

School on integrated environmental and health impact assessment (IEHIA)  
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# **1st Part. Climate change, both a risk and a biomarker of human self-inflicted sickness**

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# **Introduction**

## **A few basic assessments**

# How to read a scientific paper

## SCIENTIFIC PAPERS

### The level

- the referee system, not perfect, but what else?
- Nature, Science, Cell, New England Journal of Medicine
- the scientific level = Impact Factor, IF (Nature = 34... or equivalent in mathematics)
- authors locations, institutions

### The main features

- reproducibility
- usually doubt
- but also a few consensus

## SUSPICIOUS INFORMATION

### By decreasing degrees of suspicion:

- various gurus
- « predators » journals with a rubbish lecture committee or editorial board
- ARTE
- Internet
- many books have only been selected by the publishers without any referees
- journals with a low IF

### A few characteristics

- non-reproducibility
- holistic affirmations, plot theory
- origin not documented

- **« Science attempts to confront the possible with the actual. The price to be paid for this outlook, however, turned out to be high. It was, and is perhaps more than ever, renouncing a unified world view. This results from the very way science proceeds. Most of the other systems of explanation – mythic, magic, or religious – generally encompass everything. They apply to every domain. They account for the origin, the present, and the end of the universe.**
- **Science...operates by detailed experimentation with nature and thus appears less ambitious, at least at a first glance. It does aim at reaching at once a complete and definitive explanation of the whole universe...Instead, it looks for partial and provisional answers... asking limited questions turned out to provide more and more general answers. »**

**[François Jacob. Evolution and tinkering. Science 1977, 196, 1161-1166]**

# **The bullshit asymmetry principle of Brandolini**

**In January 2013 Alberto Brandolini, an Italian programmer, expressed what is now known to be the bullshit asymmetry principle as followed: « *The amount of energy necessary to refute bullshit is an order of magnitude bigger than to produce it* ». The principle was also quoted in Nature (2016, 540, 171)**

**A few examples: the creationists, climate-sceptics, the anti-vaccines, cholesterol-sceptics...**

# **Ecology: the new paradigm**

- **Ecology is now the first systemic and transdisciplinary science.**
- **Ecology is a network in which every constituents are members of a global system whose characteristics have a retroactive effect on its constituents.**
- **An ecosystem is a spontaneous organization without central headquarter, autoregulated thanks to both its complementarities and antagonists**
- **The society itself is a complex (complex means weaved with) and we have always to consider every particular data within the whole in which it is located**

Edgar Morin, « *La voie pour l'avenir de l'humanité* » (see also « *La méthode* » 1)

# Risks and the representation of risks

- **The reality of risks:**
  - **Two major world risks: the nuclear and the climate risk;**
- **The representation of risks:**
  - **Intergovernmental Panel on Climate Change, IPCC, (or GIEC) and the scientific data**
  - **versus the soppy ecology (« gnian-gnian » or « namby-pamby » ecology),**
  - **and the climato-scepticism**
- **Solutions have to be at the same level than the risks: i.e. planetarian and politic ; to use bicycle or to respect the flowers, why not , but above all to utilise our voting right**

