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RELATIONSHIP BETWEEN AIR ELEMENTS, DUST PHENOMENON AND WIND EROSION FOR TWO STATIONS AT WASIT PROVINCE FOR THE PERIOD 1994-2016

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Abstract

The study underwent for two selected stations at Waist province (Al-Aziza,Al-Hay). The study relied on the climate data that issued from the general committee of Iraqi Meteorological and Seismic Monitoring for the period 1994-2016. The relationship of Air Elements were studied with the (temperature, wind speed, rain quantity and humidity) with dust phenomenon that represented by dust storms, lower dust and rising dust. The correlation was analyzed to know the effect of these elements on the happening of the dust storms, and it was clear that the relationship between the climate's two elements (temperature and wind speed) and the dust phenomena (Dust storms, lower storm, rising dust) is an extreme relationship, and the relationship between the climate elements (rain and humidity) and the dust phenomenon (dust storms, lower dust, rising dust) is a reverse relationship. Also, by counting the general trend of the dust storm of the two studied stations, the results showed that the general trend of the dust storm toward an increase.

Key words : Climate factors, dust storms, lower dust, rising dust.

Introduction

The dust phenomenon means the rising of dust and sand particles and other planktons on the surface of the ground, and spreading in the air causing reduction in air transparency and range of visibility which lead to surface air pollution, dimness, feeling tight and discomfort. Instead of all that, it effects on human health, vitality, growth and production of livestock. The dust phenomenon is known aerodynamically as clay particles, silt and sand ranging between 1yakteen-500 micron, and their shapes ranged between sheet forms and irregular forms for the clay's particles and silt, while it takes oval and circular forms for the sand's particles [1].

Practical part

The study was conducted on two selected stations at Waist province (Al-Aziza, Al-Hay). The climate data issued from Iraqi general committee of Meteorological and Seismic Monitoring for the period 1994-2016, through that we can identify the range of influence of selected climate factors represented by temperature, wind's speed, rain's quantity and moisture rate in repeating the dusty phenomena that represented by dusty storms, suspended and rising dust. Also, analyzing correlation that known as statistical mean depends on the relationship between two variables each one represents a specific phenomenon, whereas if one of them changed in a certain trend (increase or decrease) and the other changed in the same trend, the correlation will be positive or trivial. But if the change happened in the opposite direction (increase in one variable with increase in the other variables) the correlation will be negative or inversely [10] between these elements and the number of dusty phenomena days.

Hereunder, we will discuss the relationship between the climate elements (temperature, winds, rains, humidity) and the dust phenomena (dust storm, rising dust, suspended dust) depending on the data issued from Iraqi

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Table 1: Shows the types of the suspended dust based on the particle's diameters, wind speed and vertical visibility.

Type of dust	Particles diameters (micron)	Winds speed (m/s)	Vertical visibility range(km)
Suspended dust	Less than one micron	Less (3.6 m/s)	(1-5 km)
Rising dust	1-10 micron	(15-25km/h)	(1-5 km)
Dust storm	Not more than 100 micron	(5.5 s/and more)	(less than 1 km)
Sand storm	Between 80 mcron-1mm	(8m/s and more)	(less than 1 km)

South of waist province based on table 2. The time limits were for the period from 1994-2016.

Table 2: Names of study's stations, numbers and heights on the level of sea and geographic location.

Station	Station number	Wide latitude (North)	Longitude (east)	Height of station/m
Al-Aziza	660	32.91	45.06	18
Al-Hay	665	32.17	46.05	17

The work of researcher depends on the climate's data issued from the general committee of Iraq Metrological and Seismic monitoring.

general committee of Metrological and seismic monitor for the two stations at Wasit province (Al-Aziza and Al-Hay) for the period from 1994-2016.

Temperature

Temperature is considered one of the main climate's elements in terms of its direct influence in barometric pressure, and therefore on the winds speed and forming clouds and rainfall and evaporation rates [11].

The number of dust phenomena days is different based on the months of the year through the (Tables 3, 7, 8 and 9) and through the fig. 2 & 3. we notice increase in the days number of hot months and decrease in the total of days of cold months as following:

Al-Azizyah's station

The monthly averages of temperatures of the period from 1994 to 2016 had recorded a highest temperature in July, whereas reached to (36.5), and the days of dust

Table 3: Monthly and annual averages Air temperature (Celsius) at study's stations for the period 1994-2016.

Average	DEC	NOV	OCT	SEP	AU	JUL	JUNE	MAY	AP	MA	FEB	JAN	Months / Stations
24.2	12.3	17.2	25.8	31.8	36.1	36.5	34.4	30.1	23.7	17.9	13.4	10.9	Al-Aziza
25.8	13.3	18.9	28.1	33.6	37.7	38.0	36.2	32.0	25.4	19.4	14.7	11.9	Al-Hay

The work of researcher depends on the climate's data issued from the general committee of Iraq Metrological and Seismic monitoring.

