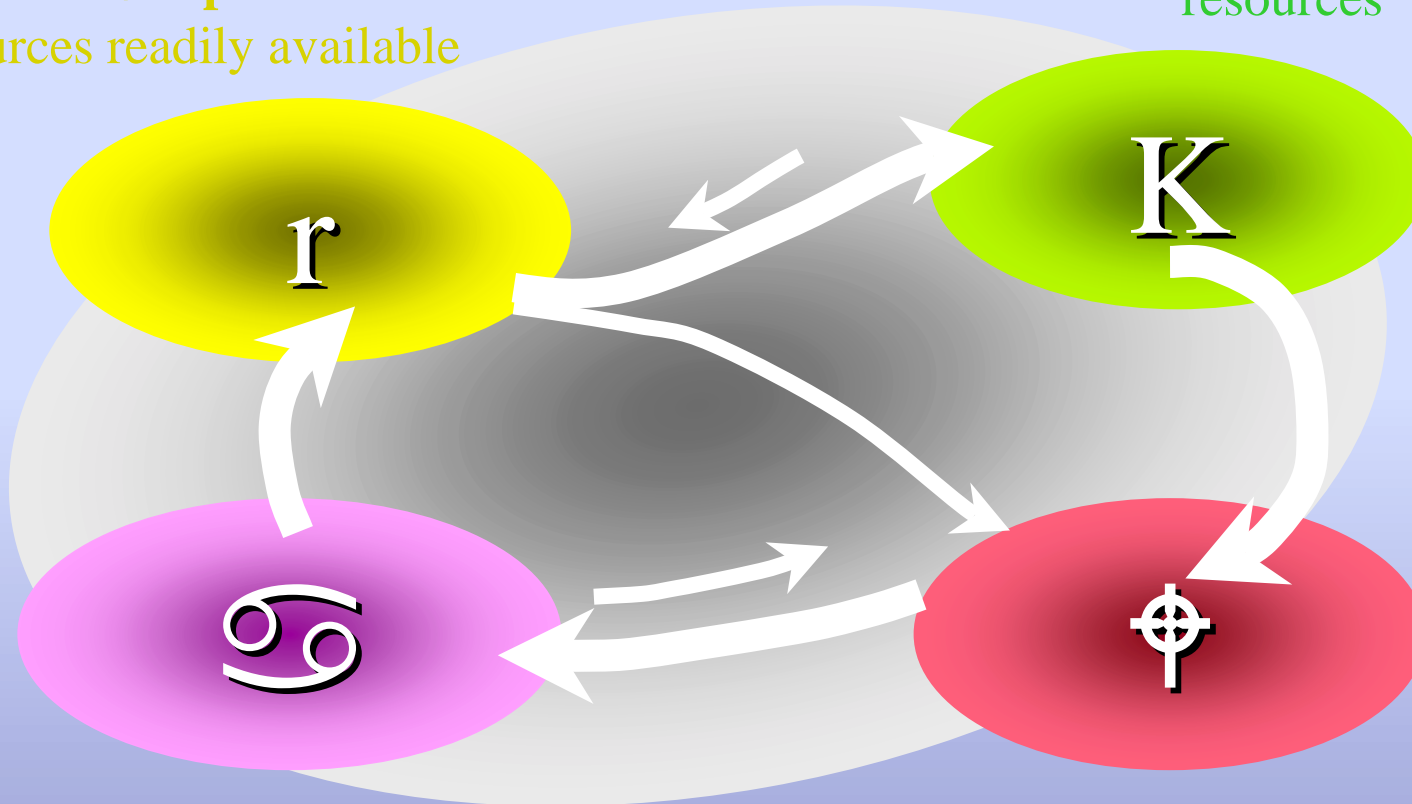
How does a crisis come about?

- System pushes itself into a trap
- Short-term solutions create long-term problems
- Reduction of flexibility
- Increasing overheads
- Risks and ‘time-bombs ’
- Initial structuring also structures the form of the demise?

Resilience varies with the state of a system...

r: growth / exploitation
resources readily available

K: conservation
things change slowly;
resources 'locked up'