**1<sup>st</sup> part.**

**The risks generated by the human activities**

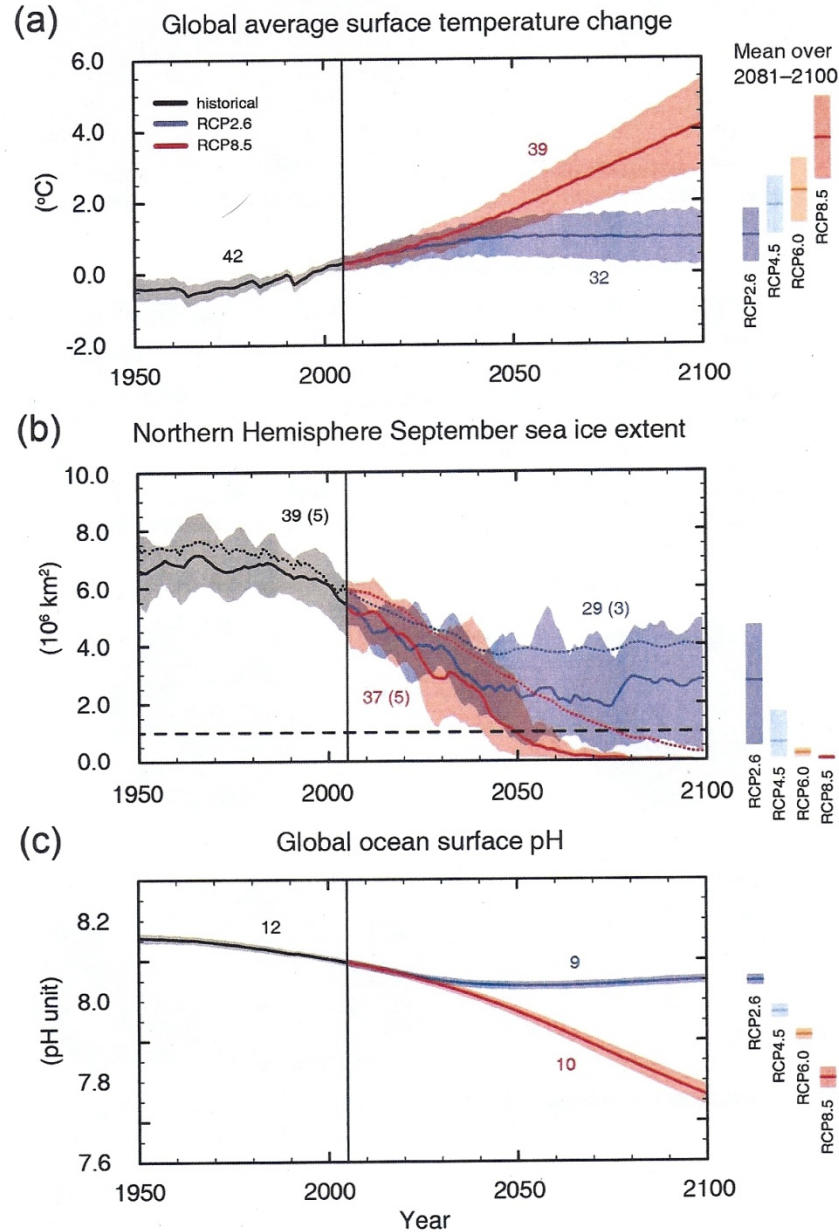


# **1. The climate risk**

# To summarize the reports of IPPC

- 1. The heating process is no more discussed by climatologists (0,8°C from 1870).**
- 2. The main origin is an increased CO<sub>2</sub> (280 ppm in 1870, 388 in 2009), others gaz also are involved as methan)**
- 3. The enhanced CO<sub>2</sub> is du to the human activities (many proofs as isotope repartition, heat gradients...**
- 4. This is associated with a reduction of glaciers, an elevation of the sea levels (3,4 mm/year since 1992), the acidification of oceans (-0,1 unité pH since 10 years), an increased severity of the extreme events (dryness, floods, cyclones), changes in Gulfstream (?)**
- 5. In parallel the overall biodiversity of metazoaires is reduced and that of procaryotes is modified**

