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HEALTH AND WEATHER

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Lecture plan

1. Concept of weather and climate
2. Weather and climate forming and characterizing factors
3. Parameters of solar activity
4. Definition degree variability of weather
5. Medical classification of weather
6. Weather features in different geographical regions
7. Concept of microclimate
8. Factors characterizing microclimate

Concept about weather and climate

Weather - dynamic set physical properties of ground layer of air (troposphere) for a short time interval (hours, day, weeks).

Climate - the long-term mode of weather naturally repeating in the given district, its parameters - monthly average temperature of air, average amount of days with deposits.

Thus, weather - the changeable phenomenon, climate - statistically constant concept

1)Concept “weather” - very complex thing, it has very many forming factors, which is not good investigated in meteorology

2) Till now the mechanisms of the development of metheotropic reactions in the organism are not well investigated.

The basic weather forming factors:

1) **Geliophysical** - intensity of a sunlight and solar activity

2) **Geophysical** - intensity of a geomagnetic field of the Earth, geomagnetic storms

3) **Electric condition of atmosphere** - intensity and gradient of electric field, air ionization

4) Meteorological - temperature, humidity, speed and direction of movement of air, atmospheric pressure

5) Synoptic - overcast, deposits

6) Chemical compound of atmosphere - the content of oxygen, CO 2, pollutants in atmospheric air.

All these factors are interconnected and operate on the person in a complex - difficulty

Meteorological factors – sharp fluctuations of temperature and atmospheric pressure - than more it is differences – than more biothropic weather.

Electric condition of atmosphere:

a) The contents + aeroions in air

b) The gradient of electric field of the Earth

Synoptic factors

Are caused by atmospheric circulation of warm and cold air weights. There are 3 types of air masses - warm, cold, neutral (local). At it movement are formed atmospheric fronts - warm, cold, occlusion (mix of warm and cold masses).

Frequency of change of air masses on the average is 1 time in 5-6 days, but happens more or less often - is connected to type of atmospheric circulation:

1) **Cyclone** - atmospheric whirlwind with low pressure in the center and movement of air masses counter-clockwise. It is more often in the winter, on the average above Europe for one year - 40 cyclones.

It is characterized by unstable weather - it is cloudy, deposits, hurricanes, typhoons. The big differences of pressure, temperatures, content O2.

2) **Anticyclone** - the atmospheric phenomenon with a high pressure in the center and movement of air clockwise. Clear weather - strong heat in the summer or frost in the winter. Sharp differences of weather factors are not present - more favorable weather.

Geliophysical factors

Till now at estimation of weather are little taken into account, though the ingenious founder heliobiology A.L.Chizhevsky in 1920th years has established influence of solar activity on alive organisms, including people.

There are data on concurrence the periods of increase of solar activity with revolutions, wars, epidemics, even frequency of automobile failures.

Complexity studying this question - cyclic changes of solar activity has different periodicity - 11-years, 22-years, 60-years and more, which can be imposed against each other and poorly studied.

There are most investigated 11-12-years a cycles, the beginning of last 24-th cycle, known to mankind -1997 year, thus the maximal activity - in middle of cycle (2001-2002 years).

Parameters of solar activity:

Index Wolf (W) - amount of spots on the Sun,

Index S - the total area of spots,

Intensity of radio emission of the Sun on a wave 10,7 sm,

Solar wind - corpuscular streams (protons, electrons.)

from the Sun - carry away with themselves magnetic fields and form spiral - sector structure of interplanetary magnetic field (IMF) + and - marks. Each 6-7 days the Earth at movement on orbit gets in IMF other mark that results in changes of.

Geophysical parameters - electromagnetic field of Earth (EMF), its deviation from a usual level named "magnetic storms" - planetary, local, on intensity - weak, moderate and big.

Definition degree variability of weather.

Will be carried out under the formula:

$$K = \frac{N}{n} \times 100\ \%,$$

Where:

K - coefficient variability of weather, %

N - number days with contrast change of weather

n - total number days in the apparent season

Degree variability of weather V.Rusanova

Weather	**Coefficient variability, %**
Very stable	25
Stable	25 – 30
Changeable	30 – 50
Very changeable	more than 50

The reasons, mechanisms and displays MR

People as a whole adapted to rhythmical changes of climate and the weather, connected with changes of day and night, season of year.