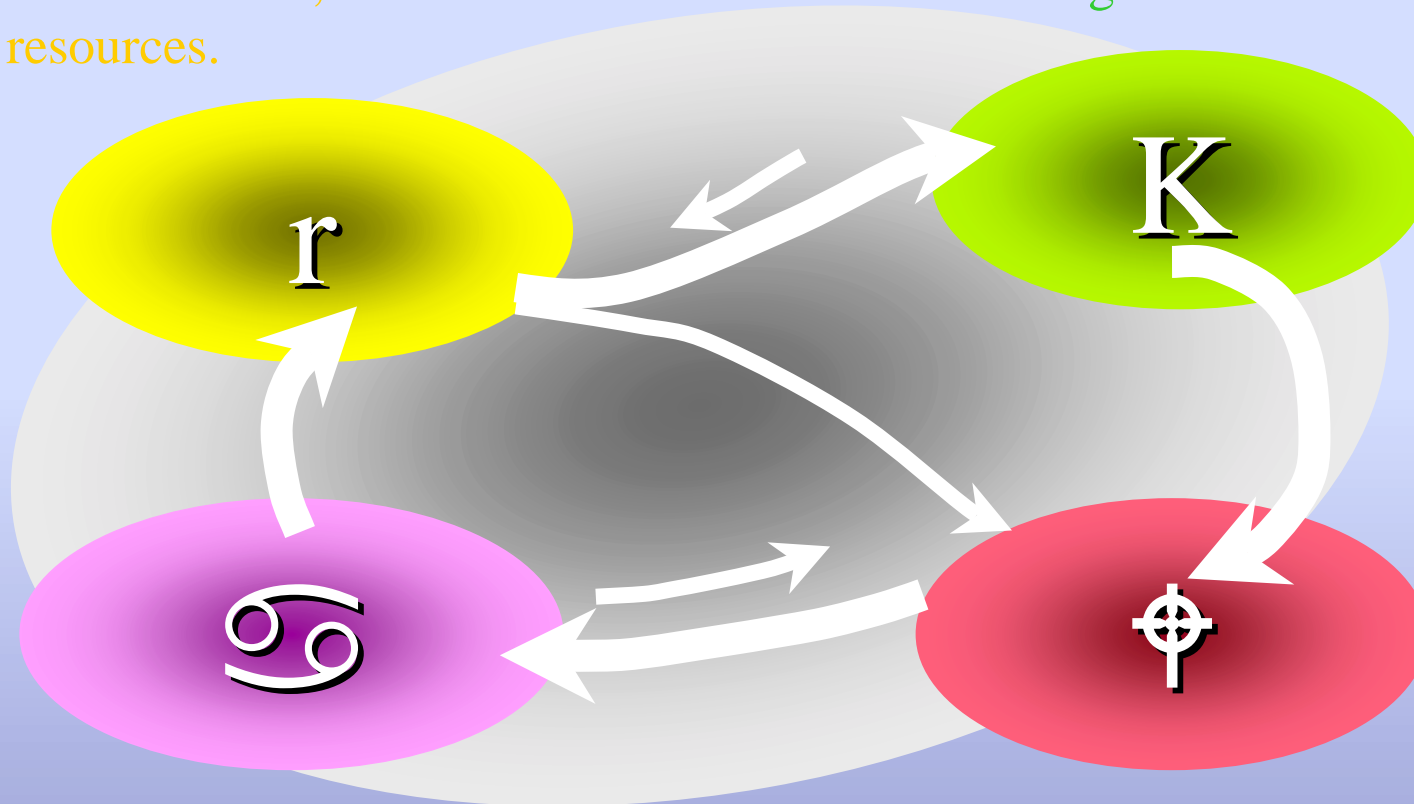
re-organization/renewal
system boundaries tenuous;
innovations are possible

release
things change very rapidly; 'locked up' resources suddenly released

...but people's attitudes are the key!

“Individualist” perspective
in a stable world, with
ample resources.

“Hierarchist” perspective:
Limited resources, impose
regulation and control



“Egalitarian” perspective in
unstable, precarious
circumstances of reorganization,

“Fatalist” perspective:
The world is out of control, and life
as a game of chance.

Can a crisis be avoided?

- There always comes a point where a system goes “nuts”, because the dynamics are irreversible
 - The appropriation of nature point in this direction
 - So does the human perception of the relationship between people and their environment
 - So does human risk perception
 - And so does the relation between cognition and action

Two ways to perceive a relationship...

Milieu ...

- Humanity is compared to nature
- The cohesion of nature, its unknown aspects, its strangeness and force are amplified,
- The confusion and the handicaps of humanity are accentuated;
- Humanity is *passive* in a natural environment which is *active* and *agressive*
- Change is attributed to nature, and people have no other choice but to adapt to nature;
- Natural changes tend to be viewed as dangerous, because they are beyond the control of humanity.