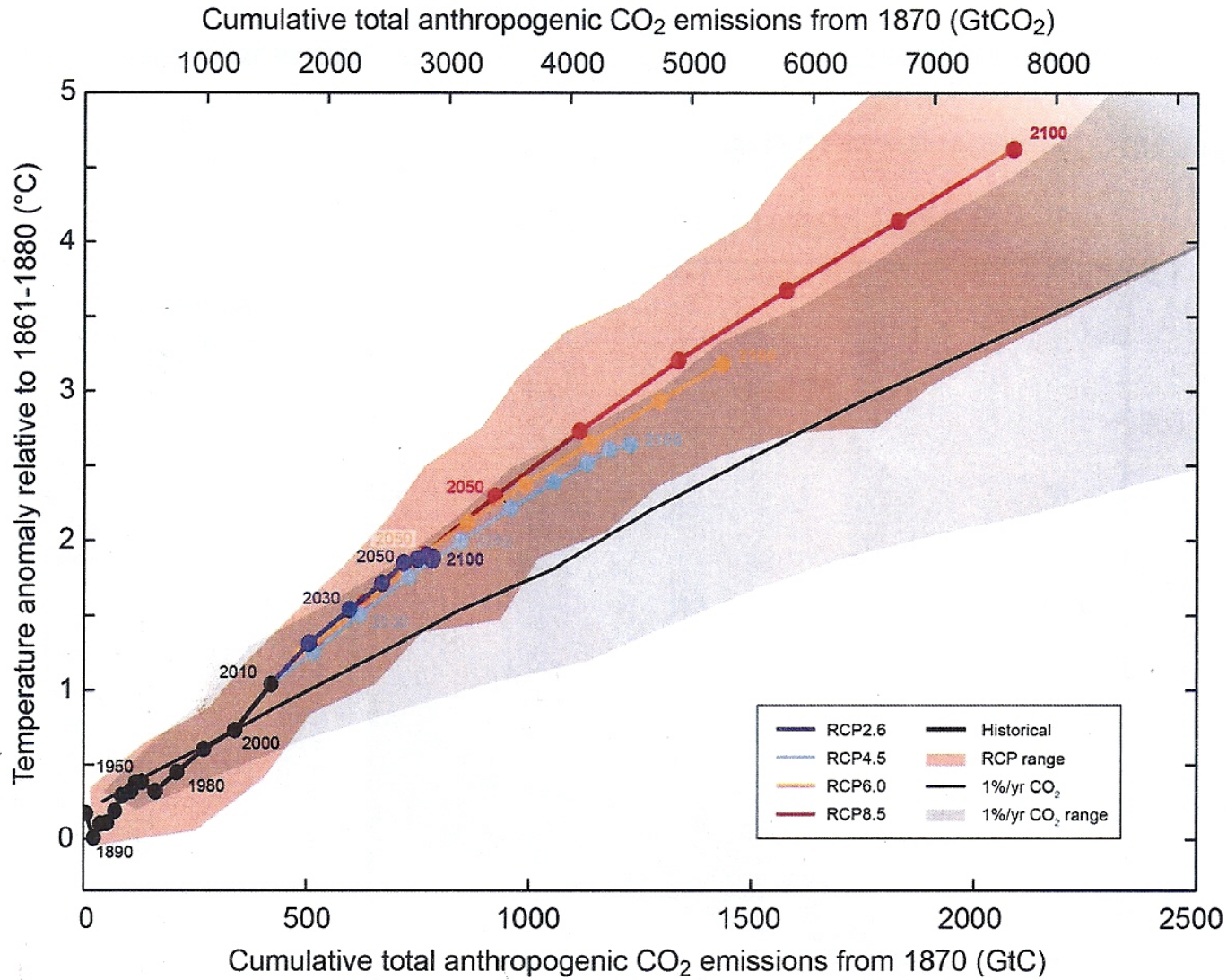
# Temperature



**GIEC 2013**

# CO2

Figure 1.1.1. Cumulative total anthropogenic CO<sub>2</sub> emissions from 1870 (GtCO<sub>2</sub>)