Table 4: Monthly and annual averages for winds speed (m/s) at study's stations for the period 1994-2016.

Average	DEC	NOV	OCT	SEP	AU	JUL	JUNE	MAY	AP	MA	FEB	JAN	Months / Stations
3.7	3.0	2.8	3.1	3.5	4.3	5.1	5.0	3.7	3.7	3.8	3.4	3.2	Al-Azizyah
3.7	2.8	2.9	3.1	3.8	4.4	4.8	4.9	3.6	3.6	3.5	3.4	3.0	Al-Hay

The work of researcher depends on the climate's data issued from the general committee of Iraq Metrological and Seismic monitoring.

Table 5: Monthly and annual averages for rains quantity (mm) at study's stations for the period 1994-2016.

Average	DEC	NOV	OCT	SEP	AU	JUL	JUNE	MAY	AP	MA	FEB	JAN	Months / Stations
10.4	17.8	23.9	9.8	0.1	0.0	0.0	0.0	4.0	13.2	15.9	12.7	27.7	Al-Azizyah
10.9	20.6	23.7	4.9	0.2	0.0	0.3	0.1	5.6	13.1	19.4	14.8	28.3	Al-Hay

The work of researcher depends on the climate's data issued from the general committee of Iraq Metrological and Seismic monitoring.

Table 6: Monthly and annual averages for humidity (%) at study's stations for the period 1994-2016.

Average	DEC	NOV	OCT	SEP	AU	JUL	JUNE	MAY	AP	MA	FEB	JAN	Months / Stations
47	70	60	44	33	28	27	28	34	47	54	63	73	Al-Azizyah
43.3	65.7	55.2	37.8	28.1	24.8	23.5	25.0	33.0	44.4	52.3	60.0	69.7	Al-Hay

The work of researcher depends on the climate's data issued from the general committee of Iraq Metrological and Seismic monitoring.

Table 7: Total of Monthly and annual dust storm days at study's stations for the period 1994-2016.

Average	DEC	NOV	OCT	SEP	AU	JUL	JUNE	MAY	AP	MA	FEB	JAN	Months / Stations
74	0	0	5	1	2	10	11	19	16	8	2	0	Al-Azizyah
40	0	1	0	1	5	5	7	9	5	5	2	0	Al-Hay

The work of researcher depends on the climate's data issued from the general committee of Iraq Metrological and Seismic monitoring.

Table 8: Total of Monthly and annual for the suspended dust at study's stations for the period 1994-2016.

Average	DEC	NOV	OCT	SEP	AU	JUL	JUNE	MAY	AP	MA	FEB	JAN	Months / Stations
2487	48	71	222	235	257	360	330	344	260	201	116	43	Al-Azizyah
2000	25	26	127	172	218	279	293	289	230	176	736	29	Al-Hay

The work of researcher depends on the climate's data issued from the general committee of Iraq Metrological and Seismic monitoring.

Table 9: Total of Monthly and annual for the rising dust at study's stations for the period 1994-2016.

Average	DEC	NOV	OCT	SEP	AU	JUL	JUNE	MAY	AP	MA	FEB	JAN	Months / Stations
1932	36	32	91	165	262	380	315	200	172	160	86	33	Al-Azizyah
1533	22	36	69	127	204	281	238	153	142	132	93	36	Al-Hay

The work of researcher depends on the climate's data issued from the general committee of Iraq Metrological and Seismic monitoring.

storms were (10) days, the suspended dust were (360) day and the rising dust reached to (380) days. The lowest value for temperature that has recorded in January is (10.9) and the total of dusty storms is (0), the suspended dust is (43) and the rising dust is (33).

Al-Hay's station

Ithad recorded a highest temperature in July, whereas reached to (38), and the days of dust storms were (5) days, the suspended dust were (279) day and the rising dust reached to (281) days. The lowest value for temperature that has recorded in January is (11.9) and the total of dusty storms is (0), the suspended dust is (29) and the rising dust is (36).

Monthly correlation of dust phenomena with temperature

Table 10 shows coefficients values of monthly correlation between the months total of dust storms days number of temperatures at study's stations during the period 1994-2016. It was noted that the monthly coefficient of correlation between monthly total of dusty storms days and the monthly average of temperature indicated for trivial correlative relationship at the two study's stations.