At aperiodic sharp changes of weather factors at people arise MR, expressed the more abruptly, than sharper changes of weather are observed.

MR is not illness and the diagnosis, but the original pathological condition having various displays on expressiveness at different people.

All people on metheosensibility share on 2 categories:

a) **meteostable** - tolerant - young healthy people

b) **meteosensitive** - on the different data it is 30-70 % of the population, in old age, among patients with bronchial asthma, hypertension - up to 90 %.

V.F.Ovcharova (1986) allocates the following biological effects of influence of weather: Tonic, Spastic, Hypoxic, Hypotensive.

Displays MR

1) **An easy degree** -

asteno-vegetative syndrome

- mass character and synchronism with changes of weather allow us to think about presence MR.

2) **An average degree** - the head and intimate pains, the expressed changes of pulse, blood pressure.
3) **A heavy degree** - aggravation and weighting chronic diseases - insults, heart attacks, aggravation bronchial asthma - growth mortality patients.

Diseases during which are marked MR

It is revealed 2 groups diseases

1. Diseases for which there are some data on presence MR:

Diseases gastroenterities way (stomach ulcer, gastritises, colites, etc.) - 40-60 % of patients,

Illnesses of kidneys and urine ways - 40-50 %, diabetes - weighting of current - 20 %, Psychiatric frustration - 50 % of patients, Ophthalmologic, surgical pathology etc. Among ill children 25-45 % - meteosensitive

2.Diseases for which presence MR is authentically proved:

- **Cardiovascular diseases** - statistically authentic growth number of insults, hypertonic crisis's, heart attacks and mortality at biothropic weather - including according to first aid,

- **A bronchial asthma** - increase and weighting attacks of asthma, mortality,

- Rheumatism - activation process, strengthening polyarthritis, artralgya - in 90 % of patients,

- **CNPD** (chronic nonspecific pulmonary diseases) - in 60-72 % of patients (according to the Yalta scientific research institute).

Medical estimation of weather

In a basis of all medical classifications - the concept offered N.E.Vvedenski about force of external irritation: low, average and high.

This on G.P.Fedorov's classification - 3 types of weather: **optimum, irritating and sharp**, on other classifications from 4 up to 7 types.

The main thing in medical estimation weather - the account sharpness fluctuations weathers factors - it intraday differences.

Scientists of the Yalta scientific climatic research institute named by Sechenov have offered the common clinical index pathogenicity weather - the sum of individual indexes changes for day on the most important weather factors.

If index

0-19 - optimum weather,

20-49 - irritating (demands strengthened medical control), more than 50 - sharp (demands strict medical control).

There is also indexes variability of weather (for estimation of a climate).The chair of hygiene Kiev medical university offers the scheme medical estimation weather on 15 parameters.

System prevention MR - 3 basic directions

1) Common hygienic methods – rational nutrition, rational mode of day

2) Organizational measures - medical weather forecasts, medical estimation of weather.

3) Treatment-and-prophylactic measures:

a) Increase nonspecific resistancy.

b) Sparing mode.

c) Medicaments prevention.

Thus allocate seasonal prevention - regular reception small dozes of preparations in adverse months in the given area

Urgent prevention will be carried out for metheosensitive cardiological and other patients in hospital in the periods and days biothropic weathers on the basis of urgent medical weather forecasts.

Seasons for seasonal prophylaxis cardiovascular diseases in Crimea(V.Bardov, 1985).

Most unfavorable months on reliable rising frequency of exacerbations:

hypertonic crisises - 2,3,4,5 and 12 month

attacks of stenocardia -1,2,3,4,5 and 11 month

myocardial infarction -1,2,3,4,5,7,8 Month violation of cerebral circulation (insults etc.)- 1,3,4,5,6,12 month

Hygienic value climate

Climate it is a long-term mode of weather in the given district. The basic climate-formed factors:

- The geographical breadth, influencing size of a sunlight,

- Height above sea level, relief and type of a terrestrial surface (ice, snow etc.),
- Features of circulation of air masses,
- Affinity to the seas and oceans.

Parameters of climate - average (monthly average, mid-annual) parameters of meteorological factors, wind rose, number of clear days etc.

The important parameter - index of instability weather:

$$T = a / b,$$

where a - number of days with changes weather, b - number of days of the period of supervision

(season, year). If index T more 0,5 – it is adverse climate (not good for ill person). At long residing at the certain climate the person has the certain dynamic stereotype providing normal ability to live.

