

**MITOCHONDRIAL and BIOREGULATORY
MEDICINE**

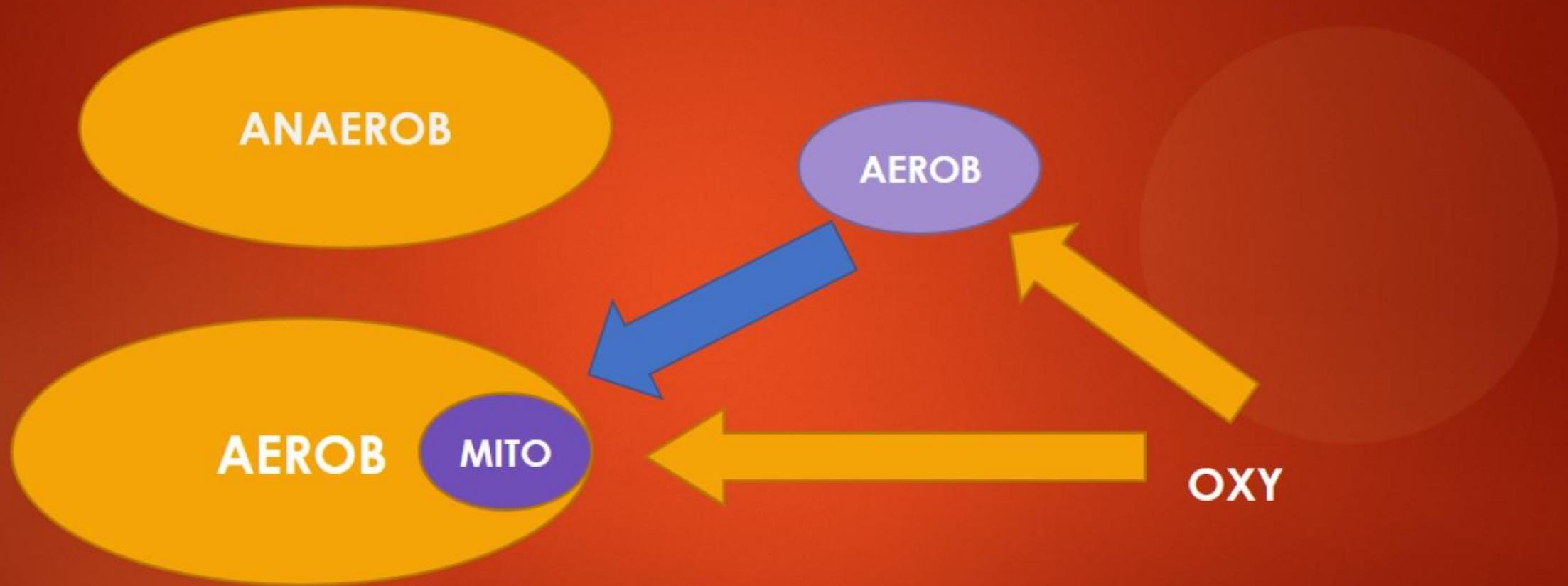
MUDr. Michael KUČERA, MD

©2018

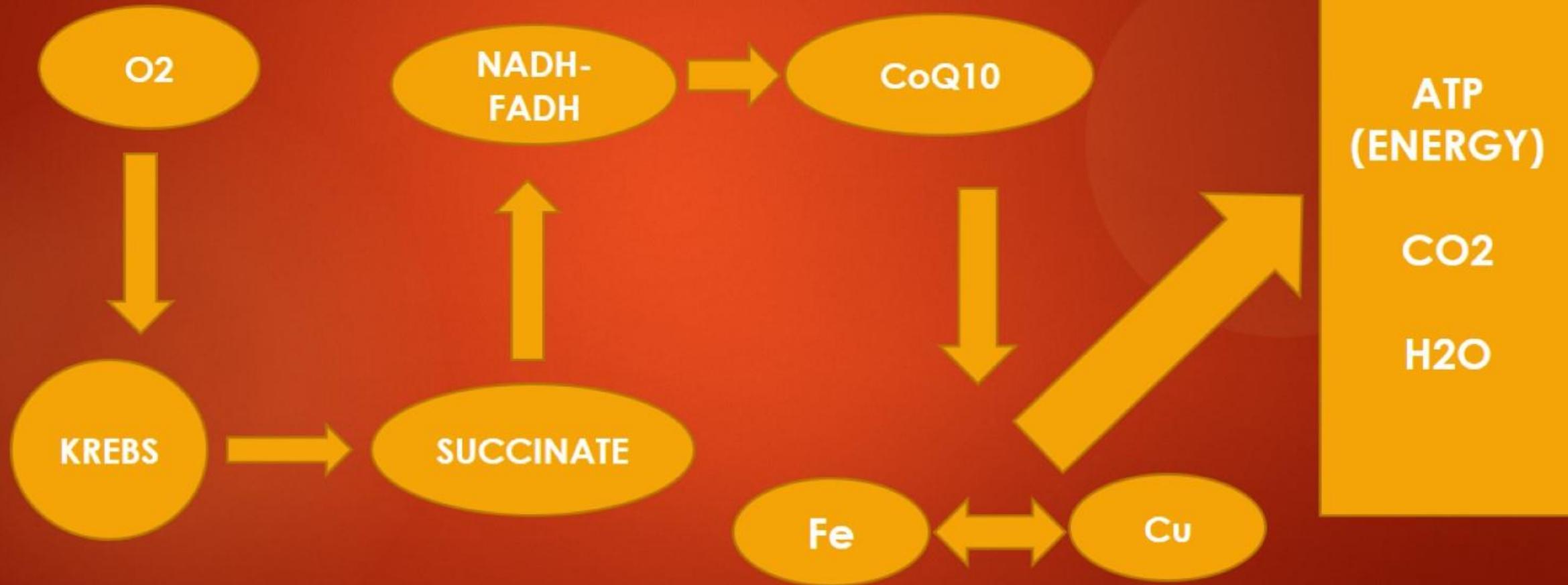
Cause of aging and degenerative processes

