

THE INFLUENCE OF SOLAR CTIVITY ON LEARNING INDICATORS

Bashirov M.,*Candidate of science in physics and mathematics, PhD,***Ahmadova K.***Baku State University, student.**Baku State Universite*<https://doi.org/10.5281/zenodo.11390922>**Abstract**

Just like solar activity, the solar wind affects the physical and magnetic parameters of planets in interplanetary space, sunspots, their number, flares, and magnetic storms created by the Sun on Earth affect radio-electronic devices and the living world. Although the educational indicators of students are associated with physical, sociocultural factors, solar wind indicators do not go unnoticed in these results. In this regard, basic data on the material of the solar wind and geomagnetic storms has been collected. The dependence of such educational indicators as attendance, academic performance, and quality indicators of examination sessions on the parameters of the solar wind and the level of magnetic storm has been studied. Regression dependencies are given, and coefficients are determined. It has been determined that educational indicators depend on parameters related to the sun and the strength of the geomagnetic storm. The results obtained are important when analyzing educational indicators.

Keywords: Sun, geomagnetic storm, education indicators, student attendance, success, quality.

The influence of the solar wind on the Earth makes the study of space plasma relevant in all areas: the formation of geomagnetic storms depending on the intensity of the solar wind plasma, control devices, ground-based complexes, aircraft and control systems, remote control systems, radio engineering, radio navigation, radar and television systems and devices, navigation and affect air traffic control, micro- and nano electronic devices, as well as humans.

Problem Statement. Depending on the time of day, each person's physiological state, intellectual capacity and mood change periodically. Our body temperature depends on the circadian rhythm. We talk about "jetlag" when the body's biological clock operates in one time zone, while other parts of the body - liver, intestines, brain, and muscles - live in a different time zone. Each time zone must be close to the same day for these clocks to synchronize. That is, if a person arrived in a city with a 3-hour difference in time zone, it takes 3 days for the body to adapt. Social jet lag is common for those who must work flexible hours or whose "social" and "biological" clocks are severely out of sync. If your alarm clock goes off before your biological clock asks you to wake up, you are in "social jet lag" mode. Many studies prove that the mismatch between "social" and "biological" clocks increases the risk of depression, heart disease, diabetes, obesity, and even cancer.

Solar activity is determined by flares on the sun. The solar wind is a stream of particles separated from the Sun because of a coronal mass ejection and spread through space. The Sun primarily affects the planets of the Solar System: it makes them revolve around itself due to gravity, the wind it creates causes the loss of planetary atmospheres, changes the magnetic properties and properties of the planets, and creates a magnetic storm on the planets' surface. The solar wind factor also affects living beings. In the works of A. Sakuma, Paris, (1965-1971) on solar activity in geodynamic processes it is shown that as solar activity

increases, there is an activation of mud volcanoes, change in the momentum of gravity, and there is a rise in groundwater during the period of low activity, increased pressure in drilled oil and water wells, natural sources of mineral water. [1]. The influence of solar activity on bio-objects, mental performance of undergraduate students, academic achievement of junior high school students, attendance, and the presence of some diseases in the older age group has been studied. [2, 3, 4]. The effect of solar activity on the spread of pandemics and viruses has also been investigated and it was found that pandemics occur only during minimum periods of solar activity [5]. Solar activity affects the academic performance of students. Seasonal amplification of influenza-like epidemics due to the influence of diurnal resonances of solar activity, the dependence of these epidemics on solar activity was studied, it was determined that the cycle of activity change can coincide with the cycle of impact of other processes in the region, with virus mutation and changes in antigenic drift, and the combination of these mechanisms can cause seasonal epidemics [6]. Factors, problems, and ways of their solution affecting the educational performance of students were analyzed [7], specific factors were studied - the influence of minors on the attendance of classes by the specific value characterizing the magnetic field [8,9]. It is found that attendance significantly decreases when solar activity decreases in younger schoolchildren (9-11 years old). It is mentioned in the paper that solar activity stimulates physical and mental activity in human life. Solar activity directly or indirectly affects the attendance of minors. However, the dependence of students' educational performance on the parameters characterizing solar activity and geomagnetic indicators has not been studied. Thus, studying the educational performance of students in the days before and after a magnetic storm created by the solar wind on Earth is as important as other factors. It is interesting to study the influence of educational perfor-

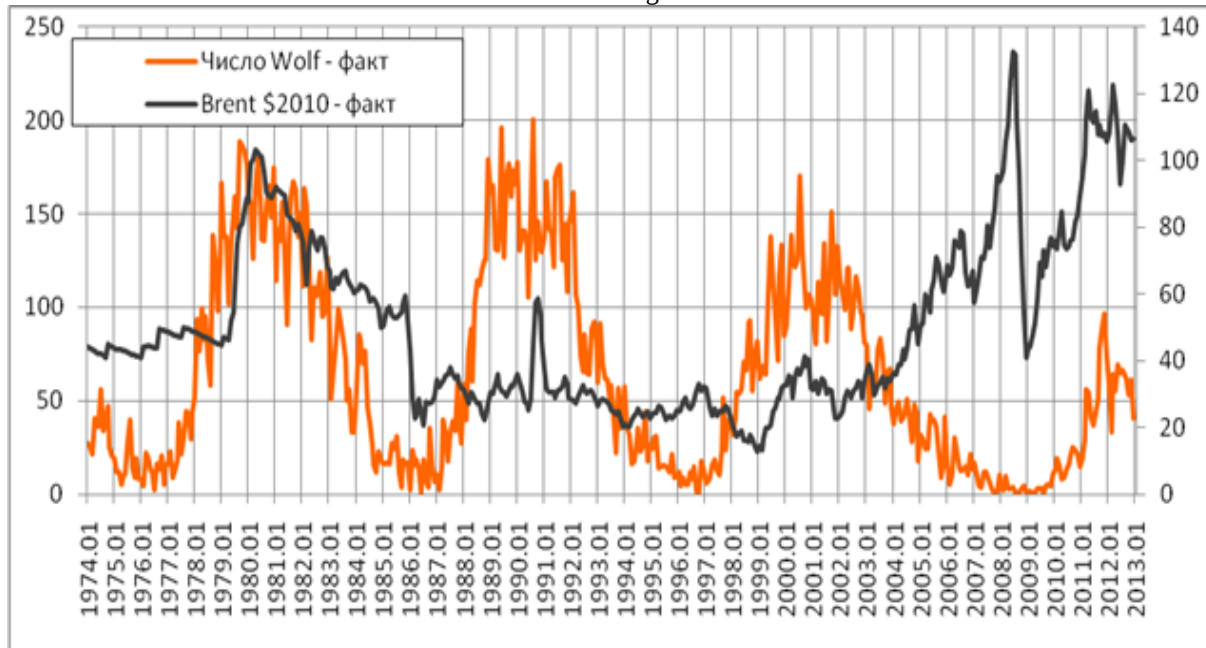
mance of students 18-23 years and older due to the preventive effect of other living things on the event during those times.

There are approaches related to the management of education quality from sociocultural, economic, and other aspects, most of them consider the human factor as a physiological object to improve the quality of education [10]. Man is a physiological object, a biological subject, and his behavior, activity and fulfillment of any needs in a certain sense depend not only on his physical indicators and thoughts, but also on the impact of ex-

ternal physical phenomena. Thus, even though a student who comes to take an exam is fully active during the period of study, the result of the exam may be low and vice versa. A student with less-than-ideal preparation can fully demonstrate the knowledge he/she has.

Sociocultural aspects affect the quality of student management [11]. Manifestation and management of these aspects depends on solar activity in one form or another.

In addition, the influence of solar activity on the sale of goods, oil prices and other facts has been investigated.



The diagram above shows the dependence of oil prices (in US dollars) on the number of sunspots. The increase in oil prices is observed at the maximum value of solar activity. It is noticeable that in areas where oil is required, the requirements of the production process are directly or indirectly dependent on solar activity.

The effect of solar events on educational performance is important. A questionnaire based on related questions was created at docs.google.com.

https://docs.google.com/forms/d/1kS7CVsBnvO8wfcDvtsZIrQsQvmQOciygAd9dDnZ_K2s/edit?ts=65798dad#responses, Information was collected and analyzed from 150 people.

1. Can events happening on the Sun affect the Earth and us? Yes, no, I can't say.

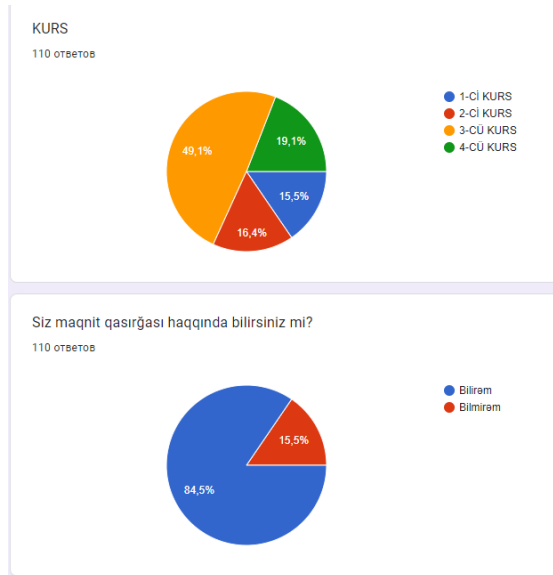
2. Do you know about magnetic storms? Yes, I know, No I don't know.

