CLIMATE CHANGE: WHETHER WE MIGHT HAVE AN INTERMEZZO BEFORE THE NEXT STEP?

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International Conference on Current Knowledge of
Climate Change Impacts on Agriculture and Forestry in Europe,
3rd-6th of May, 2011, Zámok Topoľčianky, Slovakia

The term *climate change* officially saw daylight for the first time in 1964 World Meteorological Organization document. Since then it was a subject of different reasoning and speculation from a scientific as well as from a political point of view.

Where are we now after almost fifty years?

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ISTANBUL TECHNICAL UNIVERSITY
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DEPARTMENT OF METEOROLOGY

"Kick off meeting", Atlanta 1996

Themes on the front line of sciences in 21st century

- Superconductivity (technological question)
- Contact with other civilizations (question of universality)
- The question about origin of the brain and functioning the consciousness-quantum teleology (question of the brain origin)
- Environmental problems (question of survival - question over all questions)

Let us consider which problems in the 21st will be in the focus of the world scientific community. Maybe, the most comprehensive and detailed list is given by the Royal Society (RS), in full Royal Society of London for Improving Natural Knowledge, the oldest national scientific society in the World (350 years) and the leading national organization for the promotion of scientific research in Great Britain. It emphasized the following fundamental topics:

(RS1) Whether we alone in the Universe?;
(RS2) Emission of harmful greenhouse gasses on climate change;
(RS3) What is the consciousness?;
(RS4) How to make decisions in a insecure world?;
(RS5) Extension both the maximum and average lifespan
(RS6) Whether the culture is only characteristic of people?;
(RS7) Managing the Earth resources;
(RS8) Importance of the Internet;
(RS9) Studiousness of the master cells;
(RS10) Importance of maintaining biodiversity;
(RS11) The role of geoengineering and climate change and
(RS12) Importance of new vaccines.

The aforementioned topics, which are not ordered in a hierarchical list, converge into one point, i.e. men existence including its different aspects (philosophical, biological and environmental) Mihailovic,D.T. and Gualtieri C,, 2011: Environmental Fluid Mechanic in iEMSs Sessions, Environmental Modelling and Software (accepted)

Michael Crichton : Author s message
"State of fear", Harper Collins, London, 2004

Here, will be used citations from this book, which fluently and clear in speach summarised my reflections about this subject.

1) I will follow them by examples either with more or less strong evidences

2) Open mind commetnts, which are just on the brink to be accepted by the common mind

♦) Nobody knows how much of the present warming trend to a natural phenomenon

♦) Nobody knows how much of the present warming trend might be man-made

♦) Nobody knows how much warming guess in the next century. The models vary by 400 percent, *de facto* proof that nobody knows. But if I had to guess – the only thing anyone is doing really – I would guess the increase will be 0.812436 degC.

There is no evidence that my guess about the state of the world one hundred year from now is any better or worse than anyone else s. (WE CANNOT "ASSESS" THE FUTURE NOR WE CAN "PREDICT" IT. THESE ARE EUPHEMISMS. WE CAN ONLY GUESS. AN INFORMED GUESS IS JUST GUESS)