Winds Speed

Winds are a moving air caused by the difference in Atmospheric pressure values, where it moves from the

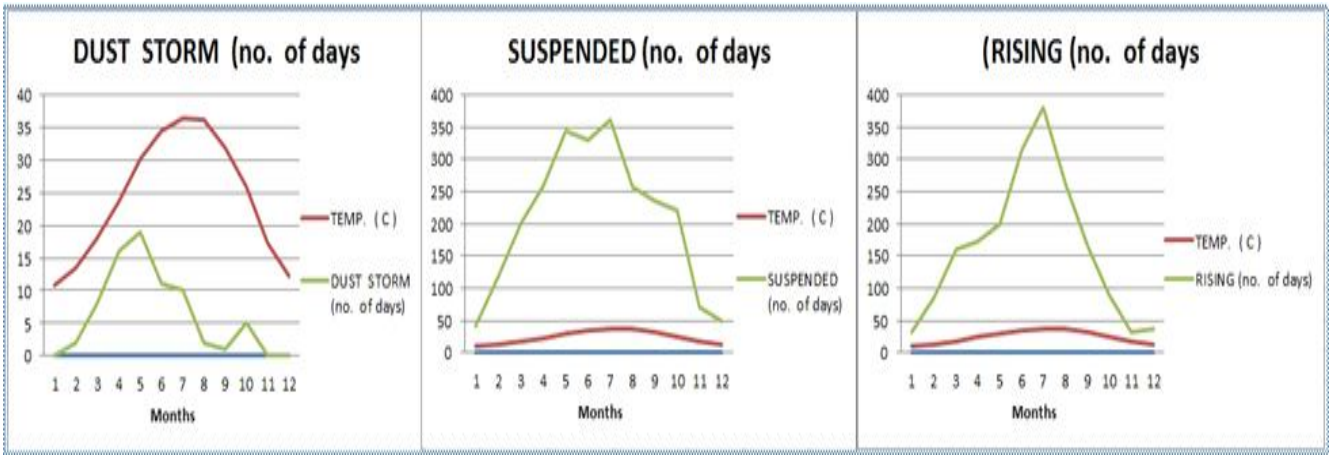

Fig. 1: Shows the monthly averages of temperatures with dust phenomena for the period 1994-2016 of Al-Aziza station.

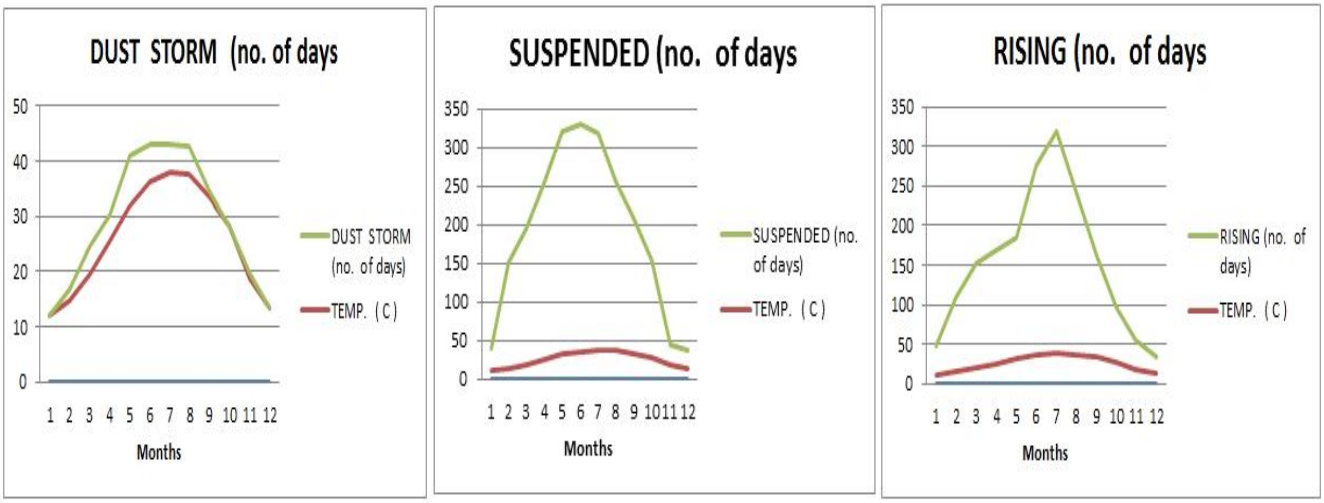

Fig. 2: Shows the monthly averages of temperatures with dusty phenomena for the period 1994-2016 of Al-Hay station.

Table 10: Correlation coefficient values between the total of months for dust storms days and monthly average at the study's stations for the period 1994-2016.

Station	Dusty phenomena	Monthly correlation coefficient values	Type of correlation
Al-Aziza	Dusty storms	0,4	Trivial correlation
	Suspended dust	0,9	Trivial correlation
	Rising dust	0,9	Trivial correlation
Al-Hay	Dusty storms	0,6	Trivial correlation
	Suspended dust	0,8	Trivial correlation
	Rising dust	0,8	Trivial correlation

high-pressure areas to the low-pressure areas horizontally and parallel to the ground surface [12].