- Decrease of energy production**
- Protein structure destruction**
- Loss of sum of cells**

1,7 bilion years ago



SCHEME of MITOCHONDRIAL OXIDATIVE PHOSPHORYLATION (ELECTRONE TRANSPORT !)



Protein structure damage

= LOSS OF FUNCTION

ENZYMES – GLOBULINS (IMMUNITY) – TRANSPORT PROTEINS – RECEPTORS

NEUROSENESCENCE

DECREASE

- ▶ **Kardiovascular and pupilar autonomic functions**
- ▶ **Sudomotoric function**

INCREASE

- ▶ **Vascular tonus.**
- ▶ **Plazmatic noradrenalin levels**
- ▶ **Sympathetic nerves muscle activity**
- ▶ **Sympathetic response to stimuli**

IMMUNOSENESCENCE

DECREASE

- ▶ **Hypermuation of immunoglobulins (B-cells)**
- ▶ **Fagocytic aktivity of neutrophiless**
- ▶ **Number of naive T-lymphocytes**
- ▶ **Production of cytokines IL-2, IFN γ (=shift in response from Th1 \rightarrow Th2)**

INCREASE

- ▶ **Number of memory cells (T-lymphocytes)**
- ▶ **Auto-antibody production by B-lymphocytes and a polyclonal aktivation against different mitogens**
- ▶ **Produktion of cytokines IL-4, IL-6, TNF (=shift in response from Th1 \rightarrow Th2)**

ENDOCRINE SYSTEM SENESCENCE

DECREASE

- ▶ Androstendion. Testosterone
- ▶ Dehydroepiandrosterion
- ▶ And its sulphate
- ▶ Growth hormone
- ▶ Progesterone
- ▶ Aldosterone
- ▶ Melatonin.
- ▶ Calcitonine.
- ▶ Vitamin D

INCREASE

- ▶ Parathormone
- ▶ ACTH
- ▶ FSH, LH (women)

HUMORAL and HORMONAL CONTROL

CORTEX

**HYPOTHALAMUS
PITUITARY GLAND
HIGHER
SUBCORTICAL
CENTERS**

**CARDIOVASCULAR
CENTER**

CENTRAL CURCUIT



**VEGETATIVE CONTROL
SYMPATHETIC-
PARASYMPATHETIC**

**LUNGS
BRONCHIAL
TUBES**

**HEART
SINOATRIAL
NODE**

**VASCULAR SYSTEM
(DYNAMICS,TONUS**

**AUTONOMIC
CIRCUIT**

CONTOUR MANAGEMENT AND REGULATION OF ANS AND HEART RHYTHM.

Level A:

level of organization the interaction between organism and external environment

Central nervous system (cortex, senses, mental functions)

Coordination of functional activity of all systems

Level B:

level executing the balance between various body systems (maintenance of intersystem homeostasis)

Higher autonomic nervous centers (hypothalamo-hypophyseal-suprarenal system)

Hormonal and autonomic homeostasis

Level C:

level of maintenance the intrasystemic homeostasis

Vasomotoric centers as a part of subcortical cardiovascular centers

Stimulation or inhibition of cardiovascular system through fibers of sympathetic nerves

HR= heart rate

D = decrease of heart rate

I = inhibition of heart rate activity

V = vascular tonus

HF = high frequencies (vagus, respiration)

LF = low frequencies (level C)

VLf=very low frequencies (level B)

SDNN= standard deviation

IC = index of centralisation

SI = stress index-sympathetic

HR= heart rate

D = decrease of heart rate

I = inhibition of heart rate
activity

V = vascular tonus

HF = high frequencies (vagus, respiration)