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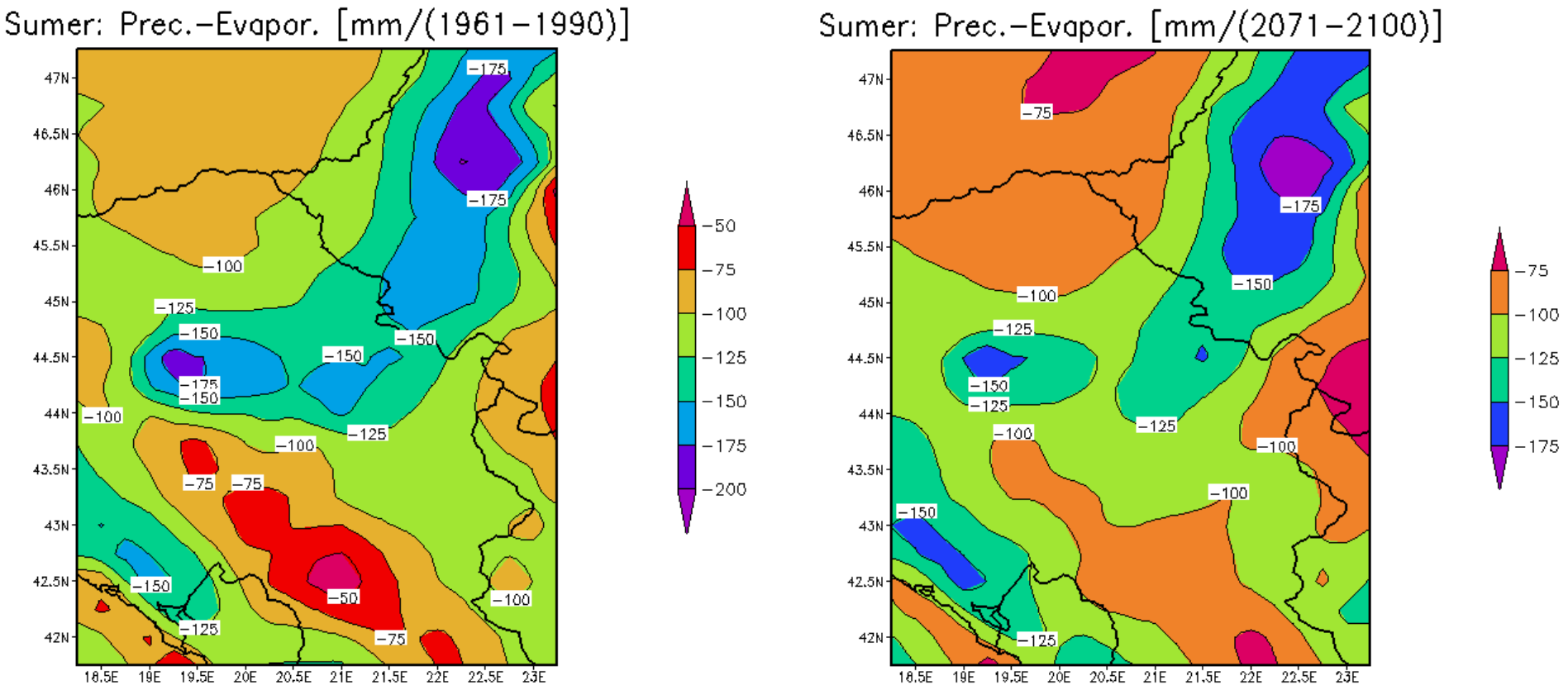
Simulation of annual water deficit



Should we believe so naively to any model but particularly to climate one?

International Workshop and Course for Decision Makers on the Effective Use of Water in Agricultural Crop Production

October 6-8 2008, Jois, Austria

DEFINITION OF ENVIRONMENTAL INTERFACE

An environmental interface can be defined as a surface between two either abiotic or biotic systems that are in relative motion and exchange mass, energy and momentum through biophysical and/or chemical processes. These processes are **fluctuating temporally** and **spatially**.

"Fluid mechanics of environmental interfaces", 2008, Eds. C. Gualtieri and D.T. Mihailovic, Taylor&Francis, London, pp. 339