3. Where do you keep track of solar activity and magnetic storms (from the press, Internet, Baku State University website or other source)?

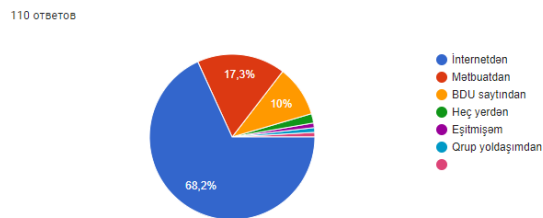
4. How does a magnetic storm affect your life (Yes, I know, No I don't know).

5. What feelings do you experience in days of magnetic storm, for example, weakness, fatigue, tension, uncontrollability (despair), vigor, business? (I haven't noticed any).

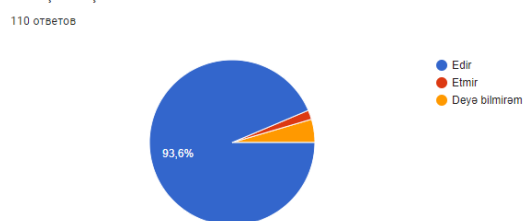
6. Can a magnetic storm affect your academic performance? Yes, no, I don't know.



Günəş aktivliyini və maqnit qasırğalarının olmasını hardan izləyirsiniz?



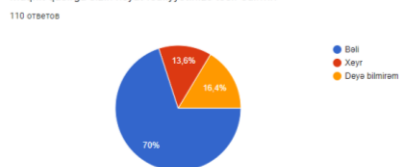
Günəşdə baş verən hadisələr Yer kürəsinə təsir edə bilərmi?



The survey covered all undergraduate courses of Baku State University, 15.5% of I (first) year, 16.4% of II year, 49.1% of III year and 19.1% of IV year students participated in the survey. The survey was analyzed, answers to the questions about solar activity, magnetic storm, its influence on the Earth and people were analyzed, and the corresponding diagrams were constructed. As can be seen from the diagrams, the fact that the respondents have information about magnetic storms is 84.5%. The survey participants stated that they follow the information about solar flares and magnetic storms on websites and in the press. Respondents believe these events affect the Earth (93%) and even

say they play a role in their daily activities (70%). During a magnetic storm, when sunspots and flares are high, 57% of respondents said they felt weak, 48% felt tired, 27% felt stressed, and 14% felt discouraged and out of control. 47% of them stated that these events also affected their academic performance and 20% stated that they did not. 3% of respondents stated that it had a positive effect and 51% stated that it had a negative effect. The fact that students are aware of related events is satisfactory. All this puts on the agenda the importance of studying the effect of solar phenomena on people, their daily activities as well as educational performance.

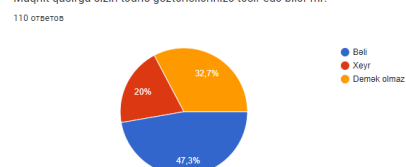
Maqnit qasırğa sizin həyat fəaliyyətinizə təsir edirmi?



Maqnit qasırğa olan günlər hansı hissləri keçirirsiniz?



Maqnit qasırğa sizin tədris göstəricilərinizə təsir edə bilərmi?



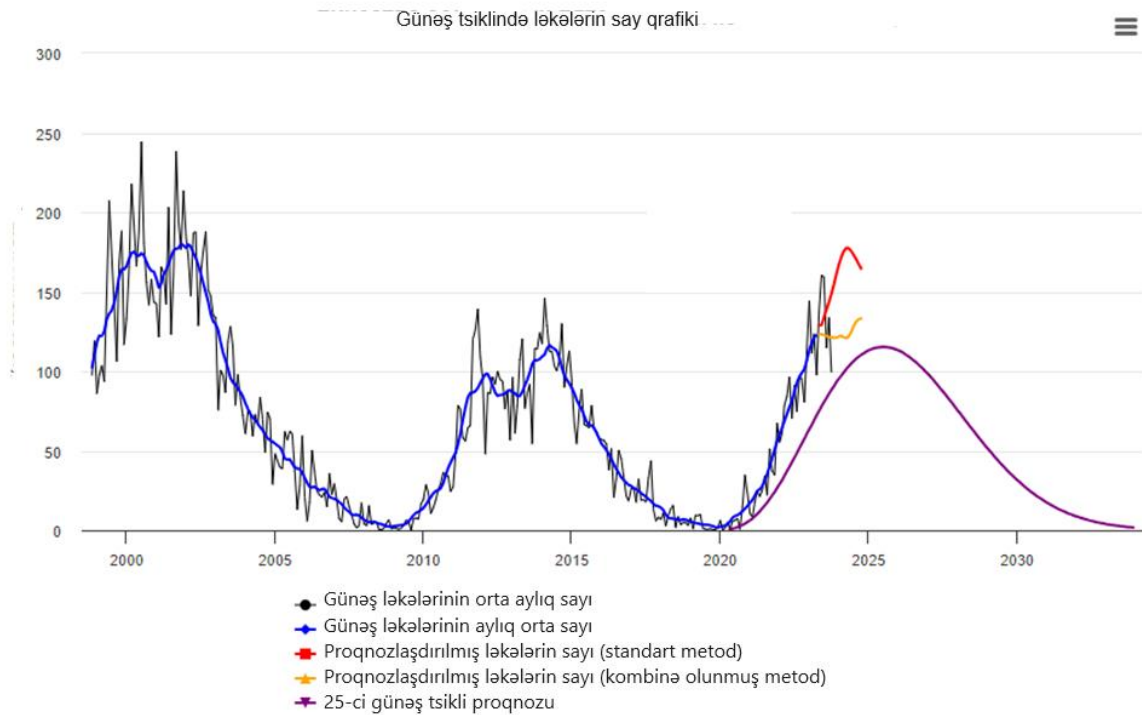
Maqnit qasırğa sizin tədris göstəricilərinizə necə təsir edir?



Actuality. Along with other facts that influence educational performance: lifestyle, mental potential, physical condition, motivation, financial opportunities, whether education is targeted or not, external influences: family, relatives, acquaintances, society, political events, etc. along with such facts, the influence of the closest star to the Earth, the Sun, is invaluable. Both the gravitational and electromagnetic properties of the Sun, as well as the fact that the Earth is inside the Sun's atmosphere, means that any process occurring on the Sun does not affect the Earth. Solar activity, solar wind strongly affects electromagnetic devices, satellites, stations, unmanned aerial vehicles, satellites, astronauts on Earth and traveling in Earth orbits. The power of the

impinging particle flux is important for displaying the aurora borealis: when the particle flux power is less than 20 kW, the aurora borealis is not visible. It is visible when it is between 20-50 kW, and when it is between 50-100 kW, auroral movement is observed. This power must be greater than 100 kW for a magnetic storm to occur.

These effects are especially evident when the older generation is on different forms of learning. Thus, students and teachers 65-75 years old cannot manage their learning activities and outcomes related to the facts arising from various health problems on days of increased magnetic activity.



<https://www.spaceweatherlive.com/ru/solnechnayaaktivnost/solnechnyy-cikl.html>

From the graph taken from the site, we can see that by periods of solar activity 2023-2028 years will coincide with the period of increased activity. This fact is confirmed by both the forecast and actual observations. Judging by the graph, the actual observed activity level is higher than the predicted values. This makes the study of events related to solar activity more relevant.

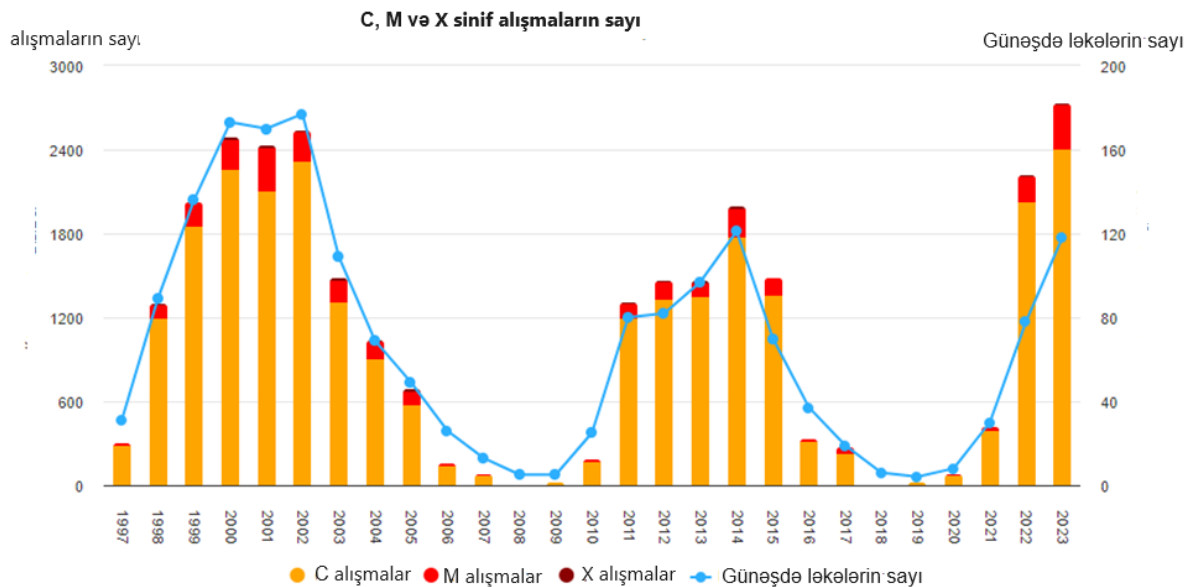
Table

Wolf number (number of observed sunspots) in 2000-2023.