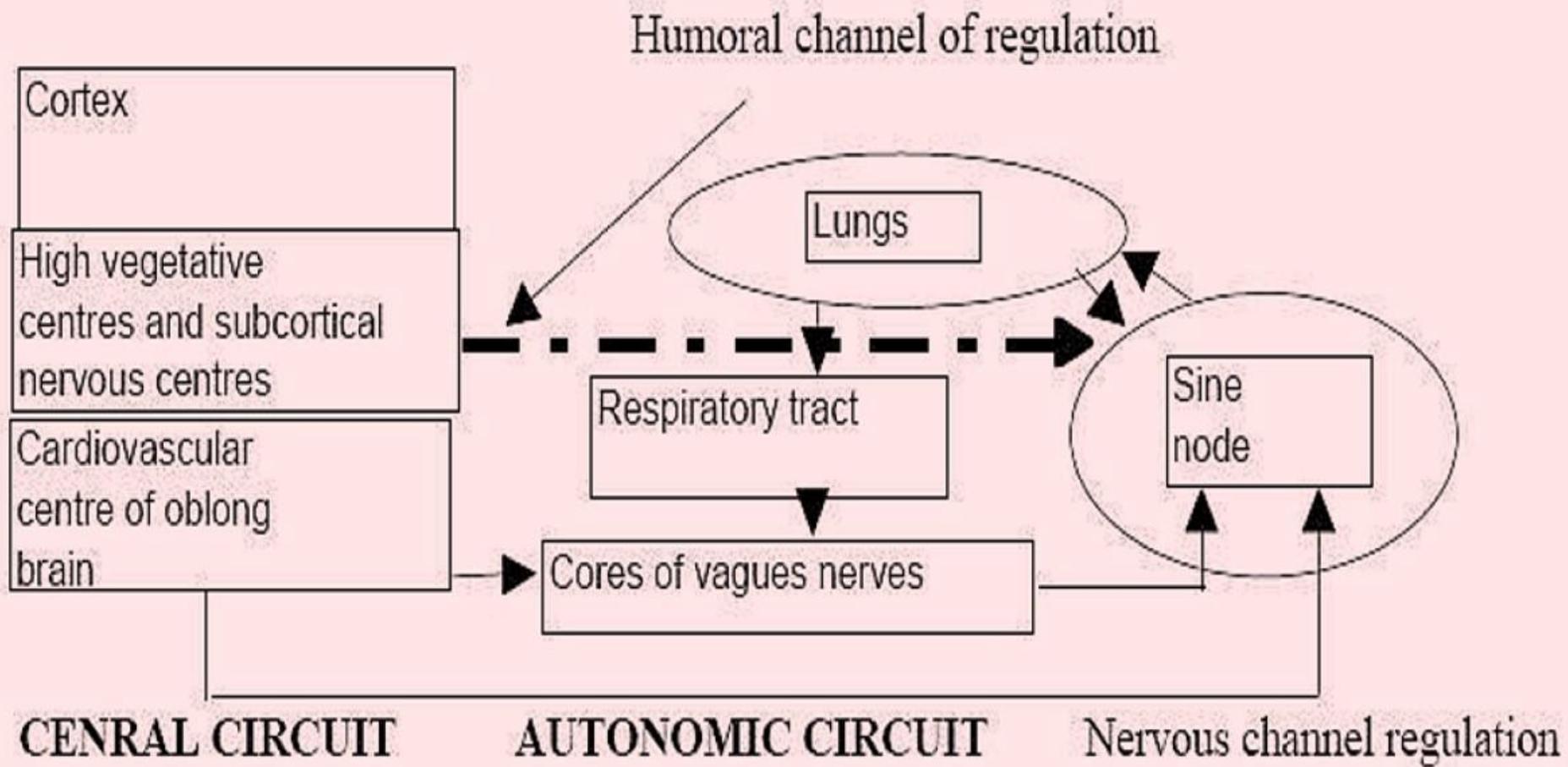
LF = low frequencies (level C)

VLFF=very low frequencies (level B)

SDNN= standard deviation

IC = index of centralisation

SI = stress index-sympathetic



CONDUCTION SYSTEM – AUTONOMIC NERVE CONTROL

Parasympathikus

Right vagus

Left vagus

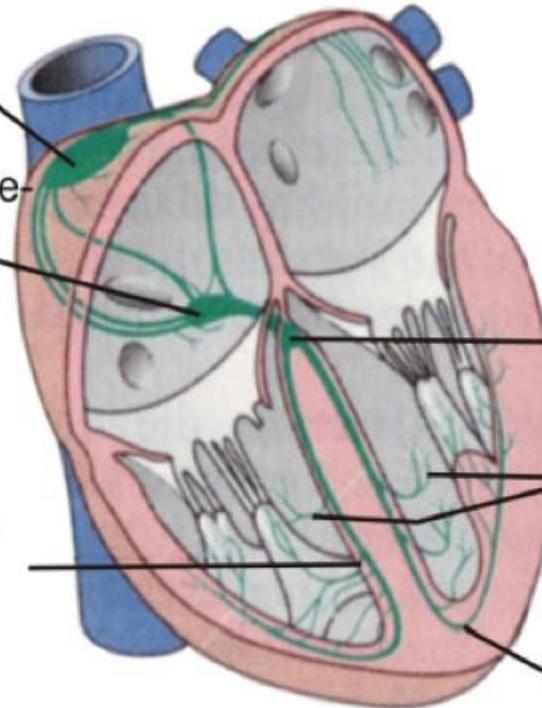
Sympathikus

Conduction System

sinus node

vestibule-chambre-
node
(AV node)

right branch
of conduction
system
(TAWARA)