At sharp change of climate (moving to the different climate) is observed acclimatization - complex functional - morphological changes in organism, directed on the adaptation to new climatic conditions.

Conditionally in this process allocate 2 stages:

a) Partial acclimatization or adaptation - from the first hours - to 14 days (at ill people - about 30 and more days).

b) Full acclimatization - after 14 day - some months, to conditions of Far North - up to 1,5 years.

During acclimatization it is reduced resistancy of organism to adverse factors of environment - growth diseases, asteno-vegetative syndrome etc.

Acclimatization should be taken into account in resort treatment - to not direct patients on resorts with sharply distinguished climate (24 days - the basic period of acclimatization). The big problem for army, the Navy, workers on Far North.

The Earth climate classification

Name of the climate zone	***Geographical latitude***	***Average annual temperature***	***Surface type****
1. Tropical	**±13° latitude**	**+20-24°C**	**Evergreen, forests, jungle**
2. Hot	**13-26° -"-**	**+16-20°C**	**Forests, steppe, desert**
3. Warm	**26-39° -"-**	**+12-16°C**	**Forests, steppe, desert**

4. Moderate	39-52° -"-	+8-12°C	Forest-steppe
5. Cold	52-65° -"-	+4-18°C	Forests
6. Inclement	65-78° -"-	0-4°C	Forests, tundra
7. Arctic (polar)	69-90° -"-	-4° and below	Tundra

* The relief (flat and undulating grounds, highlands) and height above the see level are of great importance.

Medical weather classification by I.I. Grigor'ev

The weather types	***The weather characteristics***
The most comfortable	The stable weather is determined by anticyclone without considerable cloudiness and precipitations. The atmospheric pressure is higher that 760 , an atmospheric difference is near 5, an air movement speed is to 3,0 m/sec

Comfo rtable	Insignificant regional changes of the weather due to short-term precipitations and the variable cloudiness. An atmospheric pressure is 760-755, an atmospheric difference - 6-8 , an air movement speed 4.0-7.0 m/sec, a temperature difference to - 5, oxygen concentration - below 315.

The weather requires intensified medical control (supervision)	A cloudy unstable weather with precipitations, frequently caused by moderate cyclones and local thunderstorms. An atmospheric pressure is 754-745, an atmospheric difference is 9.0 – 14.0, air movement speed is 8.0 – 10.0 m/sec, a temperature difference is 6 - 9^0C, oxygen concentration is 260 - 289 mg/l.

The weather requires severe medical control (supervisi on)

The weather is with storms and intensive precipitations, caused by deep cyclone. An atmospheric pressure is to 745, a pressure difference is above 14, a temperature difference above 10^0C, oxygen concentration - below 260 mg/l.

Medical weather classification by G.P. Fedorov

The weather type	***Meteorological characteristics***			
	Air temperature difference, ^{0}C	**Relative air humidity, %**	**Air movement speed, m/sec**	**Air pressure difference, gPa**
Optimal	**2**	**40 - 70**	**3**	**3**
Irritant	**2 - 4**	**70 - 90**	**3 - 9**	**4 - 8**
Acute	**above 4**	**above 90**	**above 9**	**above 8**

Medical weather classification by V.F. Ovcharova and others

The weather characteristics from the medical view	***The weather pattern characteristics***
Stable indifferent	The slow-moving anticyclone without atmospheric fronts
Unstable, passing from indifferent to "spastic" type	Destruction of the anticyclone. An approach of an inclination, a crest, a non-gradient region with increased pressure.

	An approach of a cold front or an occlusion front as a cold type.
“Spastic” type	An establishment of an inclination (ridge), a crest, a non-gradient region with increased pressure.
	A cold frontal passage or an occlusion frontal passage as a cold type.