	yanvar	fevral	mart	aprel	may	iyun	iyul	avqust	sentyabr	oktyabr	noyabr	dekabr
2000	90	113	139	125	122	125	170	131	110	99	107	104
2001	96	81	114	108	97	134	82	106	151	126	106	132
2002	114	107	98	121	121	88	100	116	109	98	95	81
2003	80	46	61	60	55	77	85	73	49	66	67	46
2004	37	46	49	39	42	43	51	41	28	48	44	18
2005	31	29	24	24	43	39	40	36	22	8	18	42
2006	15	5	11	30	22	14	12	13	14	10	22	14
2007	17	11	4	3	12	12	10	6	2	1	2	10
2008	5	4	16	5	6	4	1	0	1	5	7	1
2009	2	2	1	1	3	3	4	0	4	5	4	11
2010												
2011												
2012												
2013	13	19	16	8	9	14	16	20	25	24	22	14
2014												
2015	19	30	56	54	42	37	44	50	78	88	97	73
2016								51	42	33	23	22
2017	27	22	20	31	20	21	20	27	45	18	14	15
2018	13	16	11	13	17	19	11	14	12	13	13	13
2019	16	11	21	13	16	12	12	11	12	11	12	12
2020	13	11										
2020	13	11	12	14	11	12	13	15	11	20	36	
2021	7	6.	11	19	16	20	24	16	39	27	27	51
2022	44	49	59	59	73	59	77	63	73	27	54	94
2023	113	90	85	72	121	134	152	146				

The size of ordered regions on the surface of the Sun, the number of spots in a region, their magnetism, their classification, and the probability of ignition occurring in each of them are different. The regions can be expanded and separated. The number of sunspots, their total area, the number of new group formations and the number of spots in each group, the radio emission wavelength (cm), and the classification of

sunspots according to the Zurich/Mackintosh system change every day. At present, the number of sunspots, the real average monthly sunspot number, and the number of average monthly sunspots are increasing according to standard and other methods. This occurs according to the 25-year cycle of solar activity. Since the maximum of the 11-12-year cycle falls on 2025-2026, the relevance of this issue arises.



The graph above shows the number of C, M, and X class flares that occur on the Sun and can affect Earth.

Solar flares: Solar flares are divided into five classes: Class A and B flares are quiet flares, Class C flares are weak flares, Class M flares are strong flares, and Class X flares are the main class of very strong flares. Each flash class is distinguished from 1 to 9: A1, A2,..., A9, B1, B2, ...B9, C1, C2,..., C9. X-class dependency types continue. For example: flashes X10 and above are called "super X-class flashes". Class A and B flares correspond to minimum and maximum solar background levels and are not of interest for research. Class C flares are practically incapable of affecting the earth. While it cannot affect the earth, radio wave propagation and electronic devices, it does not affect living things. Class M flares are weak and effective (R1-R2) and can block and even disrupt radio wave propagation. Moderate M-class flares can create a solar radiation storm. Strong and persistent M-class flares can cause a CME (coronal mass ejection).

Class X flares are the largest and most powerful. This class of flares occurs about 10 times a year and is

mainly observed during solar maximum. When an X-class flare is received, the radio wave propagation barriers at the Earth's daytime surface (R3-R5) increase from strong to higher-extreme levels. If this flare were to occur in the middle of the Earth-facing solar disk, a strong, persistent solar radiation storm would form and a strong CME would occur, which could cause a geomagnetic storm from strong (G4) to extreme (G5) on Earth.

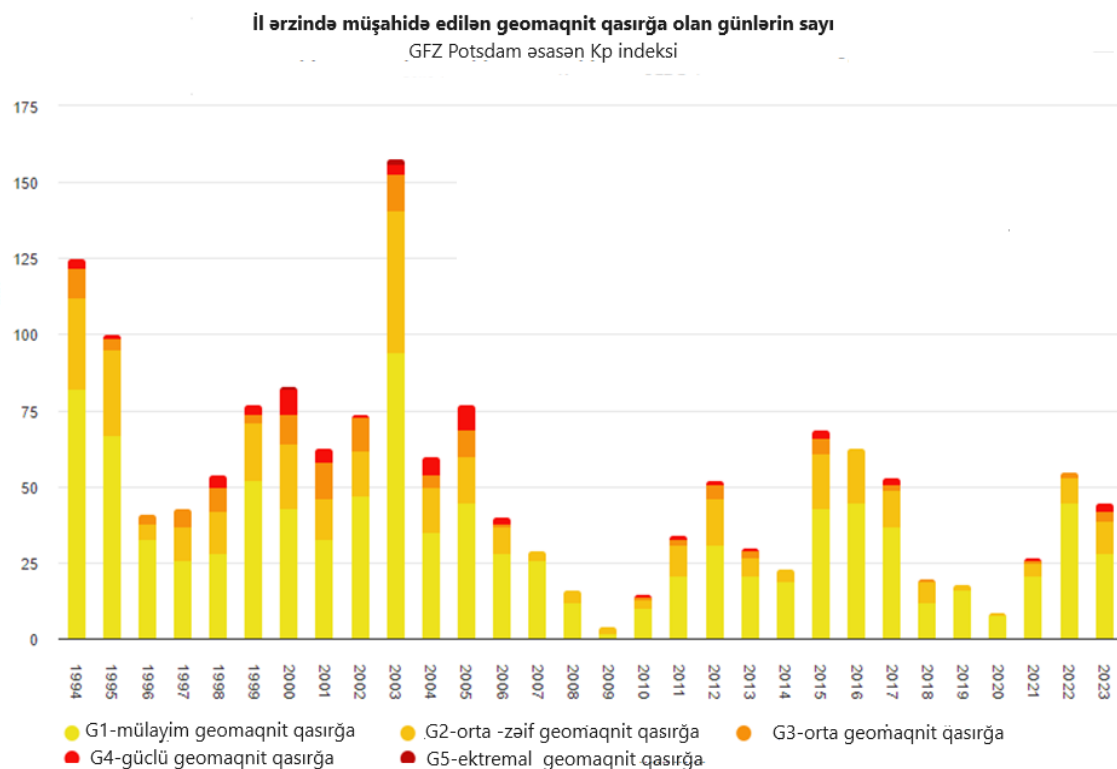
The solar wind causes geomagnetic storms on Earth. It is characterized by the Kp coefficient, which indicates the strength of the storm. Kp indicates the predicted geomagnetic conditions at mid and high latitudes. These values indicate the expected geomagnetic activity for the next 3 days with a 3-hour period. This is the easiest way to find out what the geomagnetic conditions will be like over the next 3 days. Forecasts are updated daily by the NOAA SWPC (National Oceanic and Atmospheric Administration National Space Weather Prediction Center) (data taken from the Baku State University website).

Table

Dependence of magnetic storm magnitude on the value of Kp

Kp	0-2	3-5	6-7	8-9	9
Storms	quiet	weak	average	strong	powerful
G		Kp=5, G1	Kp=6, G2 Kp=7, G3	Kp=8, G4	Kp=9, G5

As of November 2023, the last strongest flare X1.51 occurred on 01.08.2023, flare M9.8 - 28.11.2023, geomagnetic storm Kr(G2) - 25.11.2023. In March 2024 there were flares X1.1, M9.5, there was a geomagnetic storm K2(G6).



The diagram above shows the dependence of the number of geomagnetic storms by years. As can be seen, the number of geomagnetic storms of G1 and G2 class prevails in the last year.

Table

Solar flares and geomagnetic activity

year	Flashes			Number of sunspots	The level of the magnetic storm				
	C	M	X		G1 weak	G2 Average weak	G3 medium	G4 is powerful	G5 emergency
1994					94	47	12	3	2
1995					67	28	4	1	
2003					82	30	10	3	
2017	237	22		19	37	12	2	2	
2018	192	15		6	12	7	1		
2019	56	5		4	16	2			
2020	81	3		8	8	1			
2021	398	21		30	21	4	1		
2022	2036	178	7	78	45	8	2		
2023	2411	315	11	118	28	11	3	3	

The characteristic table given for the values of solar wind parameters includes solar wind speed, plasma flux density, and other parameters. An increase in these parameters is observed during a magnetic storm.