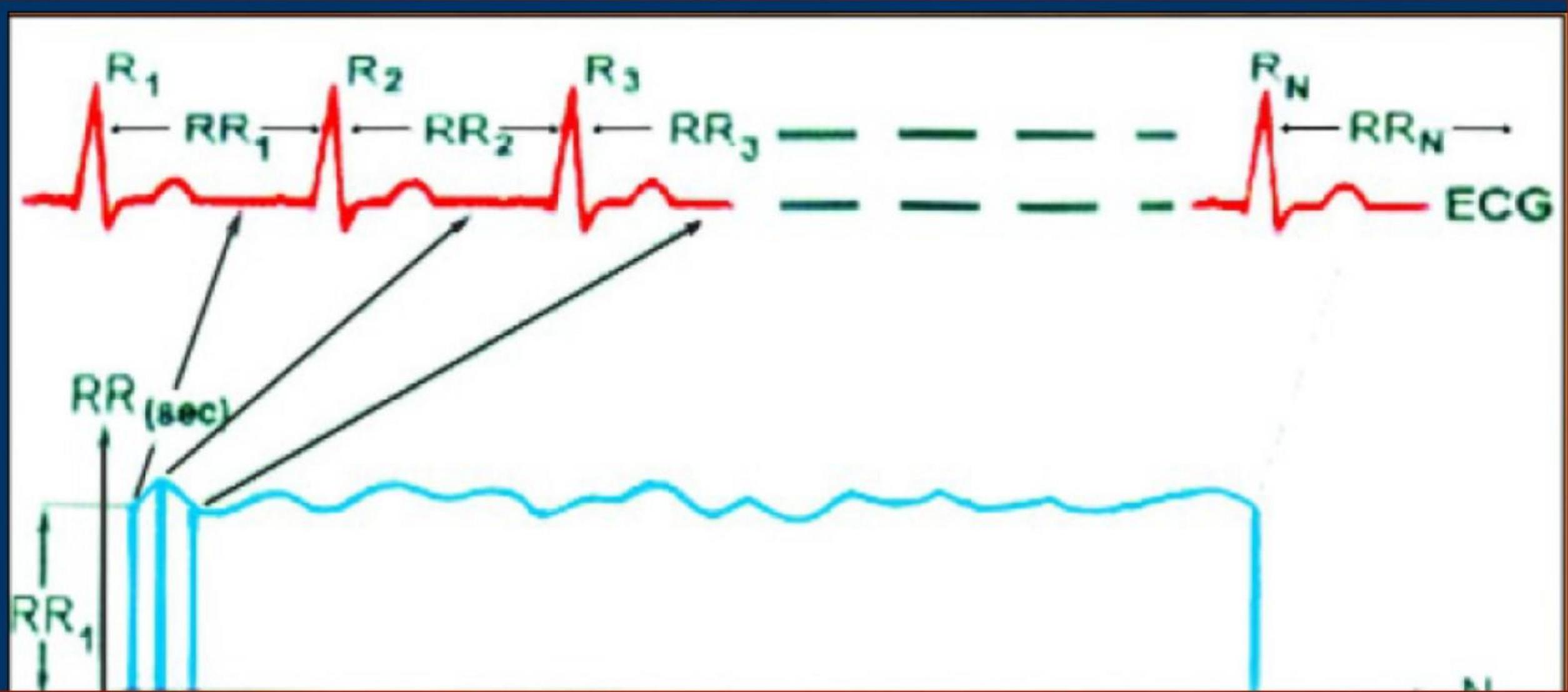
trunk of
conduction
system
(HIS branch)

