Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 3148 - 3152
Received 16 February 2021; Accepted 08 March 2021.

The Effect on the Human Body of Solar Radiation in the Conditions of the Samarkand Region

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Keywords: solar radiation, climate, insolation, atmosphere, radiation.

Introduction. The problem of human interaction with the environment is particularly acute in the regions with a dry hot climate, which includes Uzbekistan.Solar radiation is the sum total of solar matter and energy that comes to Earth. The energy propagates as electromagnetic waves at a speed of 300 thousand kilometers per second, passes through the atmosphere and reaches the Earth in 8 minutes. The Earth's surface is exposed to both direct and scattered solar rays of the Earth's atmosphere. It is the scattering of blue-blue rays in the atmosphere that explains the blue of the sky on a clear day. The yellow-orange color of the solar disk is due to the fact that the corresponding waves pass almost without scattering. The electromagnetic spectrum of solar radiation consists of infrared (50%), visible (41%) and ultraviolet (9%) parts. Since their quanta have different energies, they have a different effect on a person. The hygienic value of solar radiation is also extremely high. Its regulation is carried out in accordance with the SNiP, which for solar radiation are drawn up taking into account the light and climatic features of different geographical zones and are taken into account when designing and building various facilities.

Excessive solar radiation, dust storms, and desert heat are combined with intense atmospheric pollution, industrial emissions, and a huge chemical load on soils and water sources.

Results and discussions. The climate of Samarkand is continental-subtropical. The height of the sun in summer is 740, in winter 300. The number of clear days 155, the amount of hours of sunshine 2916, the total radiation 143,9 kcal/sm^2, the average temperature year +13,40, January 00, July +260, -180 absolute minimum, absolute maximum +450. The average annual wind speed is 2 m/s, the amount of precipitation is 328 mm, days with fogs are 14, the absolute humidity is 8.7 mm.Hg, the relative humidity is 42%. The main water artery of the city are river Zarafshan, channels Durham, Siab, Sauder. The amount of solar radiation entering the earth's surface depends on the latitude of the place, the height of the sun, the clouds and the transparency of the atmosphere. In the winter months, the height of the sun at true noon reaches 26°, in the summer 73°. The length of the day also depends on the time of sunrise and sunset. The earliest sunrise is 4 hours 30 min. and the latest approach is 19 h.31min. In Samarkand, it is observed on June 22. On this day, the longest duration of the day is 15 hours and 1 minute.The latest sunrise is at 7:15 a.m., and the earliest sunset is at 17:30 p.m. (December 22). The shortest day is 9 hours 24 minutes. The difference between the longest and shortest day in Samarkand is 5 hours 36 minutes. The height of the sun above the horizon is an astronomical factor that determines the natural light. Its duration depends not only on the length of the day, but also on the period of morning and evening twilight at negative altitudes of the sun (from 0 to 18°), when it is under the horizon. These data are of practical interest due to the fact that natural light during twilight is sufficient to perform many types of work both outdoors and indoors. The sun's rays, passing through the atmosphere, undergo molecular scattering, as well as scattering on atmospheric aerosol particles. A number of components of the atmosphere, primarily water

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vapor and ozone, cause the absorption of solar radiation. The state of the atmosphere and its transparency are determined using the transparency coefficient (P). Its values, given to the mass m at a solar constant of 1.38 kW/m^2, in Samarkand vary from 80% in December to 72% in June-September. The increased P values in the winter-spring period are due to the low content of water vapor and aerosol in the air.

In the summer, the water vapor content in the air increases, and the amount of aerosol increases, which is associated with an increase in haze caused by dust storms. The transparency of the atmosphere during this period is much less than in the cold half-year, when rain often falls and cleanses the atmosphere of various kinds of impurities. On some days, the transparency of the atmosphere in Samarkand can be high and the values of the transparency coefficients in comparison with the norm can increase to 86-89%.