Solar wind parameters	yaxşı	orta	pis
Solar wind speed x100km/s	0-4	4-7	More than 7
Wind density	0-12	12-24	More than 24
Pressure nPa	0-4	4-8	More than 8
Magnetic induction of the interplanetary medium nTl	0-9	9-21	More than 21
Pole induction angle	0-40°	40°-48°	More than 48°
Pole voltage x10kV	0-11	11-20	More than 20
Particle flux power at the pole QW	0-50	50-100	More than 100

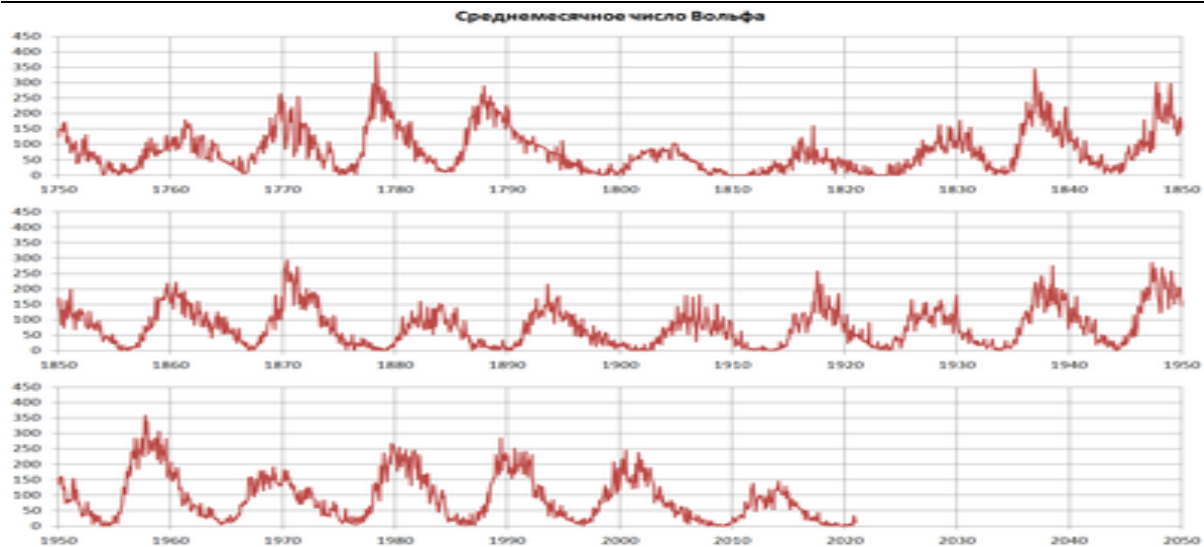
What happens during a geomagnetic storm and what advice do doctors give during a geomagnetic storm? Geomagnetic storms caused by solar flares can have a negative impact on human health. These storms can cause headaches, insomnia, severe uncontrollable agitation and other unpleasant symptoms. In this case (a) it is recommended to drink more water, which reduces the impact of the geomagnetic storm. Water improves blood circulation and reduces muscle tension. During a geomagnetic storm there is fatigue and increased excitement, so it is considered advisable to refrain from heavy physical exertion and sports during these days. People suffering from any illnesses should be more careful on geomagnetic storm days and consult a doctor when symptoms appear. They should be out in the fresh air. Fresh air relieves stress and reduces tension. Rooms should be ventilated if you feel discomfort on geomagnetic storm days. Healthy food can reduce the negative conditions that occur in the body during a geomagnetic storm. If you pay attention to these facts and eat healthy fruits and vegetables, you can prevent and reduce the effects of geomagnetic storms. All of these factors have a significant impact on a student's academic performance.

Research Objective. Solar wind, magnetic storms respond by preventive effects on various organisms and microbes. Colors, shape, etc. change its parameters. Naturally, such changes lead to the manifestation of

various diseases in the human body. The number of one or the other diseases increases. Accordingly, it does not affect the educational indicators. Ultimately, all these facts affect the educational performance of students. If we compare the time that students devote to learning (35-45% of the day, more in high schools), we can see how important it is to study the impact of the above-mentioned phenomena on the learning process.

It should be noted that the logarithmic coefficient of magnetic storm intensity K_r varies from region to region. The coefficient depends significantly on whether the locality is near or far from the Earth's pole. For this reason, in the work we analyzed, the coefficients were taken by region.

The temperature on the surface of the Sun varies, and areas whose temperature differs from the surface temperature by 1500-2000 K are registered as spots. The sunspots appear black on the Sun. Groups of spots are sorted and listed. Spot clusters are labeled as regions. Spot groups are numbered throughout the year, each characterized by activity, number of spots per area, area, location, spot shape, tendency to disperse, and other factors. Spots also vary in width, length, and depth. These spots have a certain depth at the surface of the Sun. (<https://rg.ru/2023/12/06/dyra-na-solnce.html>) The last coronal hole was observed in March 2023, after which solar activity increased.



Solar activity is characterized by the Wolf number by the number of spots on it. The Wolf number is defined as $W=k(f+10g)$: f is the number of observed spots, g is the number of observed groups of spots, and k is the normalization factor

<https://www.spaceweatherlive.com/ru/otchety/otchet-o-solnechnyh-pyatnah.html>

Research. The immediate possibilities of research questions study were evaluated. As a first step it was planned to study educational indicators of separate groups of specialties of the faculty: students' attendance, educational indicators, attendance of examination

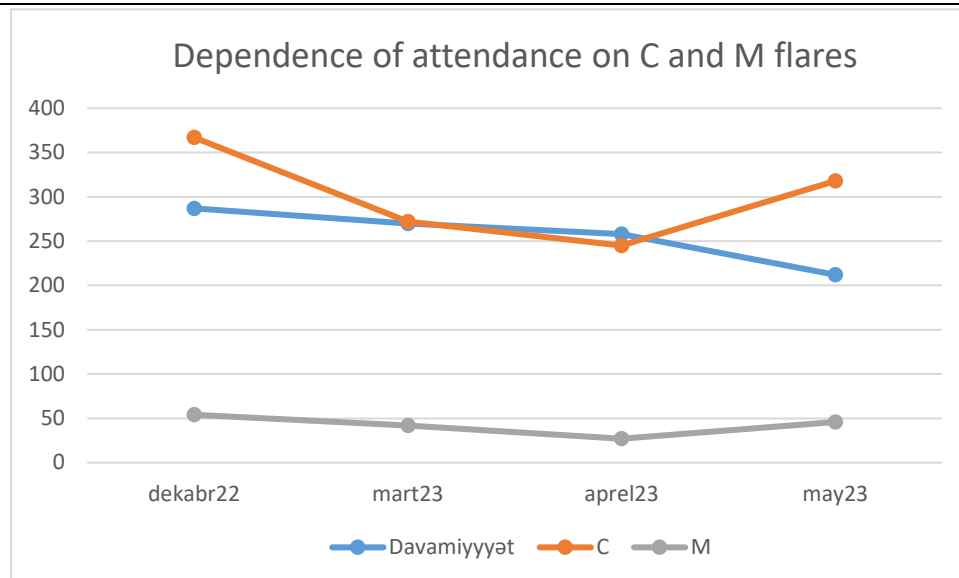
sessions and performance indicators. For this purpose, the dependence of indicators on the Kp coefficient for the months of December-January, March, April, May and June of different years was studied. Kr coefficient fixed for Baku city was taken.

The attendance of 20 academic groups for different four months was taken and a diagram of average monthly grades depending on the habits of C and M was plotted. It covers December 2022, March, April and May 2023. Since there are no classes in January-February 2023, these months are not shown.

Table

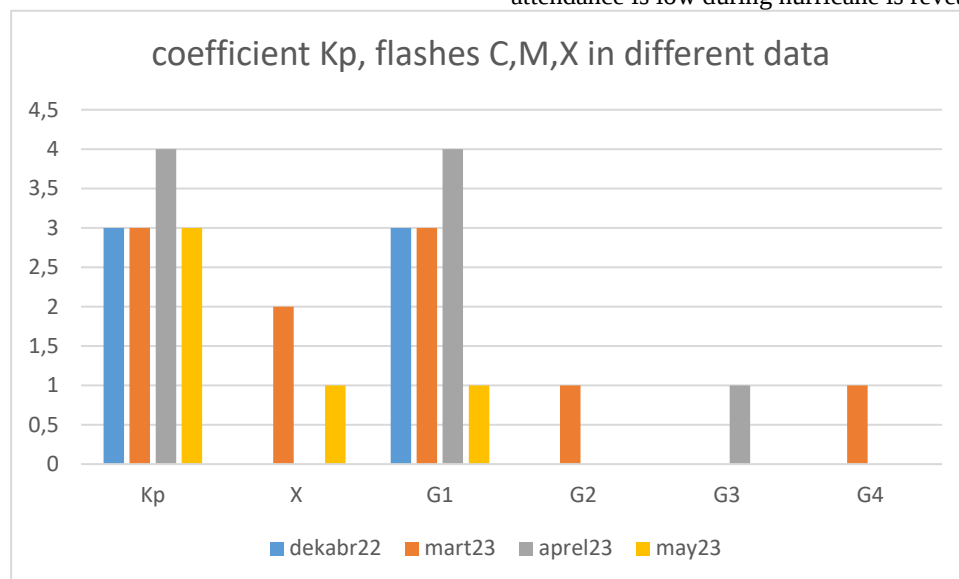
Monthly attendance (number of absences) and number of outbreaks for the 2022-2023 school year