Complex system

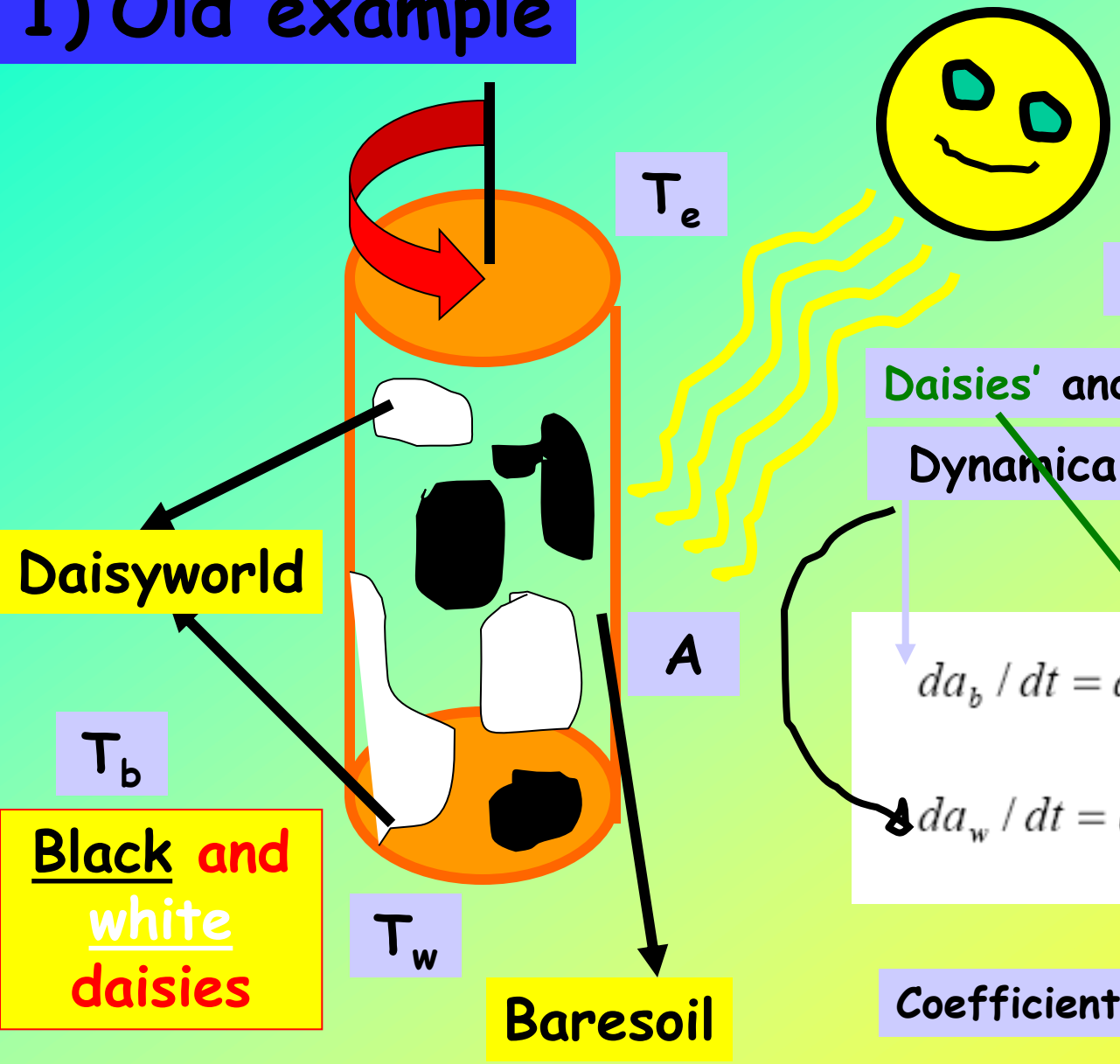
In the thirty-five-odd years since the environmental movement came into existence, science has undergone a major revolution. This revolution has brought new understanding of **nonlinear dynamics**, **complex systems**, **chaos theory**, **category theory**. It has transformed the way we think about evolution and ecology.