Solar radiation enters the earth's surface in the form of two streams: direct solar radiation *S*, which comes directly from the solar disk, and scattered radiation *D*, which comes from the entire firmament. The sum of these fluxes is called the total radiation *Q*. At meteorological stations, direct solar radiation *S* is measured, arriving at the surface perpendicular to the sun's rays. The amount of solar radiation coming to the horizontal surface *S'* corresponding to the surface of the earth,calculated by the formula

$$S' = S \cdot sinh_{eff..}$$

The daily course of direct solar radiation and its change during the year depend on the height of the sun, the transparency of the atmosphere and cloud cover. The first factor determines the growth of hourly amounts of direct solar radiation before noon and their subsequent decrease in the evening. The average hourly amounts of direct solar radiation at true noon vary throughout the year in Samarkand from 0.75 MJ/m^2 in December to 2.6 MJ/m^2 in July high sun exposure, cloudless skies provide a large influx of solar radiation to the earth's surface in the summer months. In the cold half of the year, cloud cover significantly reduces the influx of direct solar radiation. It is interesting to note that in Samarkand in the autumn months (October), the hourly amounts of direct solar radiation are higher than in the spring (April), due to the small frequency of clouds in the autumn period compared to the spring. The hourly amounts of scattered radiation, as well as direct radiation, increase from morning hours to noon, followed by their decrease. In the annual course, the greatest hourly amounts of scattered radiation are observed in the spring, since at this time in Samarkand there is the greatest cloud cover. During the daytime hours in April, the scattered radiation reaches 1.05-1.09 MJ/m^2 and is close to the direct solar radiation 1.09-1.13 MJ/m^2. The hourly and daily totals of total radiation are shown in the table below. Monthly amounts of direct solar radiation entering the horizontal surface increase from 92 MJ/m^2 in December to 637 MJ/m^2 in July. The average monthly amounts of direct solar radiation entering a perpendicular surface are 175 MJ/m^2 higher in winter and 255 MJ/m^2 higher in summer than the amounts of solar radiation entering a horizontal surface. The average monthly amounts of scattered radiation in winter are close to the amounts of direct solar radiation, and in January even slightly exceed them. In spring and summer, the scattered radiation is about three to four times less than the direct radiation. Its maximum in the annual course is observed in April 247 MJ/m^2, by the summer with a decrease in cloud cover, its value decreases. The average monthly amounts of direct radiation in clear sky conditions in the winter months are 466 MJ/m^2, and in the summer months are 622 MJ/m^2 (156 higher) than in real conditions. The amount of scattered radiation, on the contrary, is less. When the sky is clear, the highest average monthly amounts of direct solar radiation in Samarkand are observed in the

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period from May to June, when the transparency of the atmosphere is greatest due to the fall of frequent rains. The annual amount of direct solar radiation on the horizontal surface is 3940 MJ/m^2.

The total radiation flux, falling on the active surface, is partially reflected from it back into the atmosphere. The amount of reflected radiation depends on the properties of the active surface (color, moisture content, structure, etc.). The value that characterizes the reflectivity of the soil surface is called albedo *A* (%) and is calculated by the formula

$$A = (R/Q) \cdot 100\%$$

where *R*is the reflected radiation.

Natural surfaces have different reflectivity: dark surfaces (chernozem, swamp-meadow soils, etc.) have low albedo values of 10-15%, the albedo of light surfaces (white sand, salt marshes) is 35-40%. The albedo of surfaces with a grassy cover ranges from 15-25%, and the crown of deciduous forest in summer ranges from 17%. Fresh snow has the greatest reflectivity, with an albedo of 85-90%.

$$B = Q - R - E_{eff.}$$

Insolation (in Latin in solo – "I expose to the sun") is the irradiation of the surface of a parallel beam of rays that originate from the direction of the light source. In our case, the light source is always the Sun. The insolation is significantly different at different points on the Earth's surface. In the southern regions of our region, the insolation is much higher than in the middle zone or in the north of the country. For comparison, we present the total annual values of insolation for different regions of the globe: Europe (1000÷1800) kW×h/m^2, Central Africa about 2300 kW×h/m^2, the Middle East 2000 kW×h/m^2, Central Asia 1800 kW×h/m^2. Seasonal variations in the values of monthly insolation increase the closer to one of the poles of the Earth. Such seasonal variations in insolation would be little felt if the Earth's axis were perpendicular to the Earth's orbit around the Sun. And then such fluctuations in insolation would depend only on the distance to the Sun. But in reality, the earth's axis is an angle of 23° with the plane of the Earth's orbit, and this introduces significant seasonal fluctuations in the insolation of a particular area of the Earth. According to the following table, the insolation in summer and winter differs very significantly. If we compare the values of insolation at different latitudes on June 21, we can see that the insolation varies in the range (370÷512) W×h/m^2, i.e. not very much.