Purkyne
fibers

left branch
of conduction
system

MEASUREMENT of HEART RATE VARIABILITY

ECG: R-R INTERVALS = CARDIOINTERVALOGRAM

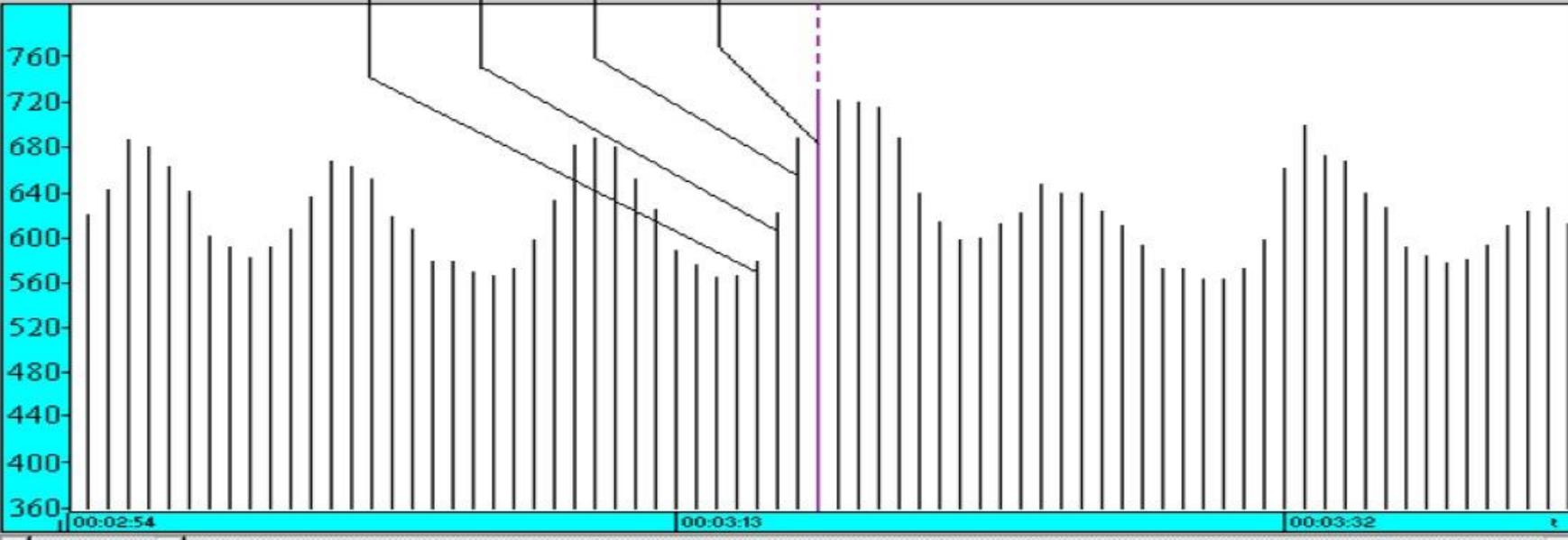
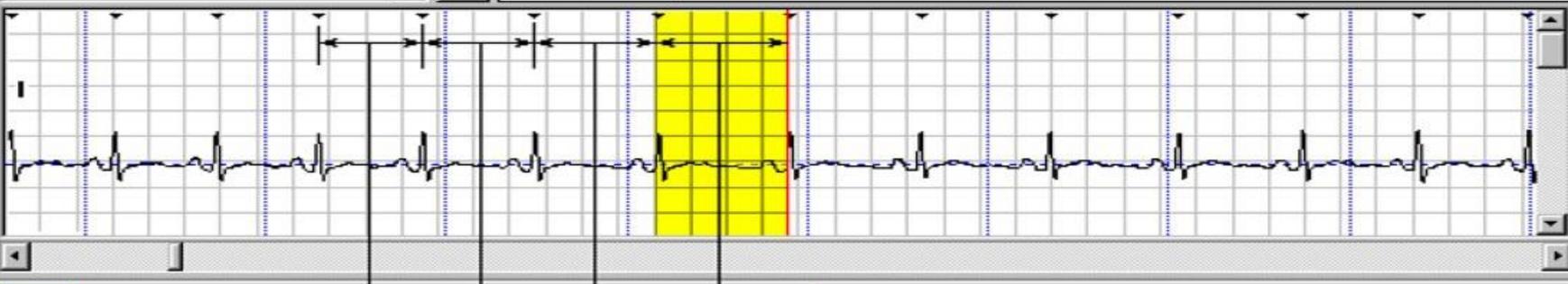


Старт > Стоп ■ Пауза || Сброс ↶

Чувст. 10 мм/мв. Скор. 25 мм/с.

Закреть

Отведение I n 328 Время: 00:03:17 ээо RR: 0.729 с.