COMPLEX SYSTEMS VersuS SIMPLE MECHANISMS

- **COMPLEX**
- WHOLE MORE THAN SUM OF PARTS
- ANALYTIC ≠ SYNTHETIC
- NON-FRAGMENTABLE
- NON-COMPUTABLE
- REAL WORLD

- **SIMPLE**
- WHOLE IS SUM OF PARTS
- ANALYTIC = SYNTHETIC
- FRAGMENTABLE
- COMPUTABLE
- FORMAL SYSTEM

1) Old example



No ocean is included

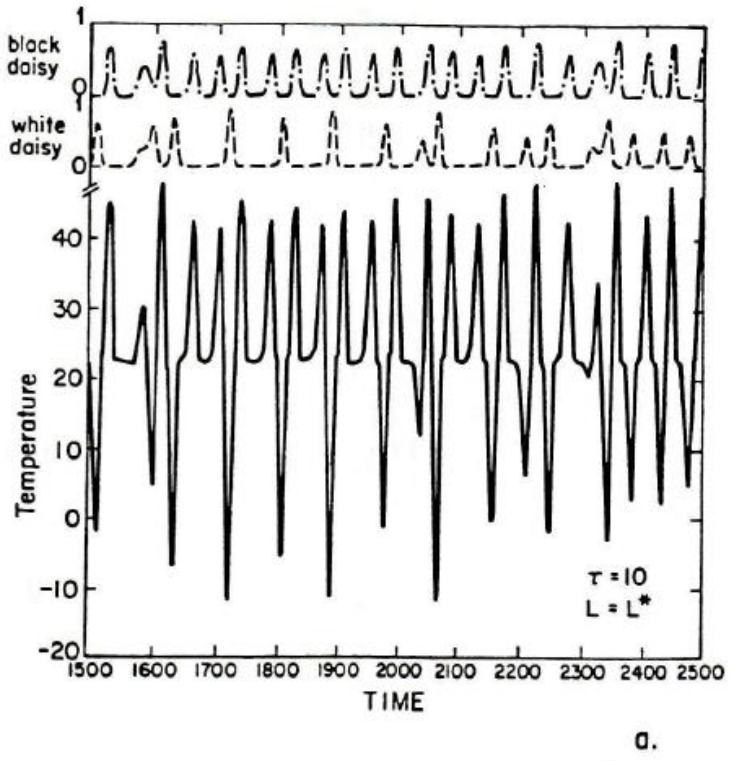
Daisies' and fertile ground fractions

Dynamical evolution of daisies

$$da_b / dt = a_b\left[(p-z)\beta_b(T_b) - \gamma\right]$$

$$da_w / dt = a_w\left[(p-z)\beta_w(T_w) - \gamma\right]$$