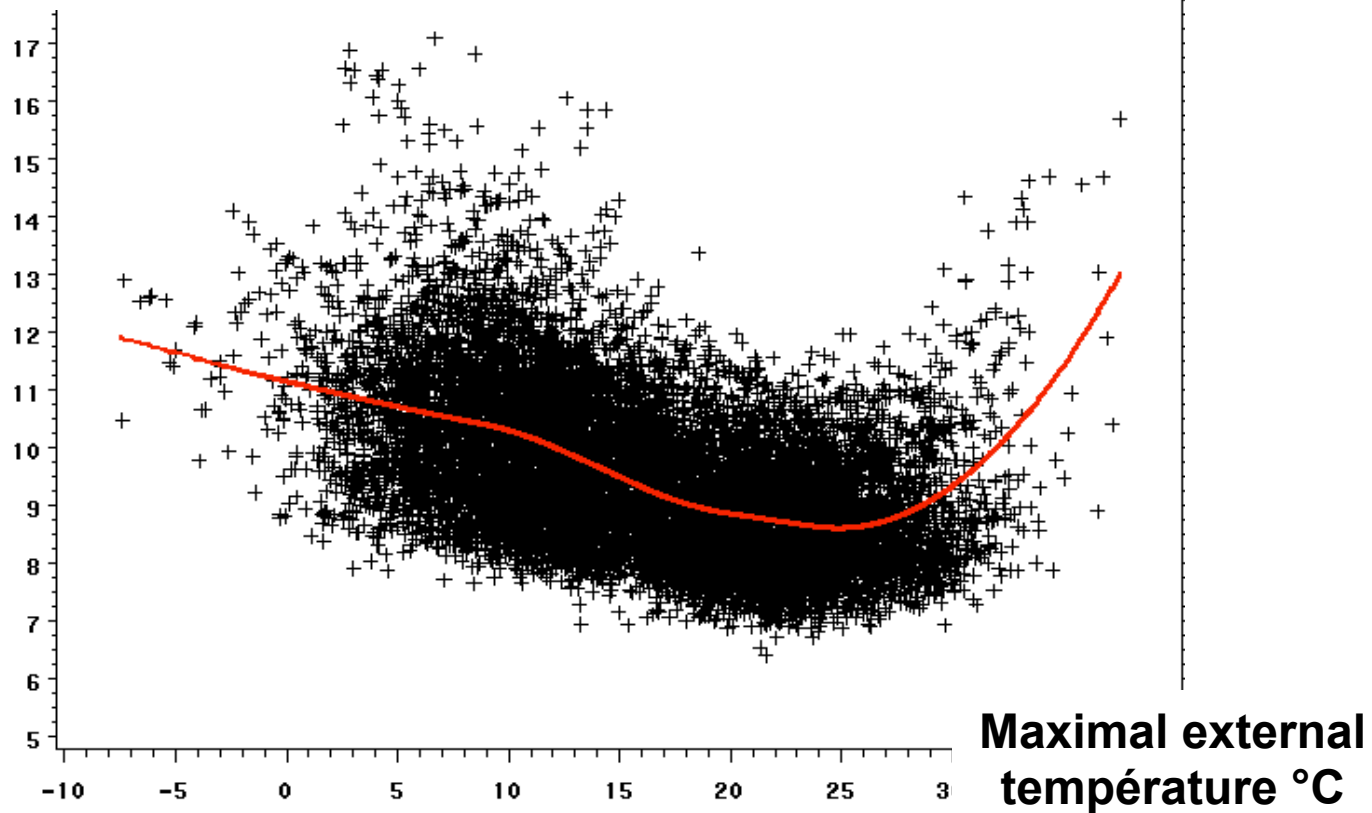


(GIEC 2013)

## **2. The direct medical consequences of the global heating**

**Heat waves,  
a problem for emergency doctors**

# Mortality for 100 000 inhabitants



**The mortality curve has a U shape**

[Données INSERM-CépiDc, Météo-France, 1975-2003]

# **UV rays & skin cancers**

**Mainly the UV-B (280-315 nm), UV-C are more dangerous but usually blocked by the stratospheric ozone. The active spectrum – in terms of D vitamin synthesis and erythemateous or cancer generation, is around 300nm and below**

**Protections are recommended above a Global Solar UV Index of 3: hat, shirts, sun glass; creams are useless and not reliable**