		2022	2023		
	GROUP	DECEMBER	MARCH	APRIL	MAY
1	211	232	196	135	182
2	212	370	277	162	227
3	213	130	125	108	93
4	214	286	214	270	207
5	215	390	610	472	300
6	216	170	227	186	145
7	217	114	145	285	186
8	218	112	131	244	194
9	219	466	300	352	434
10	220	253	165	176	312
11	231	356	432	368	260
12	232	246	308	312	196
13	233	316	325	360	275
14	234	528	264	384	236
15	235	550	268	376	240
16	236	288	400	280	264
17	237	348	344	108	164
18	238	176	176	192	76
19	239	193	276	200	172
20	240	225	220	208	92
	total	5749	5403	5178	4255
	average D	287	270	258	212
	Kp	3	3	4	3
	C	367	272	245	318
	M	54	42	2	46
	X		2		1
	The number of spots	94	85	72	121
	G1	3	3	4	1
	G2		1		
	G3			1	
	G4		1		



As can be seen, the decrease in C and M fires corresponds to a decrease in attendance. In the latter part, C and M increase sharply and attendance decreases sharply. Compared with the magnetic hurricane index

Kr, ignition X and the number of occurrence of hurricanes G1 and G2 in April, the Kr coefficient and the number of occurrence of hurricanes G1 are higher and the attendance is lower in these months. The fact that attendance is low during hurricane is revealed.



Let's use the regression formula used in statistical processing of data. First we will consider the linear regression dependence.

To study the regularity of changes, we will write the regression formula and determine the regression coefficients:

$$TG1 = TGo1 - a1Kp^{n1} - a2A^{m1} - a3V^{p1} - a4C^{g1} - a5M^{r1} - a6X^{h1}$$

$$TG2 = TGo2 - b1Kp^{n2} - b2A^{m2} - b3V^{p2} - b4C^{g2} - b5M^{r2} - b6X^{h2}$$

$$TG3 = TGo3 - c1Kp^{n3} - c2A^{m3} - c3V^{p3} - c4C^{g3} - c5M^{r3} - c6X^{h3}$$

TGoN - initial value of educational indicators. aN, bN, cN, etc. as well as ni, mi, gi, ri, hi, etc. coefficients represent the degrees of parameters (N, i = 1, 2, ...) on which the corresponding educational indicators can depend. Kr, A, B, C, M, X are the number of geomagnetic indicators, spots and corresponding fires, respectively.

The initial values can be taken as maximum, and it can be assumed that these other factors are ignored. TGoN=100%.

TG1 is attendance (D), TG2 is success (M), TG3 will represent quality (K). From the basic data collected, as many of these equations as possible were solved for each indicator and linear regression coefficients were determined.

$$D = Do + c1L + c2C + c3M + c4X$$

$$M = 100 + a1L + a2C + a3M + a4X$$

$$K = 100 + b1L + b2C + b3M + b4X$$

The dependence of success and quality percentages in different courses on the number of sunspots in years has been established.

If we systematize the data and solve together, for the quality parameter.

$$K = 100 - 3.5L - 0.3849C + 4.7600M - 15.657X$$

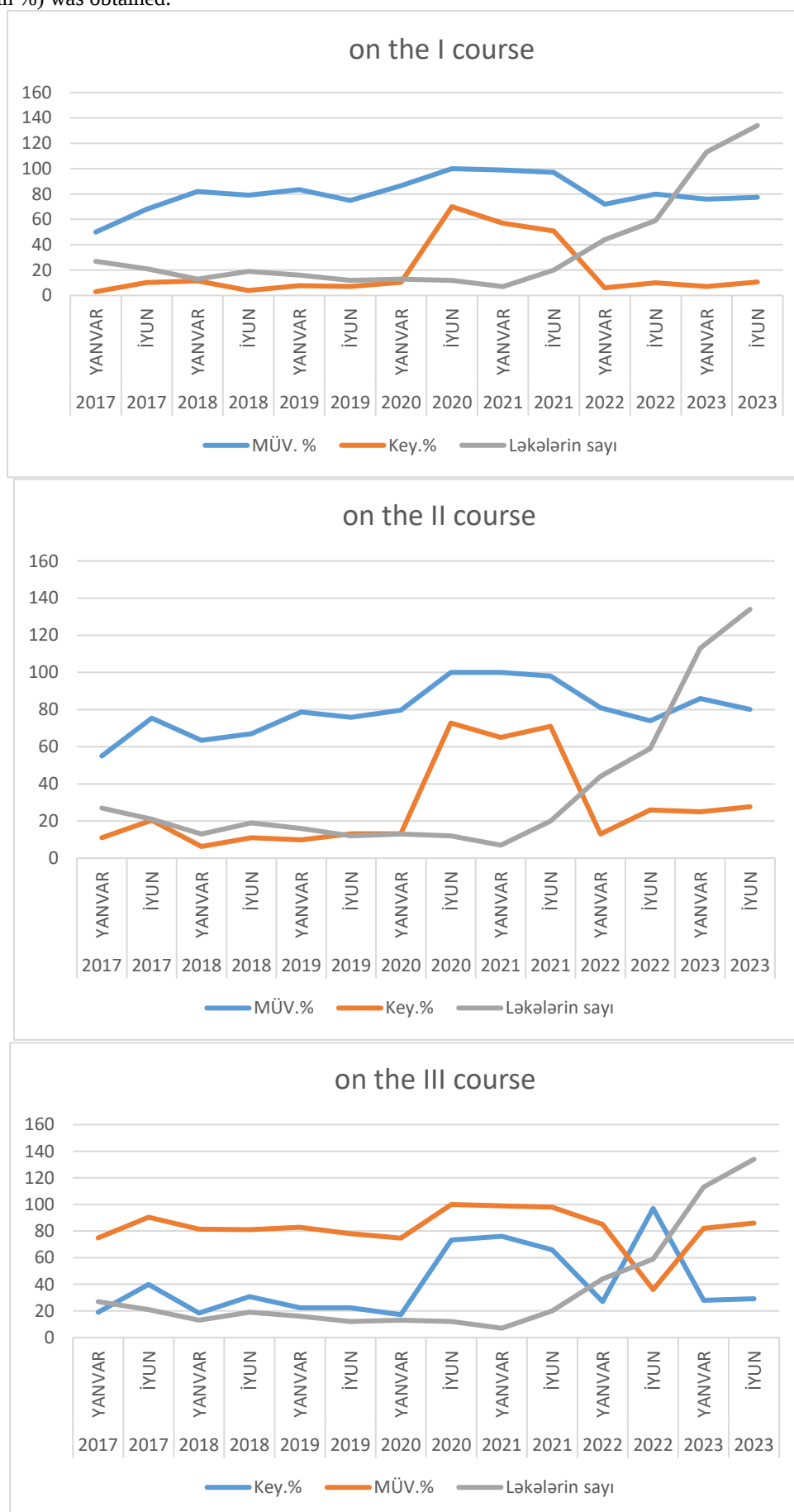
for the performance parameter we obtain the following expression

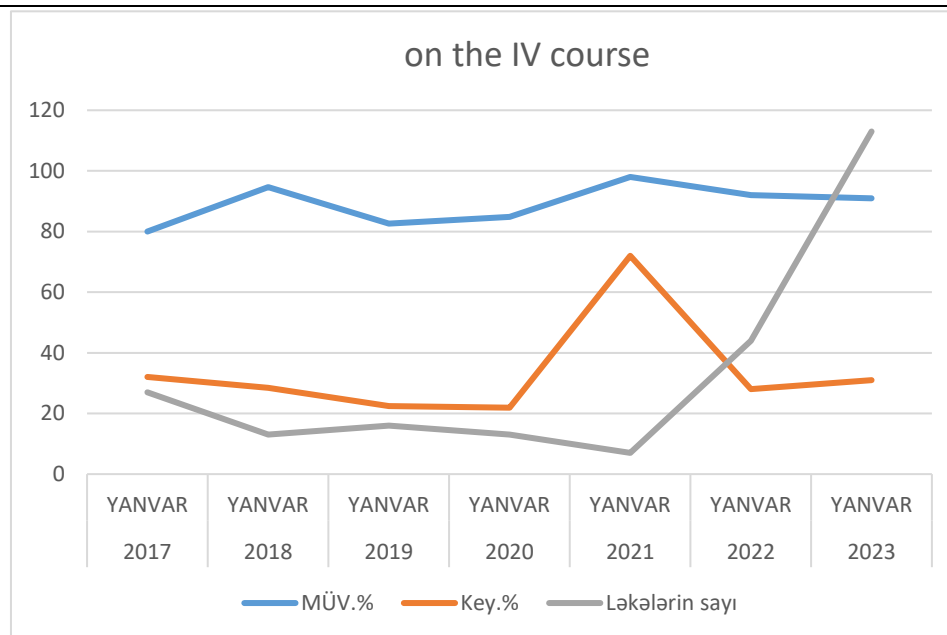
$$M=100-0,095L-0,1476C-2,2077M+8,806X$$

A regression expression of the dependence of attendance (percent of attendance) on solar activity parameters (in %) was obtained.