Coefficient of birth and death



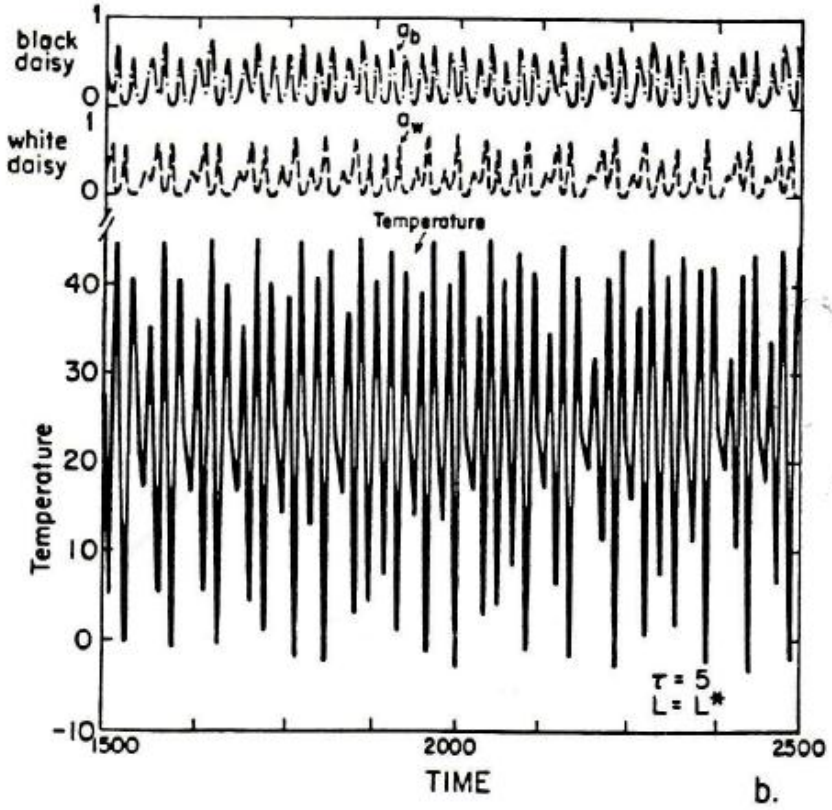
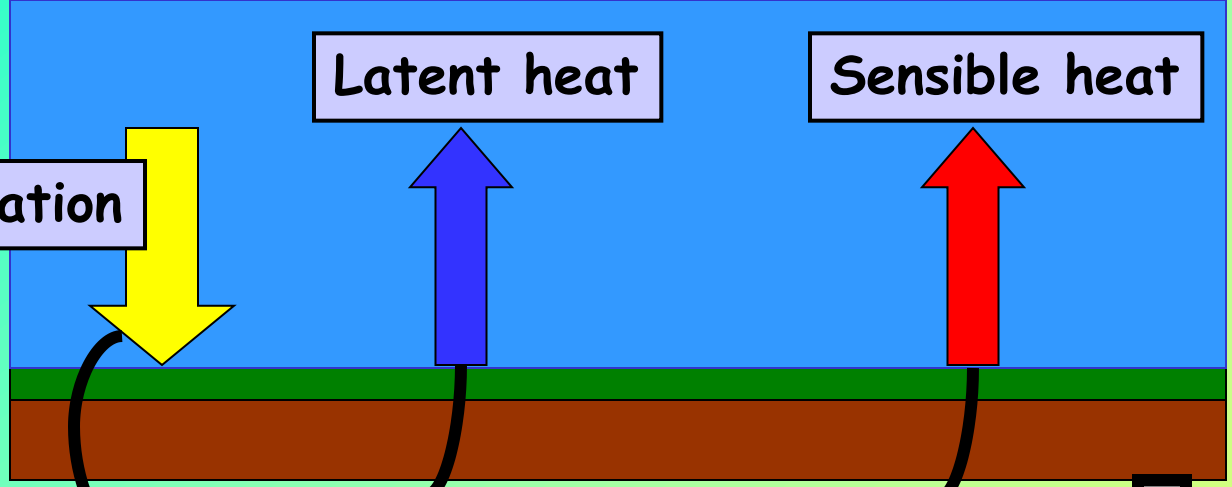


Fig. 11a, b. The shift to an apparently chaotic behavior when the fertility is raised to $p = 1$ with $\beta = \beta_0$ and $\tau = 10$ and $\tau = 5$, respectively.

(De Gregorio et al., 1991, J. Nonlinear Sci.)



surface capacity

Soil heat

$$C_g \partial T_g / \partial t = a(T_g - T_r) - C_L[E(T_g) - e_r] - C_H(T_g - T_r) - C_D(T_g - T_r)$$

wat. vap. press.

heat in atmosp.