# The heatstroke

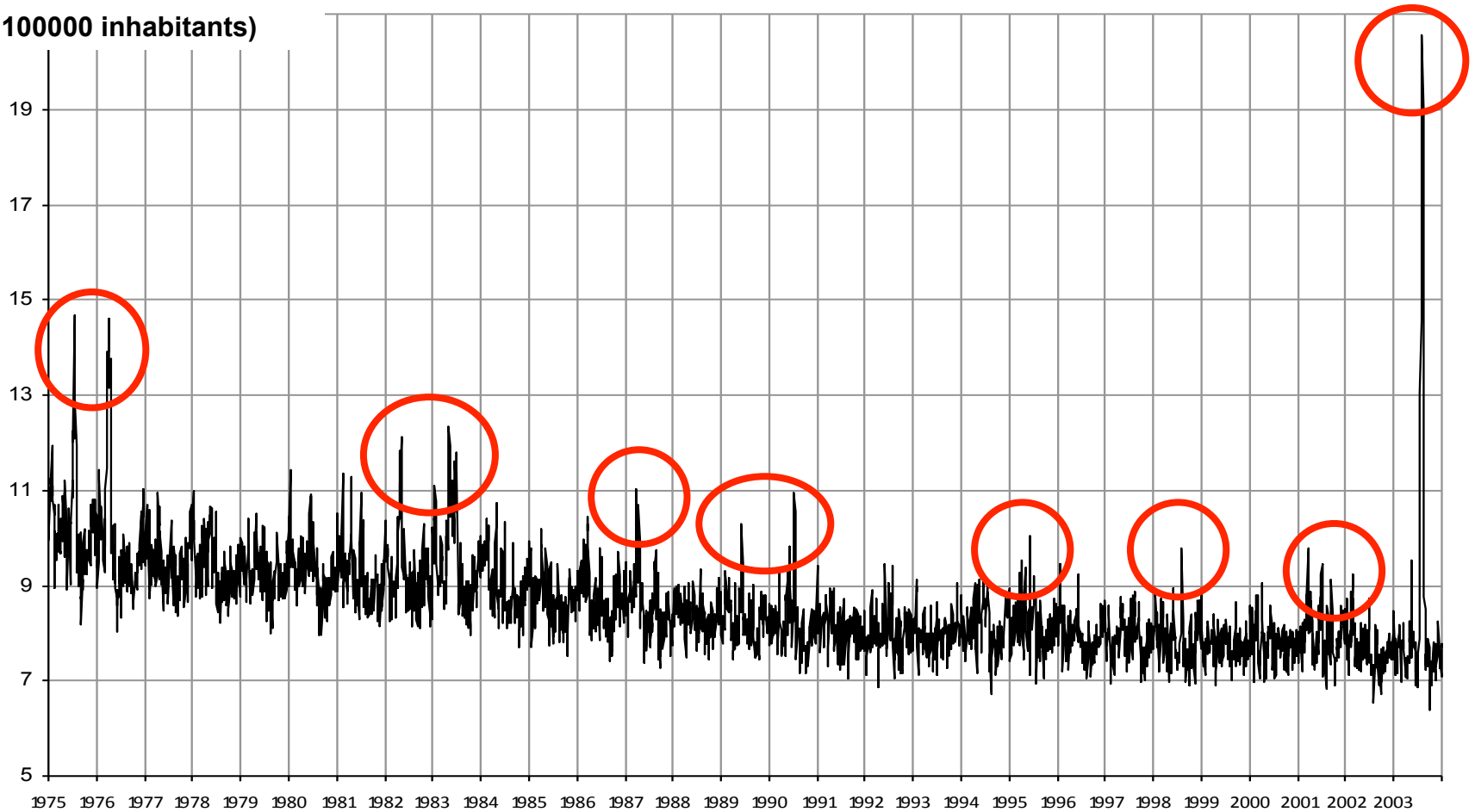
**The 2003 heatwave was not unique, numerous others has been detected in 1975, 1983, 1990, 2001. Recent projections predict both their rapid multiplication and increased intensity**