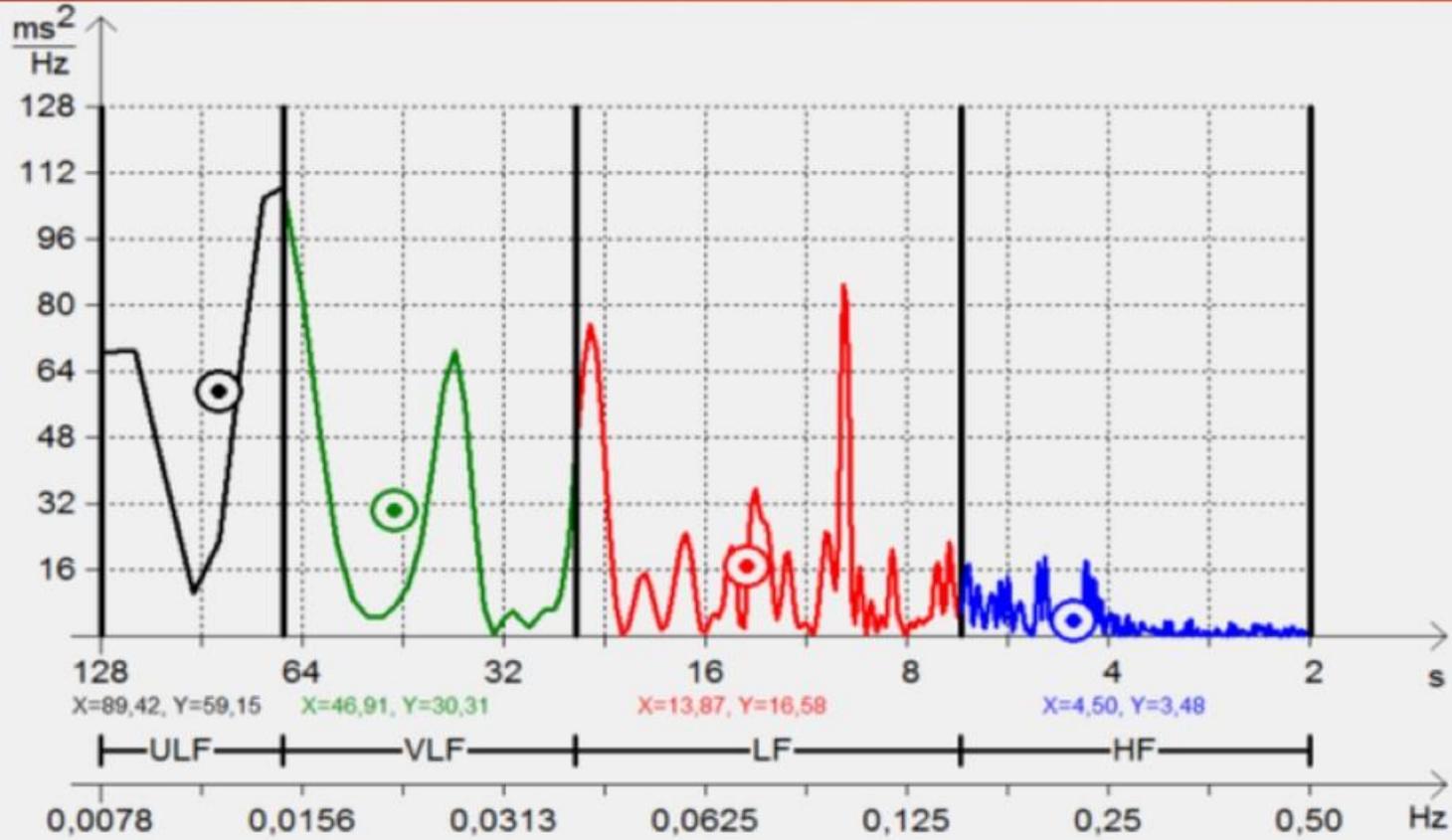


IRSA

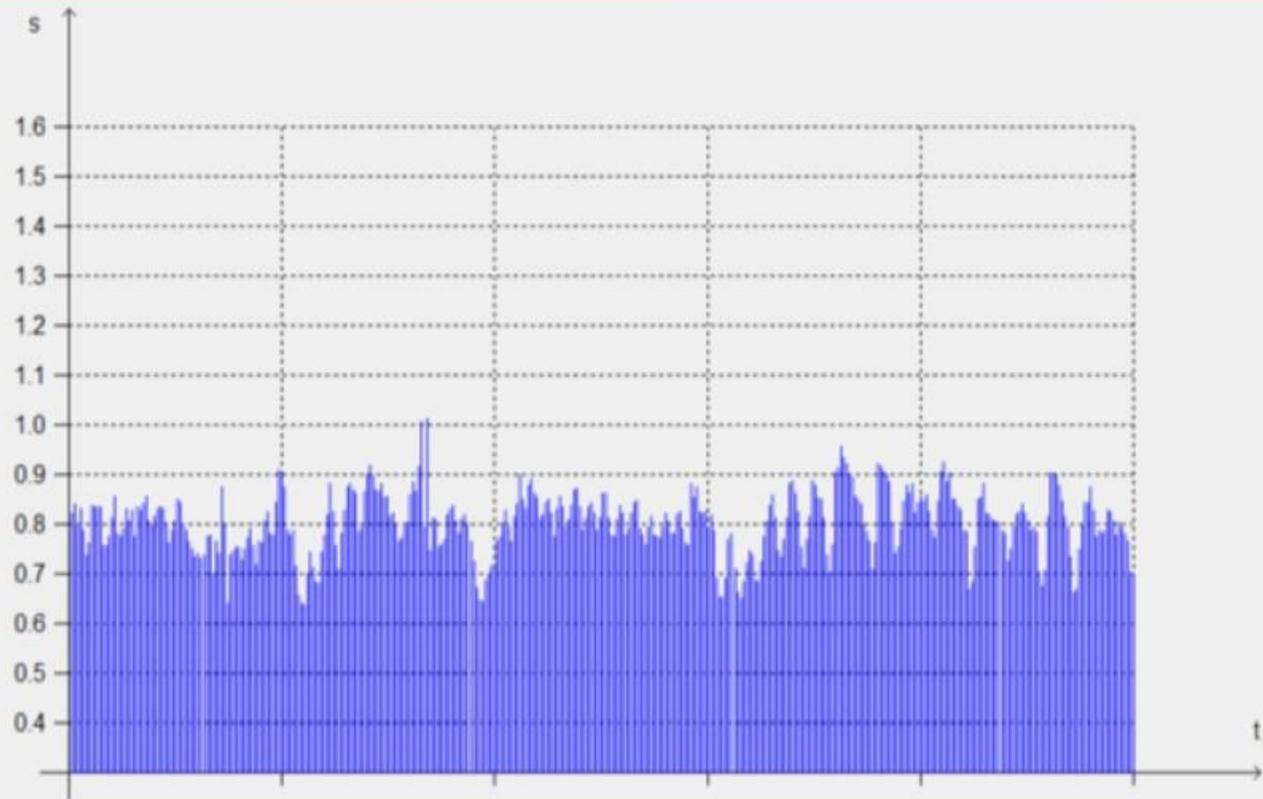


- Green: Physiological norm
- Yellow: Prenosological states
- Light Yellow: Premorbidium states