soil heat

radiation

Transfer coefficient

ground surface

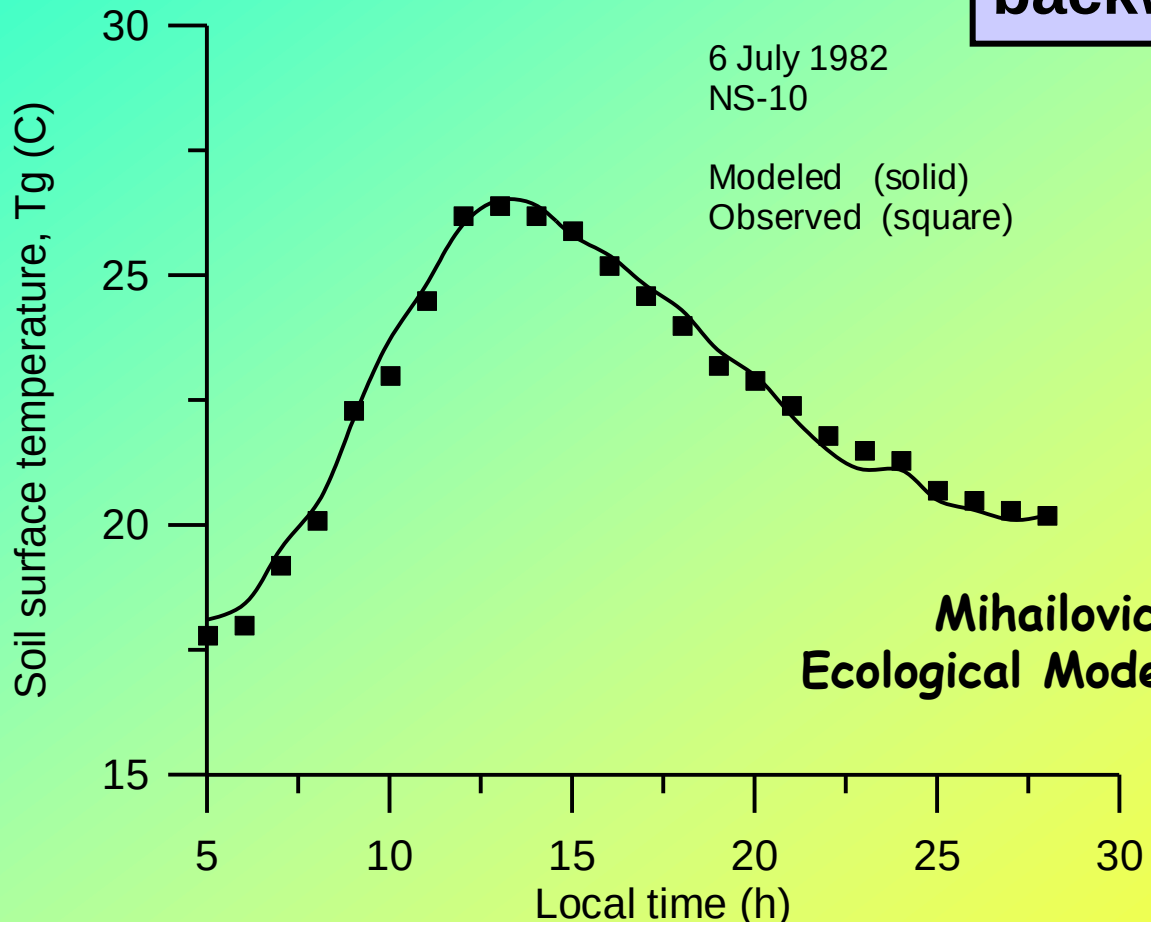
TEMPERATURE

at reference level

2) Numerical solution of energy balance equation that leads to chaos

$$T_g^{n+1} = T_g^n + F^n / (\Delta t / C_g + (\delta F^n / \delta T_g^n))$$

backward scheme in time

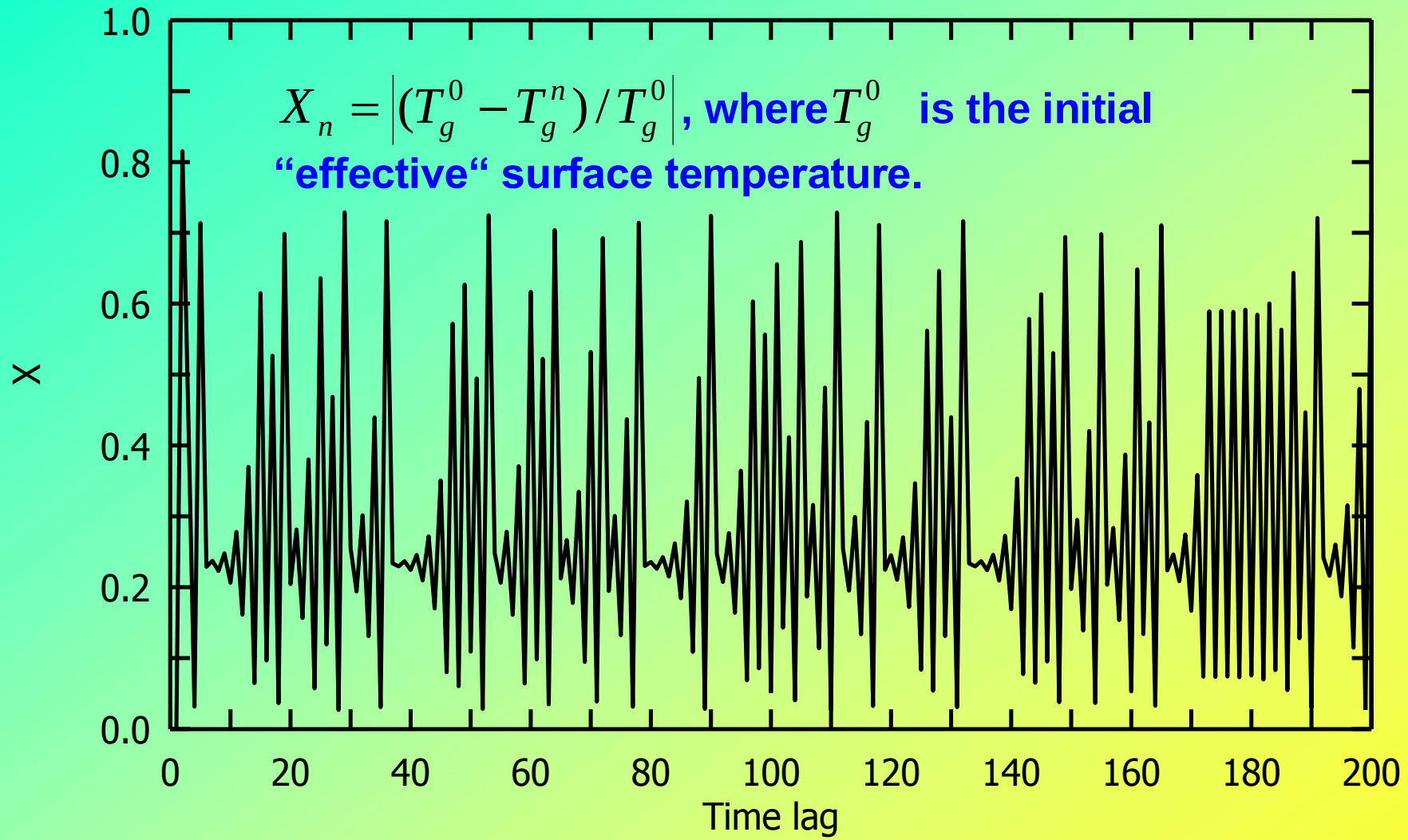


in this form