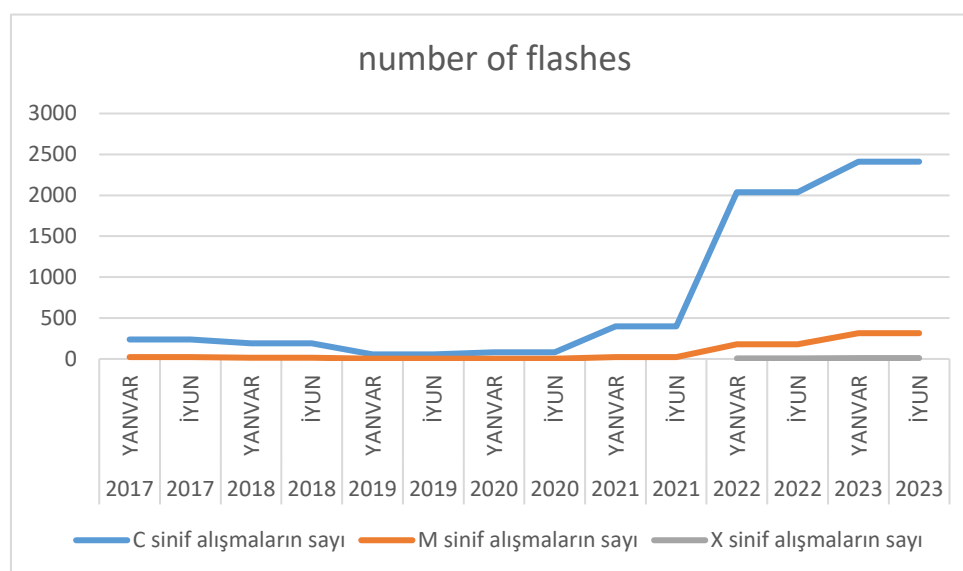
$$D=0,77866L+0,23544C-1,35486M+8,073X$$

L is the number of spots, C, M and X are the number of outbreaks during this period.





From the charts, we can see that the success rate is directly related to the number of spots with small errors. As the number of spot numbers increases, the success rate also increases. In 2020-2021, due to the pandemic, we do not consider the values of learning rates suitable for study, so we will not consider the dependencies falling in this part.

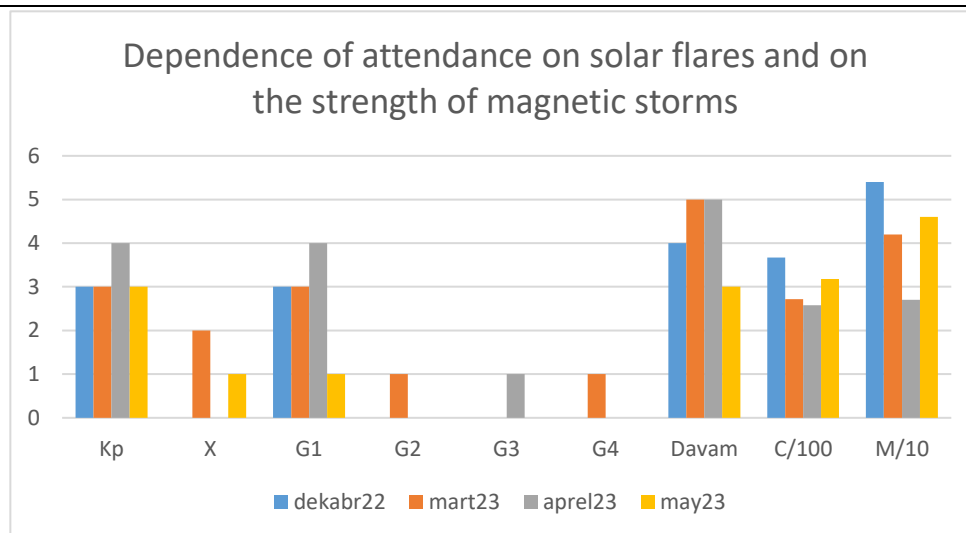


The last chart shows the number of solar flares over the years. The charts show that as the number of rolls increases, the quality and success rate partially decrease, and as the number of rolls decreases, these indicators generally decrease. Given that 2020-21 falls during the pandemic period, the fluctuations are. On February 2, 2023, and June 16, 2023, unlike other exam

days, the Kr factor was 5. Other exam days had 2, some 3 - 4. It was observed that the average monthly number of spots and number of C outbreaks were higher in these months than in other months. The number of spots and the number of outbreaks on these days are given in the table below.

date	Kp	success%	qualities%	L monthly	L	C monthly	C	M monthly	M	X monthly	X
02.02.23	5	88,9	40,6	49	19	2036	3	178	-	7	-
16.06.23	5	94,4	75,8	134	32	2411	10	315	3	11	-

As the number of monthly and daily commercials, monthly and daily C burns increased, there was an increase in success rates and quality.

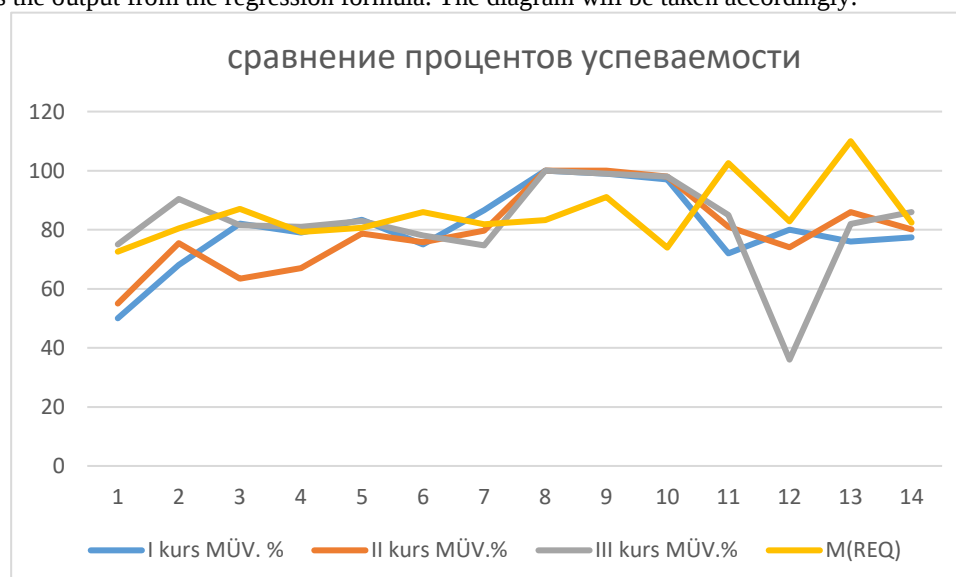


As can be seen from the diagram, as the Kp coefficient and the number of magnetic storms G1 increase, attendance decreases, and absenteeism increases. However, the average number of failures is inversely proportional to the number of C and M connections. As the number of C and M connections decreases, the number

of failures increases. This chart is based on figures for December 2022 and March, April, and May 2023. As attendance increases, truancy decreases, which is the opposite of attendance, it is natural that students continue to attend classes and other indicators of educational attainment increase.

sN	years	months	I kurs ac.p. %	II kurs ac.p. %	III kurs ac.p. %	Academic performance M(REQ)
1	2017	YANVAR	50	55	75	72,56976
2	2017	İYUN	68,1	75,4	90,4	80,46216
3	2018	YANVAR	82,1	63,4	81,5	87,09536
4	2018	İYUN	79	67	81	79,20296
5	2019	YANVAR	83,39	78,69	82,94	80,69868
6	2019	İYUN	75	75,82	78	85,96028
7	2020	YANVAR	86,67	79,68	74,69	81,89348
8	2020	İYUN	100	100	100	83,20888
9	2021	YANVAR	99	100	99	91,06904
10	2021	İYUN	97	98	98	73,96884
11	2022	YANVAR	72	81	85	102,59318
12	2022	İYUN	80	74	36	82,86218
13	2023	YANVAR	76	86	82	109,97538
14	2023	İYUN	77,35	80,07	85,97	82,35198

M(REQ) is the output from the regression formula. The diagram will be taken accordingly:



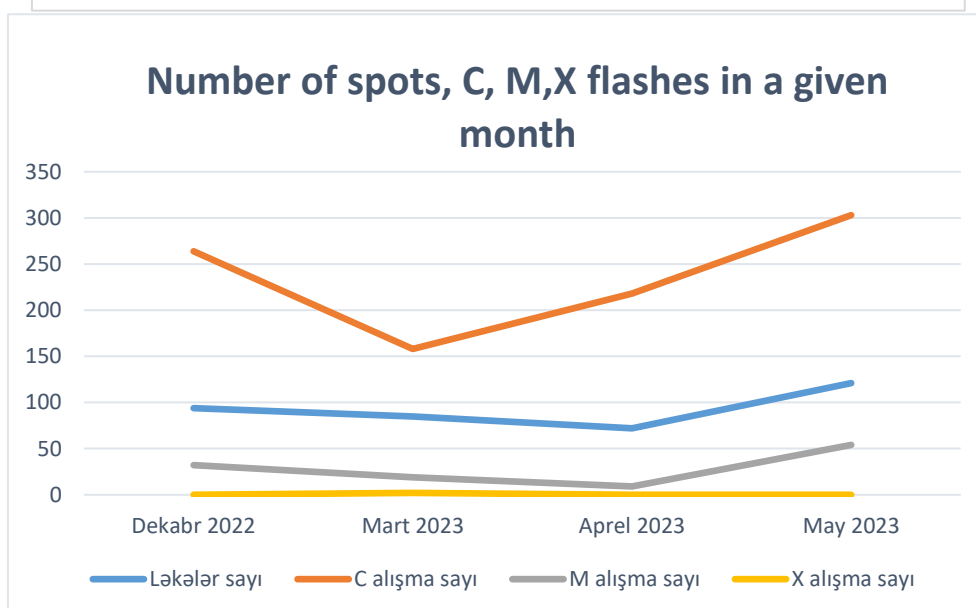
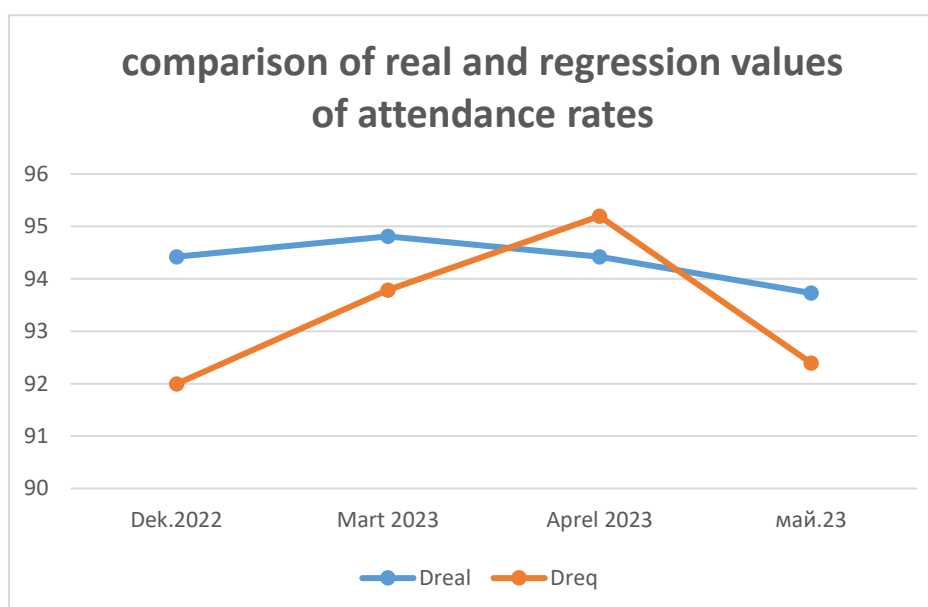
The regression formula allows us to find the success rate by the number of spots, C, M and X ignitions. In parts 8-9-10, the sharp difference between the real results and the results obtained by the regression formula coincides with the pandemic period. During this period, exam performance, such as natural online exam results, should have been different from real exam performance. In other parts, there are variations depending on the courses. If deviations from the mean are not considered, the regression formula obtained for the success rate can express the relationship.

The obtained statements differ from the real values by 5-12%.

The differences in the quality percentages are larger. Differences of 20-30% were found between the regression expression and the real values. This shows that the quality indicator is more dependent on other factors more important and dominant than solar flares.

For December 2022, March, April, and May 2023, the average scores of the 20 groups were taken and the scores were compared with the regression expression derived from the previous attendance and parameters (Table).

time	Dekabr 2022	Mart 2023	Aprel 2023	May 2023
Number of spots	94	85	72	121
Number of flashes C	264	158	218	303
Number of flashes M	32	19	9	54
Number of flashes X	0	2	0	0
date	Dekabr 2022	Mart 2023	Aprel 2023	May 2023
D(real)%	94,42	94,81	94,42	93,73
D(req)%	91,99468	93,78928	95,1957	92,39374

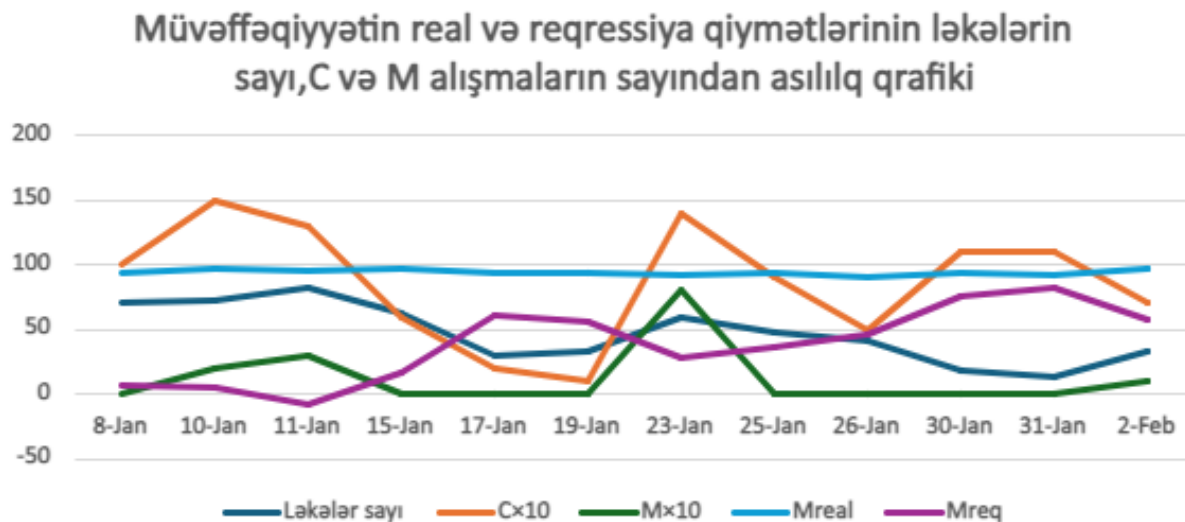


It can be seen from the diagrams that the percentage of attendance decreases as the number of ignitions increases and increases as it decreases. This can be seen in both the real and dependent diagrams of the expression obtained from the regression formula. The real prices differ from the theoretical ones by a maximum of 2.5%.

At present, solar activity continues to increase and this activity will be felt in the next 8-10 years. Therefore, it is important to study all areas that can be affected by solar activity. The results obtained will make

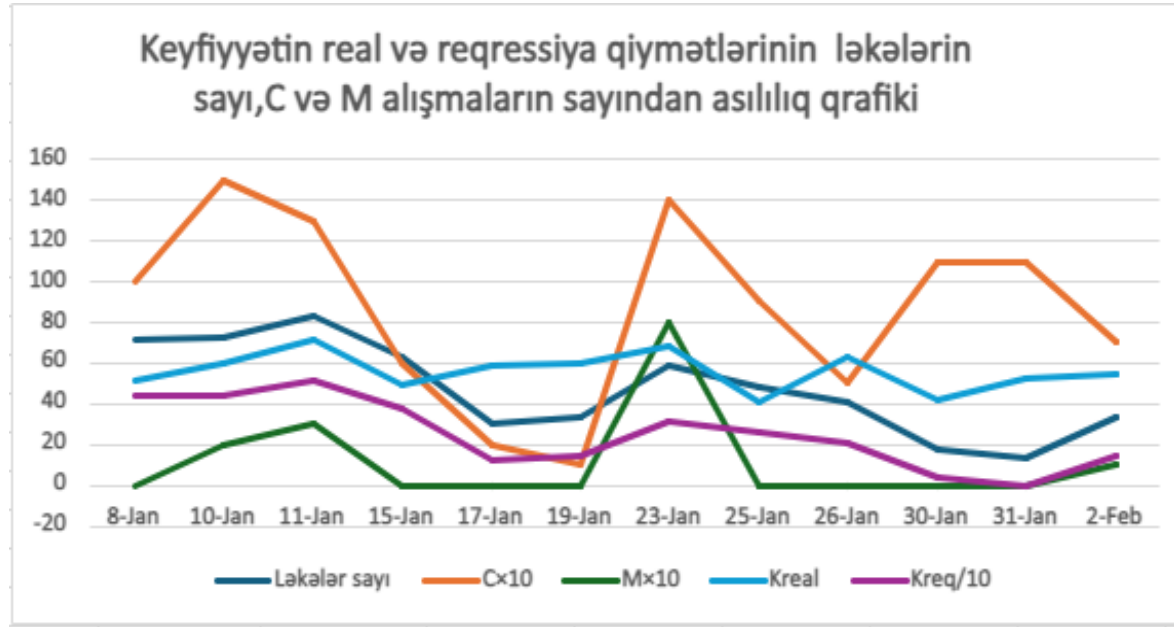
it possible to make forecasts of educational indicators taking into account solar activity.