- Red: Failure of adaptation

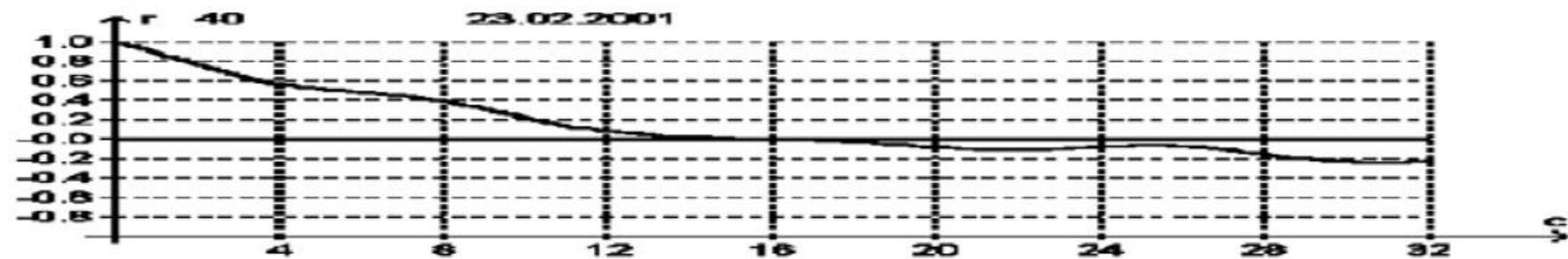
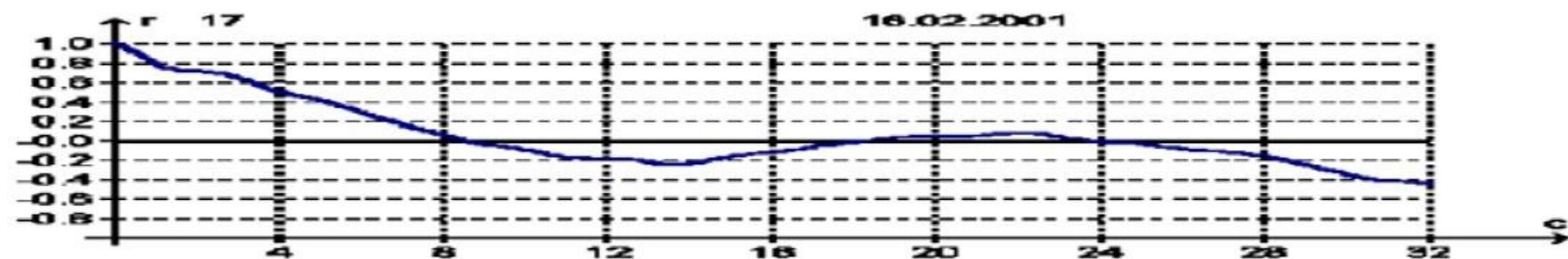
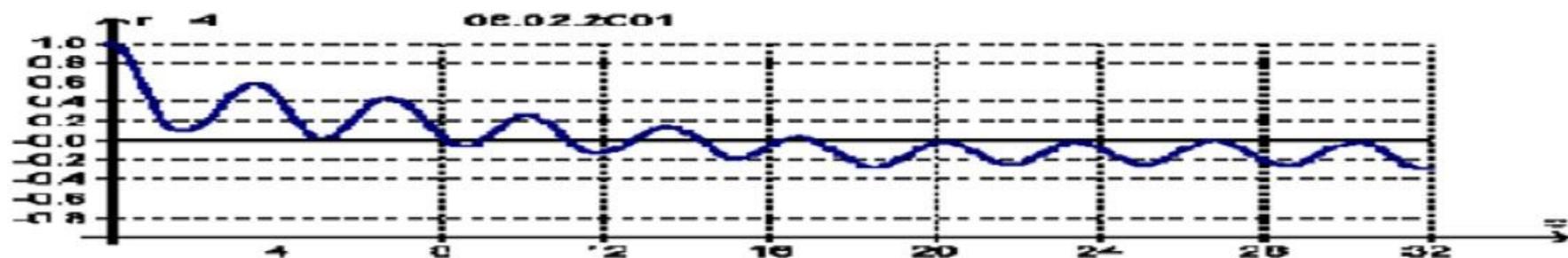
NTI