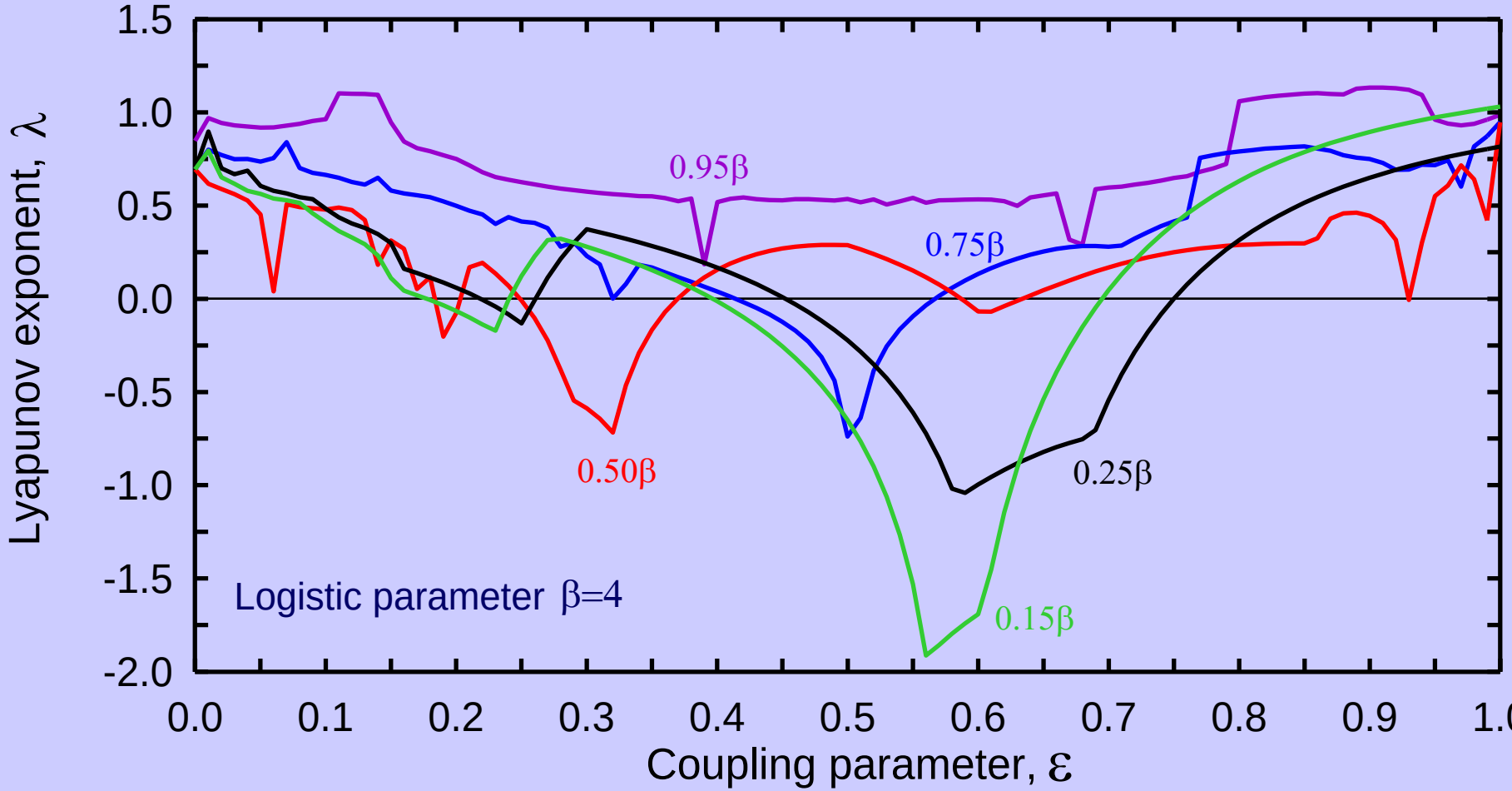
n **time level**

Δt **time step solution**

Mihailovic and Eitzinger, 2007
Ecological Modelling, 202 (3-4), 465-475



Solution of energy balance equation plotted as the renormalised "effective" surface temperature X in terms of time.



$$\lambda = \lim_{N\to\infty}\left\{\ln[\left\|\underline{\mathbf{D}}^{(N)}(\vec{x}_0)/N\right\|]\right\}$$

Mihailovic at al.,2011, *Natural Sciences* , 4, 74-82

Mihailovic at al.,2011,*Chaos&Fractals and Solitons* R

where $\left\|\underline{\mathbf{D}}^{(N)}\right\|$ is the norm of the derivative matrix, $\vec{x}_n$ comes from general vector mapping while N is the number of the last iterate

Mihailovic at al.,2011, In: *Climate … Edited by V. Alexandrov et al.*, al., Springer