**with important surmortality(between + 1473 in 1983 and + 15.000 in 2003), above all in fragile persons**

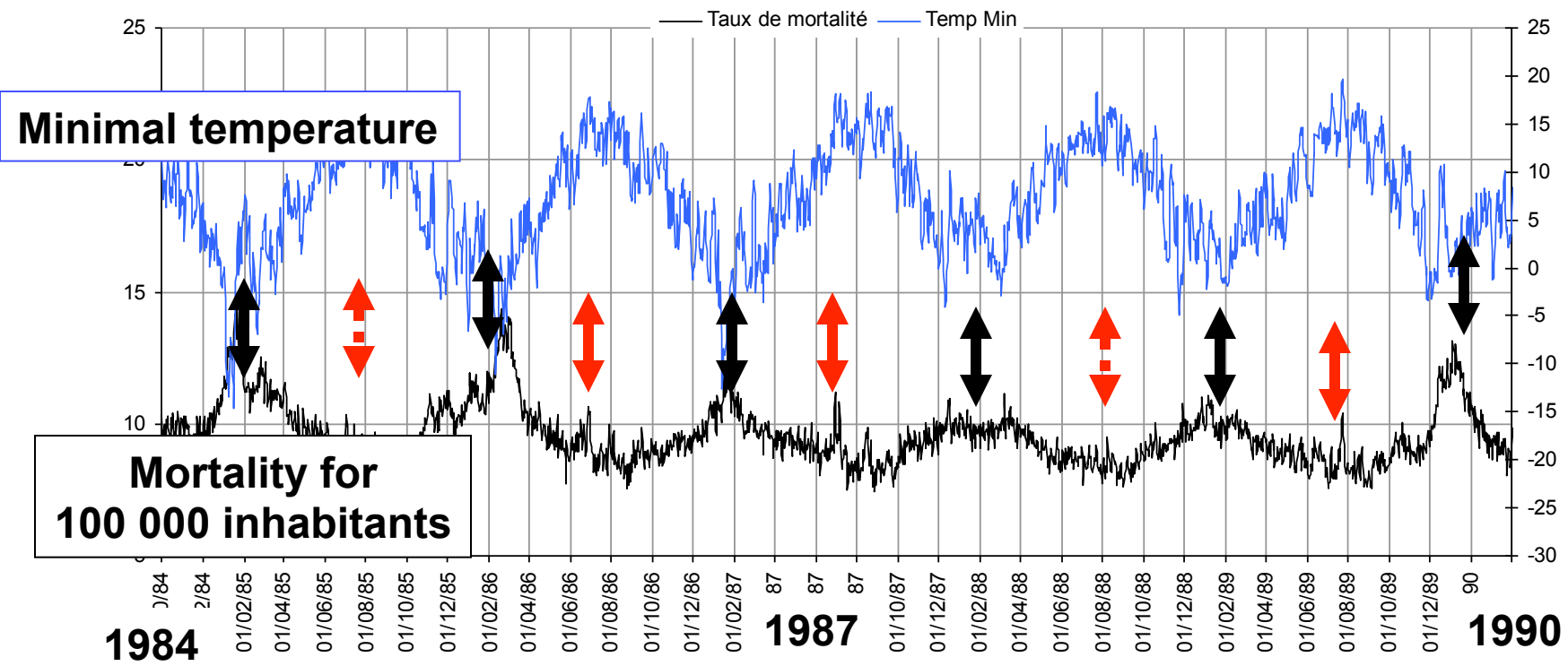
**Mortality is mainly caused by heatstroke that is a neurological syndrome, not a dehydration, happening when central temperature is  $> 40^{\circ}\text{C}$  (World incidence is 20 /100000; mortality 0,15/100000)**


# Summer mortality between 1975-2003


day/ 100000 inhabitants)