Total (direct and scattered) solar radiation on a horizontal surface under actual cloud conditions, MJ/m^2

Republic, region	Months											
Point	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**
Samarkand	***222***	***263***	***373***	***524***	***708***	***825***	***854***	***784***	***620***	***423***	***243***	***189***

Solar radiation at the upper limit of the atmosphere (Wxh/m^2 per day)

Latitude, ^{0} n.l.	0	10	20	30	40	50	60	70	80	90
21 June	370	410	440	460	475	471	465	481	502	512
21 December	401	344	288	214	152	85	24	00	00	00
Average annual value	404	399	384	354	318	275	222	195	176	168

On December 21, the situation is completely different-the value of insolation ranges from 0 to 401 W×h/m^2, i.e. in winter, the higher the latitude, the greater the difference with the summer value of insolation. In December, between the north and south latitudes has the

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maximum difference. As a result, the insolation varies greatly depending on the time of year and geographical location. This should not be forgotten when using renewable energy sources based on solar panels. How to protect yourself from solar radiation: the infrared component of solar radiation is the coveted heat that residents of the middle and northern latitudes look forward to all the other seasons of the year. Solar radiation as a health-improving factor is used by both healthy and sick people. However, we must not forget that heat, as well as ultraviolet light, refers to very strong stimuli. Abuse of their action can lead to burns, general overheating of the body, and even to an exacerbation of chronic diseases. When taking a sun bath, you should adhere to life-tested rules. Especially careful to sunbathe on clear sunny days. Infants and the elderly, patients with a chronic form of tuberculosis and problems with the cardiovascular system, should be content with scattered solar radiation in the shade. This ultraviolet light is quite enough to meet the needs of the body. Even young people who do not have special health problems should provide protection from solar radiation. Now there is a movement whose activists oppose tanning, and not in vain. Tanned skin is undoubtedly beautiful. But the melanin produced by the body (what we call tan-erythema) is its protective reaction to the effects of solar radiation. There is even evidence that sunburn shortens life, as radiation has a cumulative property - it accumulates throughout life. If the situation is so serious, you should scrupulously follow the rules that prescribe how to protect yourself from solar radiation:

- strictly limit the time for tanning and do it only during safe hours; - while in the active sun, you should wear a wide-brimmed hat, closed clothing, sunglasses and an umbrella;
- use only high-quality sunscreen.

Conclusions

1. Is solar radiation dangerous for humans at all times of the year? The amount of solar radiation entering the earth is associated with the change of seasons. At mid-latitudes, it is 25% higher in summer than in winter. At the equator, this difference does not exist, but as the latitude of the place of observation increases, this difference increases. This is due to the fact that our planet is tilted at an angle of 23.3^0 in relation to the sun. In winter, it is low above the horizon and illuminates the earth only with sliding rays, which warm the illuminated surface less. This position of the rays causes their distribution over a larger surface, which reduces their intensity compared to the summer vertical drop.
2. In addition, the presence of an acute angle when the rays pass through the atmosphere, "lengthens" their path, causing them to lose more heat. This circumstance reduces the impact of solar radiation in winter.
3. Solar radiation as a health factor is used by both healthy and sick people. At the same time, infrared and ultraviolet rays are very strong irritants. Abuse of their action can lead to burns, general overheating of the body, and even to an exacerbation of chronic diseases. Infants and the elderly, patients with a chronic form of tuberculosis and problems with the cardiovascular system, should be content with scattered solar radiation in the shade.

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