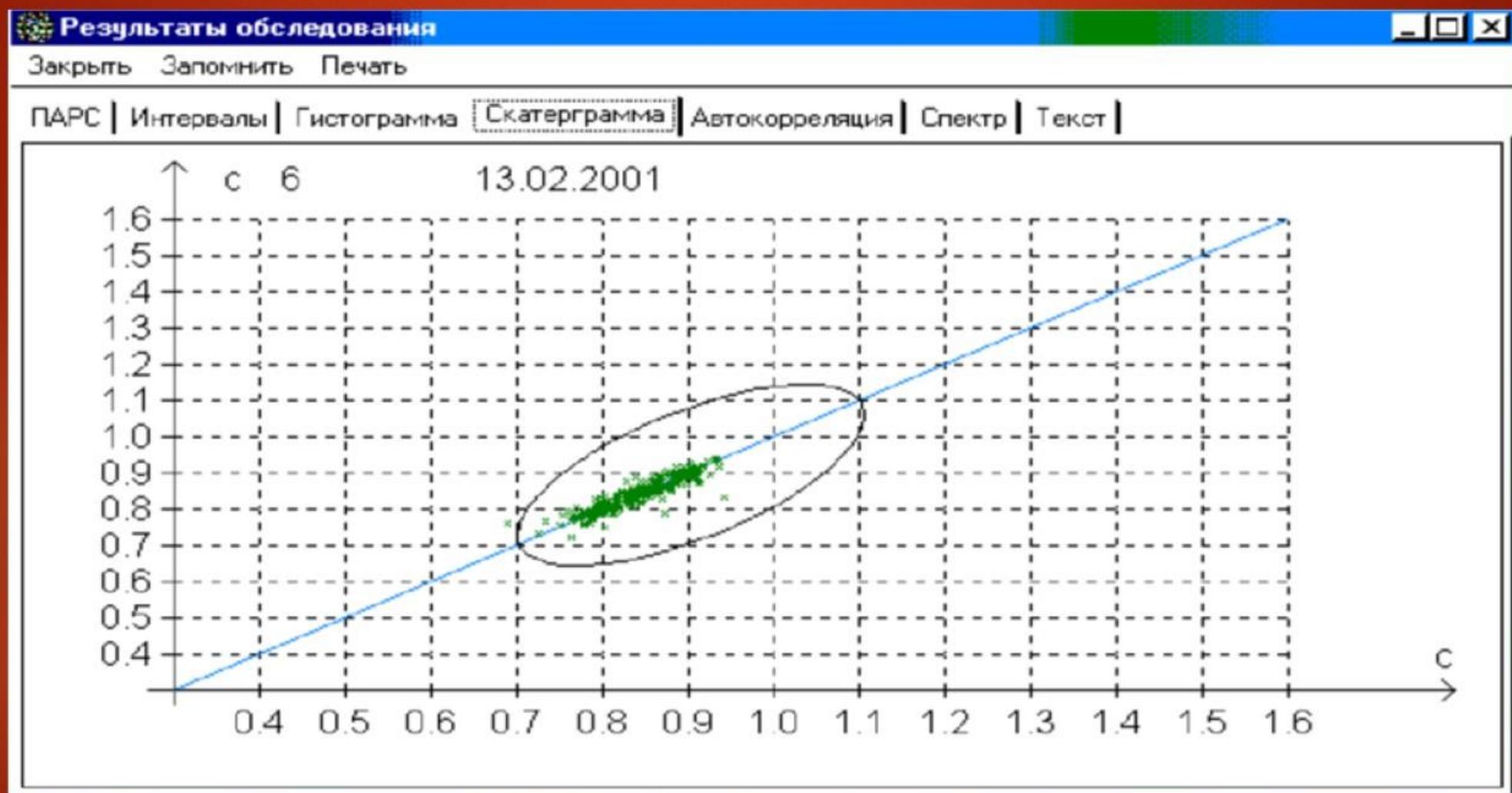
To change vertical zoom press left or right mouse button



Models of autocorrelograms with expressed breathable waves (at the top), with the prevalence of slow (in the middle) and the slowest waves (at the bottom)



SCATTERGRAM



Результаты обследования

Закрывать | Запомнить | Печать

ПАРС | Интервалы | Гистограмма | **Скатерграмма** | Автокорреляция | Спектр | Текст