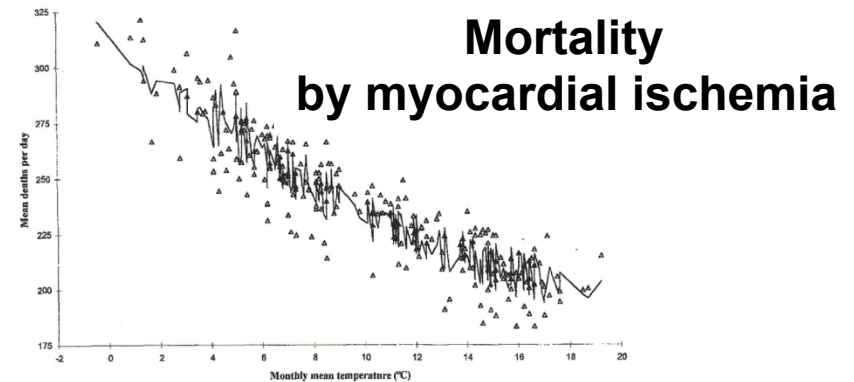
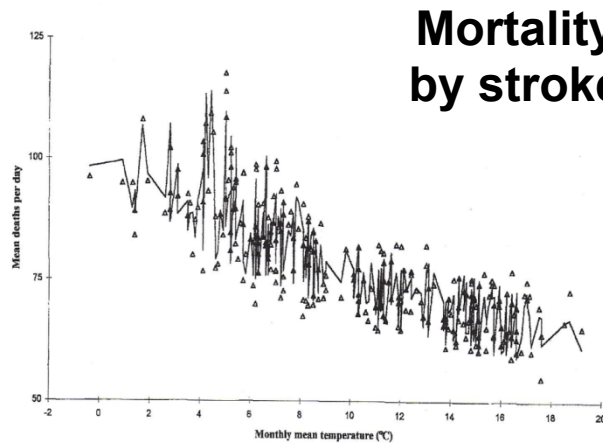
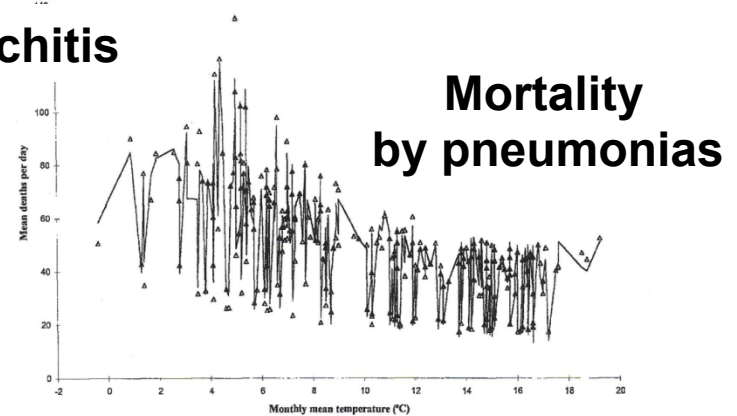
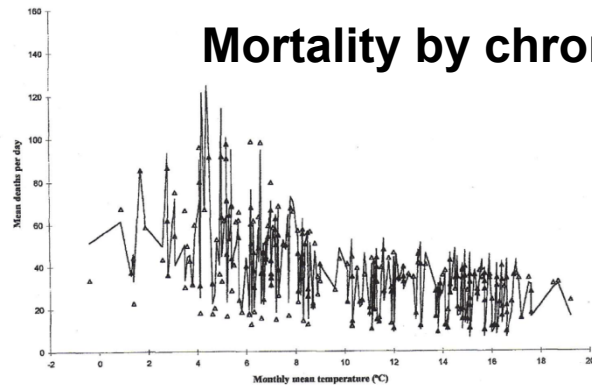
# **Periodic climate variations in mortality, a current medical problem**



  
**February 1st**

  
**Summer heatwaves**

**Annual variations of mortality**  
(INSERM-CépiDc, Météo-France)



**In winter, the cold... above all the heart,  
but if it's hot?**

[Langford IH, Bentham G. The potential effects of climate change on winter mortality in England and Wales ; Int J Biometeorol 1995, 38, 141-147]

**3. Such approach has to be global,  
the risk concerns the whole activity  
recently generated by humans**



**« *The planetary confinement* »**

[André Lebeau. *L'enfermement planétaire*. Paris 2008]