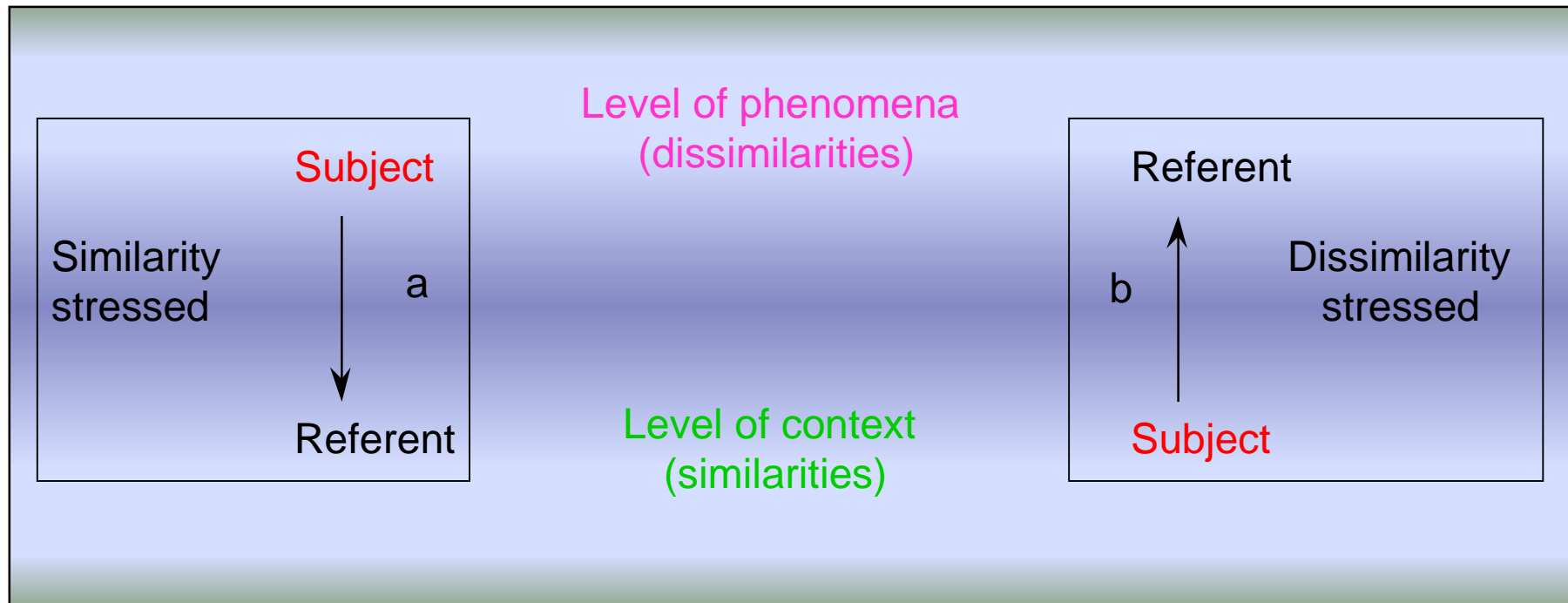
Environnement ...

- Nature is compared to humanity
- The cohesion and strength of nature is diminished
- The same properties are accentuated in humanity
- The known aspects of nature seem to be more important
- Nature seems more controllable and loses its dangerous appearance
- Humanity tends to be viewed as the source of all change, people as creating their environment

... and their interaction

- The “*milieu*” and “*environnement*” perspectives are complementary
- By their interaction, the natural dangers are exaggerated and those of human intervention systematically undervalued.
 - This encourages society to increasingly intervene in its natural environment
 - It gives the impression that society’s actions reduce the risks it runs
 - In reality, society reduces by its actions the predictability of natural phenomena.
 - Society loses control: the more it transforms its surroundings, the less it understands them.
- *This seems to be an irreversible tendency!*

The perception cycle



Opening a category ...

... and closing it

Disturbance-dependency

- Complex ecological systems consist of hierarchies of dynamics on multiple spatio-temporal scales
- Faster dynamics easily take control of slower dynamics, *but not vice-versa*
- In the long term, “human” dynamics (rapid, but initially without much impact) take the upper hand, controlling the (slower) “natural” dynamics, that are more encompassing
- Landscapes become dependent on human activity to continue as they are (“*disturbance-dependent*”).
- *This seems to be another irreversible tendency!*

Risk spectrum shifts

- Any society's risk spectrum shifts over time with respect to its environment.
 - The perception of risk over-emphasizes frequent risks, and societies tend to do something about these
 - Human action involved introduces new risks, which include both short and long-term frequencies.
 - Long-term socio-environmental interaction tends to shift the risk spectrum towards the long-term.
 - Eventually, the society will meet what one could call a “risk barrier” by analogy to a “sound-barrier”. That may just be a bit too much ...
- *Another irreversibility!*

Conclusions

- The long term is important, archaeology can help
- A multi-scalar approach is essential
- Crises are societal rather than environmental
- Striving for sustainability externalizes change, and enhances vulnerability
- Society's impact is strongest in domains where it is most dependent on environment