Unstable „spastic" type with elements of „hypoxic" type	The retreat of a cold front or an occlusion front as a cold type
	An approach of a cyclone, a saddle, a dish, a non-gradient region with low pressure
	An approach of a warm front or an occlusion front as a warm type

“Hypoxic” type	The retreat of a cyclone, a saddle, a dish, a non-gradient region with decreased (reduced) pressure
	A warm front passage of an occlusion frontal passage as a warm type

The weather characteristics from the medical view	***The weather pattern characteristics***
Unstable „hypoxic" type with elements of „spastic" type of weather	An establishment of a cyclone, a saddle, a dish, a non-gradient region with decreased pressure
	The retreat of a warm front or an occlusion front as a warm type

	An approach of a inclination (ridge), a crest, a non-gradient region with increased pressure
“Spastic” type weather passing to stable indifferent	An establishment of an anticyclone after a cold front
	A formation of a local anticyclone

Microclimat - the climate of a small area, as of confined spaces such as caves or houses (cryptoclimate), of plant communities, wooded areas, etc. (phytoclimate), or of urban communities, which may be different from that in the general region.

Microclimate depends on humidity and speed of movement of air, temperature of protecting surfaces

$$Q_{total} = Q_r + Q_c + Q_t$$

Q total - total loss of heat

Qr - radiation

Qc - convection

Qt- transpiration

Hygienic estimation of a microclimate:

- Value estimation
- Objective estimation:

Comfort zone (comfort of 50% of people) – 17,2 -21,7 ^{0}C

Temperature-humidity index

combination of temperature and humidity that is a measure of the degree of discomfort experienced by an individual in warm weather; it was originally called the discomfort index.;

The index is essentially an effective temperature based on air temperature and humidity

Most people are quite comfortable when the index is below 70 and very uncomfortable when the index is above 80 to 85.

Pathological reactions to temperature discomfort

Sharp hyperthermia - rise in temperature of a body to 38,5-40 ^{0}C, sweat branch, pulse increase, breath increase, dizziness

Heatstroke - slackness, a headache, a damp skin, a nausea, vomiting, a tachycardia, temperature 39-40 ^{0}C

The conception of "climate" includes not only the temperature, humidity, the mobility of air masses and atmospheric pressure, but also electromagnetic characterization of factors - intensity ofthe magnetic field,

electrical conductibility of air,
the activity of the atmospherics, the intensity of solar radiation.

At the day time increases the motor activity of human, increases also metabolism, stronger secretes bile. This has important meaning for treatment of diabetes mellitus and diseases of the gastrointestinal tract,
the building of therapeutic diets.

We also know that most people are born and die in the dark of night. Clinically are confirmed changes of physiological functions dependent of the seasons of the year.

So, register cyclical changes of skin sensitivity to ultraviolet rays during the year: in winter it is higher than in summer

In the summer register redistribution of blood from internal organs to the skin, in connection with thisfact blood pressure is lower in summer than in winter.

In the summer there is anincreased cardiac output, less manifested vascular reaction and a large consumption of oxygen tissues than in winter. Ability of blood to bind carbon dioxide greatest in the winter.

Dry and hot strong wind, brings a lot of sand. The dust gets into the house, penetrates clothes, hair, gets in eyes, nasopharynx, generates the feeling of bothersome sultriness.

By humans develops low mood, special oft appear backsetsof chronic diseases of the nervous and cardiovascular system.

The highest manifestation of activity of climatic factors are the so-called seasonal disease and the seasonal exacerbation of chronic diseases.

Most remarkable are associated with the seasons catarrhal diseases(influenza, acute respiratory diseases, inflammatory diseases, respiratory diseases, etc.) The maximum number of these diseases happen in the autumn , winter and early spring.

The greatest number of cases of pneumonia by children under 1 year was registered in January and April, which coincides with the most drastic weather changes. Cooling, the violation of trophic of pharyngonasal cavity promote the development of the infectious process.

In cold weather increases mortality. Highestdeath-rate from pulmonary tuberculosis accounts for the winter and early spring, from cardiovascular disease - in November, December.

In the spring atmospheric pressure may have significant daily variation, it generally tends to decrease, decreases the absolute quantity of oxygen in the air.

Due to frequent changes of air masses in spring increases the number of days with so-called meteorotropic effects of the atmosphere, tonic and spastic during the passage of cold atmospheric fronts at increased atmospheric pressure and hypotensive-hypoxicin areas of the low atmospheric pressure and a warm front.