**human health,  
climate change,  
biodiversity,  
energy...**

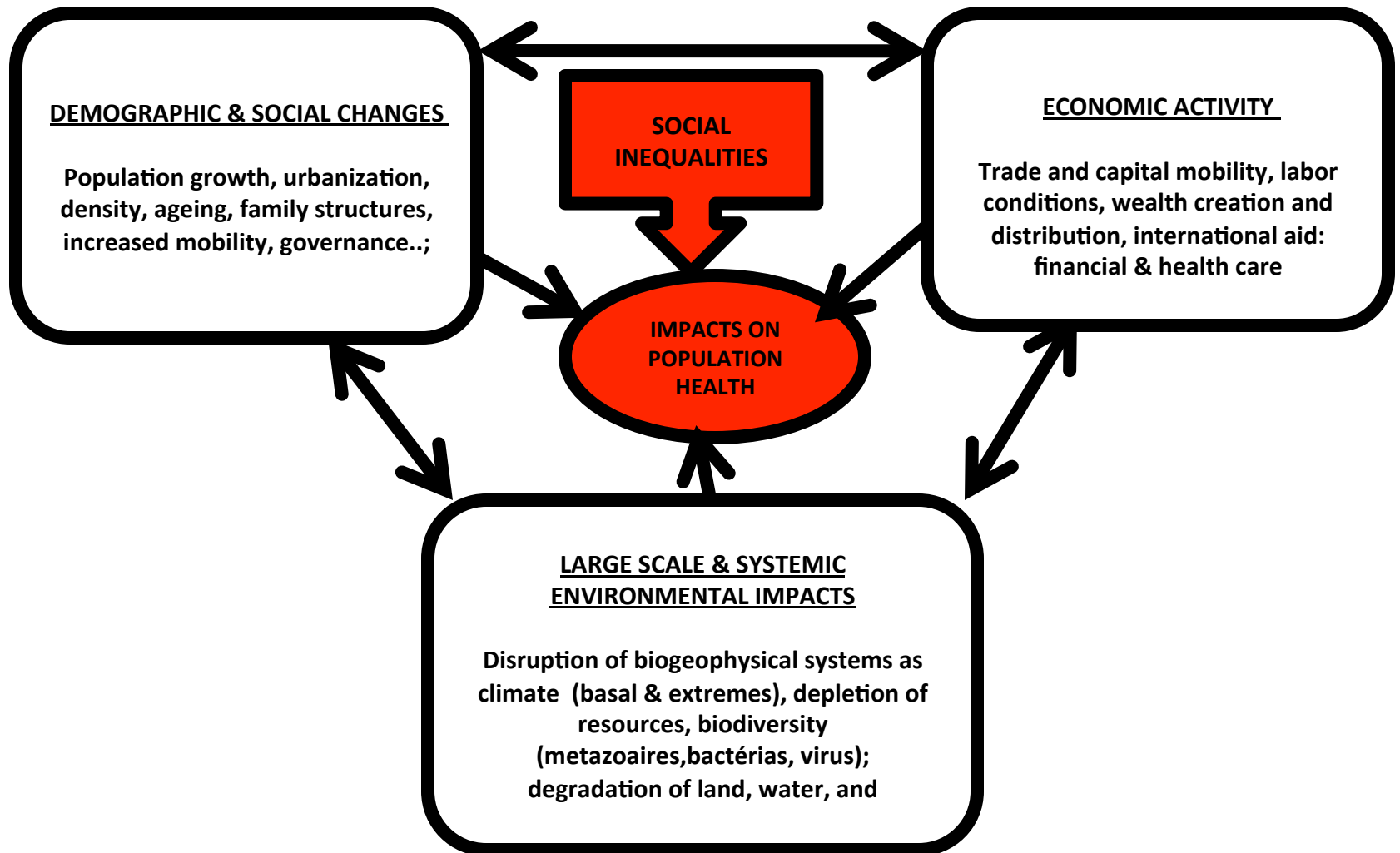
# **The climate change, above all a biomarker of the deleterious consequences of humankind activities**

- 1. Climate change is the most spectacular and the most easily quantified aspect of human activity**
- 2. The first two parameter responsible for health are social inequalities and nuclear power**
- 3. Demography and ageing are the third risk factor**
- 4. The solid or air pollutions, the increase of exchanges, soil , water and ecosystems degradations, the use of sand from depth sea**
- 5. In terms of biodiversity , from a medical point of view the most important changes come from microbia and virus more than from metazoaires or plants**



# The multiple anthropogenic changes at the origin of the new epidemiology

[ from McMichael NEJM 2013; Pascal BEH 2012]



**Such a globalisation results from an increase of several flux that, all, have health consequences**

**« *The big Acceleration* »**

**[Hibbard 2007]**

- **Commercial and service flux**
- **Financial flux**
- **Information flux**
- **Population flux**
- **Flux in bacteria and virus**