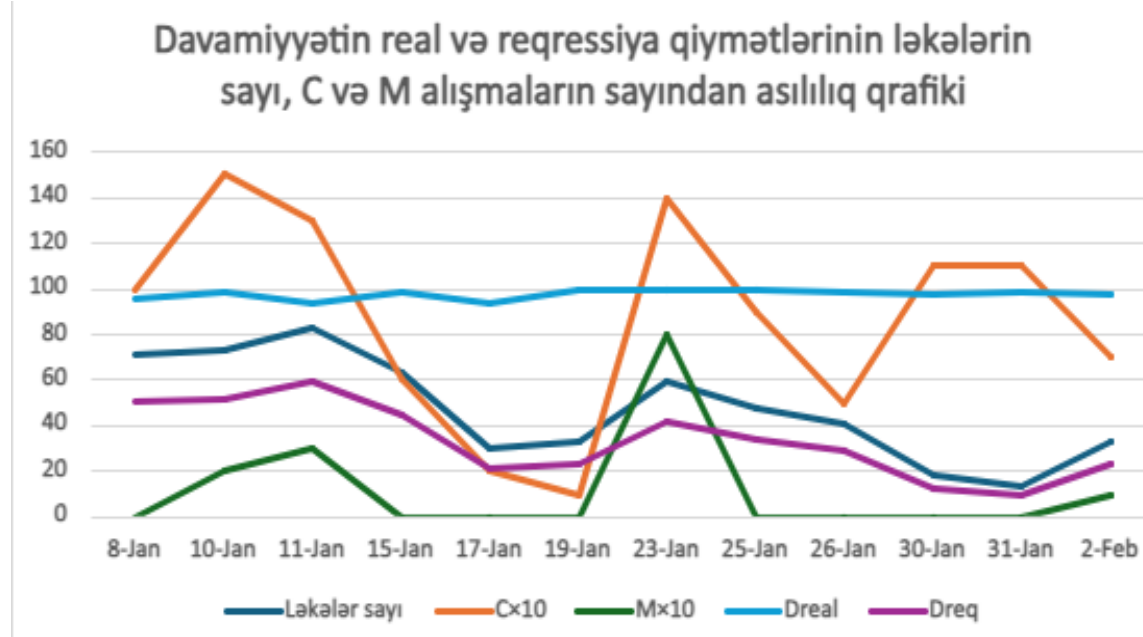
We applied the resulting regression formulas to the January 2023 test session scores. The charts below show the dependence of attendance and success rates on the number of sunspots and the number of C and M classes during the test session. As you can see, the real value of the success rate depends on the number of spots. Of course, it must be with a lag that shows its effect. The effect of the number of sunspots on the Sun today is evident in the next 3-4 days. The changes caused by spots affect the Earth in 3-4 days.



This fact is also manifested in the attendance rate. So, the amount of spot changes affects the prices after 2-3 days. The changes in the regression expressions obtained for both success rate and attendance rate are in

the same harmony with the changes in real values. The change in the regression expression for a small percentage of changes in real prices is more noticeable.





Many factors influence the educational performance of students. If we consider the human factor, there are fuzzy factors in these processes. Most of all other factors depend on solar factors. Taking all these into consideration, it can be said that sunburn, sunspot number affect the educational performance. This should be studied and researched more comprehensively.

Result.

Educational performance of students in the age group 18-22 years directly or indirectly depends on the parameters of the solar atmosphere, the number of sunspots and flares, the strength of geomagnetic storms caused by solar wind and coronal mass ejections.

Attenuation (number of absences) depends on parameters indicating changes in the Earth's magnetic field: The number of sunspots is directly proportional to the number of class C flares.

As the number of sunspots, the number of Class C and M burns change, the test results also change by a certain percentage on those days, 3-4 days before the day of the hurricane and 3-4 days after the hurricane.

There is already an increase in sunspots and sunburns increasing student performance and quality scores.

Sunburns are believed to affect the human body at the nano level, causing changes in the functioning of human organs and causing them to deviate from the norm.

In order to obtain more effective research results, it is planned to prepare more databases, and at the same time to study the dependence of educational indicators on other solar wind parameters.

Changes in the environment are inevitable. But as a result of our irresponsibility and negligence, these changes are becoming tragic and widespread. Some tragedies can be prevented, some can be protected, some can be reduced in complexity, and some can be made prettier and simpler by removing the factors that hinder our development. The listed events and studies

show that it is geomagnetic conditions that can lead to emergencies of various types.

It is the change in the Sun's activity, especially its decrease, that leads to a decrease in the activity of many events occurring on Earth, a decrease in epidemics and airplane accidents. Solar activity stimulates people, their physical and mental activity, and directly or indirectly affects continued learning and outcomes. Humans have adapted to solar events that have and will continue to occur throughout their lives and have experienced changes in this form. As such, solar phenomena should not be a cause for concern. Solar phenomena should be studied more carefully, and the facts obtained should be applied for use in everyday life.

References:

1. V. Qədirov Geodinamik proseslər və günəş aktivliyi AMEA, Rusiya EA, Birləşmiş yer fizikası İnstitutu-Beynəlxalq konfrans 2022, s44
2. Days of "Zero" level geomagnetic activity accompanied by the high neutron activity and dynamics of some medical events-Antipodes to geomagnetic storms E. Stoupe, E. S. Babayev, E. Abramson, J. Sulkes Health Vol.5 No.5, May 27, 2013 DOI: 10.4236/health.2013.55113
3. Azərbaycanca günəş aktivliyinin (volf ədədinin) insan xəstəliklərinə təsirinin ekonometrik qiymətləndirilməsi - Econometric evaluation of the effect of solar activity (wolff number) on human diseases in azerbaijan, <https://www.ceeol.com/search/article-detail?id=1057681> Sage Yayınları Turan-2022)
4. Влияние солнечной активности на распространённость ВПР среди новорожденных детей. г. Атырау https://www.yaneuch.ru/cat_34/vliyanie-solnechnoj-aktivnosti-na-rasprostranennost/548397.3422865.page4.html
5. Цикл вируса. Какая связь между солнечным минимумом и пандемией? <https://ku->

ban.aif.ru/society/cikl_virusa_kakaya_svyaz_mezhdu_solnechnym_minimom_i_pandemiei

6. Усиление сезонности гриппоподобных эпидемий с помощью ежедневного солнечного резонанса Fabrizio Nicastro and att. Volume 23, Issue 10, 23 October 2020, 101605 <https://www.sciencedirect.com/science/article/pii/S2589004220307975?via%3Dihub> Solar UV-B/A radiation is highly effective in inactivating SARS-CoV-2 Fabrizio Nicastro and att. <https://www.nature.com/articles/s41598-021-94417-9>

7. M.M. Bashirov Factors, problems and solutions affecting student-s academic performance/ ACTORS, PROBLEMS AND SOLUTIONS AFFECTING STUDENTS' ACADEMIC PERFORMANCE Slovak international scientific journal # 66, (2022) Partizanska, 1248/2 Bratislava, Slovakia 811 03 20-38 DOI:10.5281/zenodo.6973303 <http://sis-journal.com/wp-content/uploads/2022/08/Slovak-international-scientific-journal-%E2%84%9666-2022.pdf> <https://zenodo.org/record/6973303#.YvXL7nbMKUk>

8. Влияние солнечной активности на успеваемость детей в начальных школах г. Воронежа Тестов Дмитрий Александрович, Воронежский государственный университет, <http://asf.ural.ru/VNKSF/Tezis/v7/Base/Tesis.php?Code=181.htm>

9. М.В. Яценко, Н.З. Кайгородова Умственная работаспособность и функциональное состояние головного мозга у студентов младших курсов при разных уровнях солнечной активности. Междисциплинарный научный и прикладной журнал «Биосфера» 2018, т10, ном.1, стр.36-42, <https://cyberleninka.ru/article/n/umstvennaya-rabotosposobnost-i-funktsionalnoe-sostoyanie-golovnogo-mozga-u-studentok-mladshih-kursov-pri-raznyh-urovnyah-solnechnoy/viewer>

10. M. Nəzərov Təhsilin keyfiyyətinin idarə edilməsinin sosiomədəni aspektləri Homeros Cilt / Volume 2, Sayı / Issue 3, 2019, pp. 111-124 <https://dergipark.org.tr/tr/download/article-file/795655>

11. Azərbaycan Respublikası Nazirlər Kabinetinin 2020-ci il 29 sentyabr tarixli 361 nömrəli Qərarı ilə təsdiq edilmişdir. Azərbaycan Respublikasında ümumi təhsilin dövlət standartları <https://e-qanun.az/framework/46052>

12. N.S. Əyyubova Statistika ümumi nəzəriyyəsi 2014 Afpoliqraf nəşr. 341 səh. https://www.pa.edu.az/library/8/61/statistika_umumi_nezeriyye_derslik2014.pdf

13. İ. Əhmədov Ali təhsil keyfiyyətinin planlaşdırılması, idarə edilməsi və ölçülməsində yeni tendensiyalar Azərbaycan müəllimi.- 2014.- 4 iyul.- səh.8. http://www.anl.az/down/meqale/az_muellimi/2014/iyul/382278.htm

14. Reqresiya analizi (elektron kitab) <https://genderi.org/mundericat-v3.html?page=16>