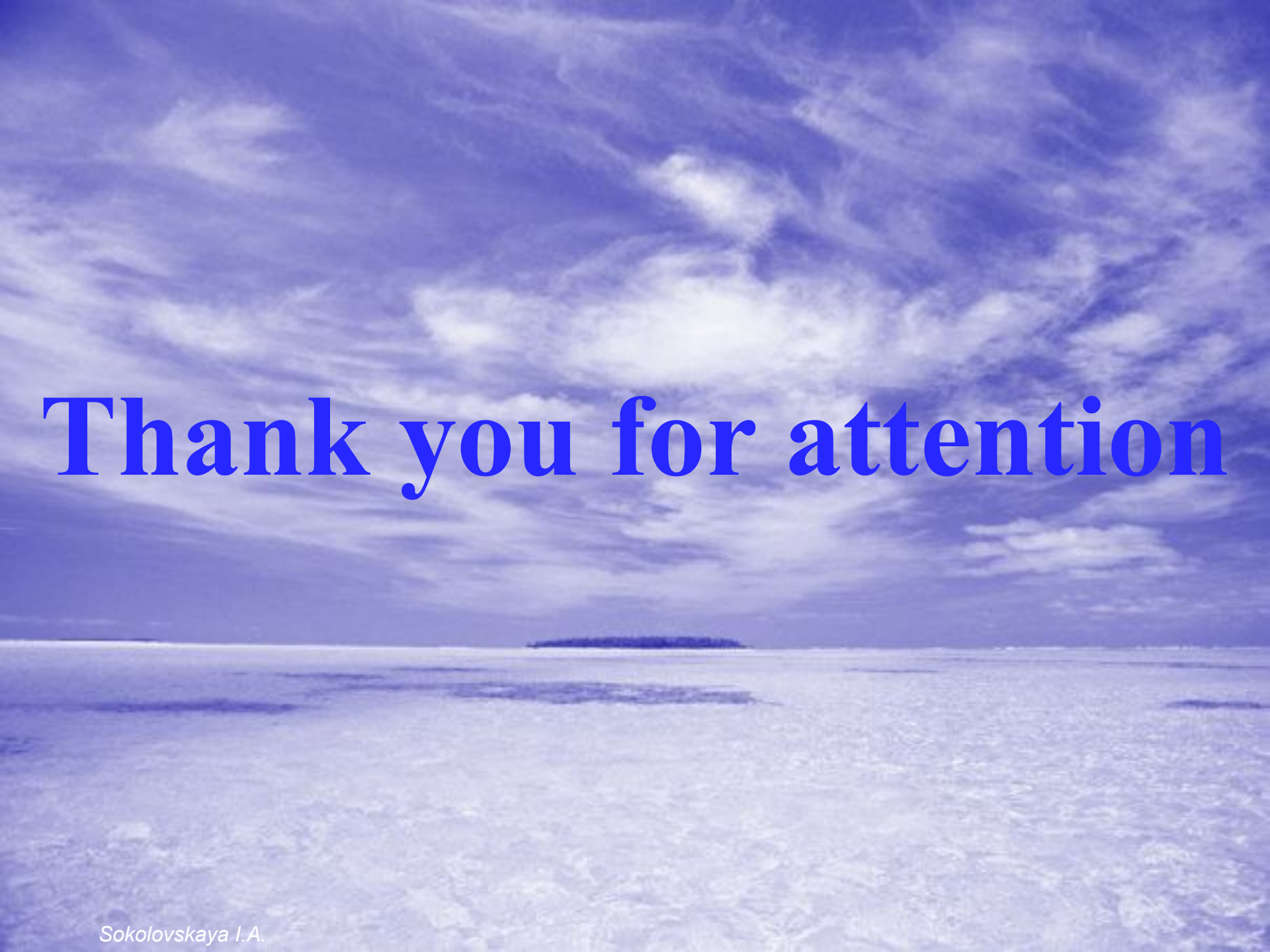
The process of acclimatization is a longtime adaptation to new climatic conditions associated with the formation of a new dynamic stereotype, which occurs through the establishment of temporary and permanent reflex connections with the environment through the central nervous system.

Adaptation is the process of supportingof the functional condition of homeostatic systems of the body, that provides its preservation, promotion, performance, maximum life duration in the inadequate conditions ofnatural environment.

Vital activity of organism inthe inadequate conditions of natural environment bypreservation of optimal characteristics of vital functions requires additional inclusion of adaptive mechanisms of physiological reactions.

For the successful acclimatization of man has so much value does not effect the harsh climatic conditions, as a rational and purposeful organization of dwelling, clothes, working conditions and nutrition.

By successful resolution of this question the human acclimatizationin the inadequate climatological conditions is successful, without prejudice to his health and performance.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