The winds considered a mechanical mean works to transfer the temperature energy, water vapor and results of the air phenomena between different areas [13].

Winds help in forming the dusty storms. Speed plays a great role in forming these storms, because it is the influential factor to move these soil particles and transferring them to another locations [14].

The number of dusty phenomena days is different based on the months of the year through the tables 4,7,8 and 9, and through the Fig. 4,5 we notice increase in the days number of hot months and decrease in the total of days of cold months as following:

Al-Azizyah's station

Monthly averages of temperatures of the period from 1994 to 2016 had recorded a highest temperature in July, whereas reached to (5,1) m/s, and the days of dusty storms were (10) days, the suspended dust were (360) day and the rising dust reached to (380) days. The lower value for temperature that has recorded in January is (2.8) m/s and the total of dusty storms is 0, the suspended dust is (71) and the rising dust is (32).

Al-Hay's station

It had recorded a highest temperature in June, whereas reached to (4.9) m/s, and the days of dusty storms were (7) days, the suspended dust were (239) day and the rising dust reached to (238) days. The lower value for temperature that has recorded in December is (2.8) m/s and the total of dusty storms is (0), the suspended dust is (25) and the rising dust is (22).

Monthly correlation of dusty phenomena with winds speed

Table 11 shows coefficients values of monthly correlation between the months total of dusty storms days number of winds speed at study's stations during the period 1994-2016. It was noted that the monthly coefficient of correlation between monthly total of dusty storms days and the monthly average of temperature indicated for trivial correlative relationship at the two study's stations.

Rains Quantity

Rain is considered one of the forms of falling, and it is a water drops formed due to the water vapor condensation at the atmospheric air. The diameters of the drops are between 0,5 -8 mm, and the big drops splitting to many small drops [15].

Rain is considered one of the influential climate's factors to eliminate and reduce the impact of dusty storms. The rains that fall in Iraq characterized as being relatively little, and non-in some months. Generally, the total annual rains decrease from North to the South, and from East to the West [16].

Through the (Tables 5,7,8 and 9) and through the

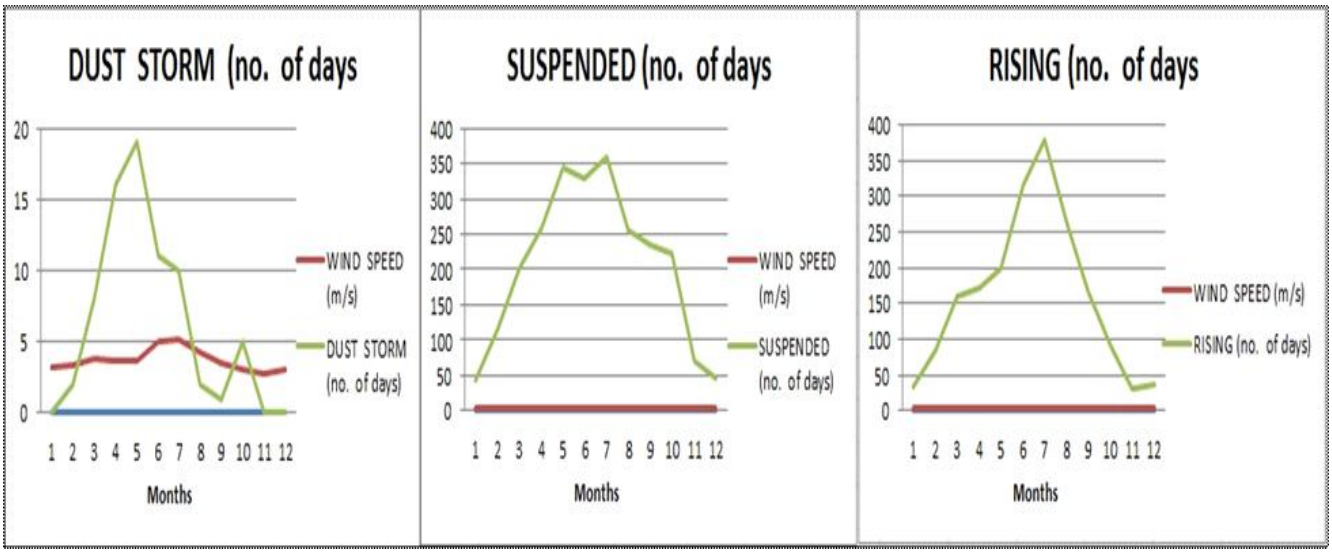

Fig. 3: Shows the monthly averages of winds speeds with dust phenomena for the period 1994-2016 of Al-Azizyah's station.

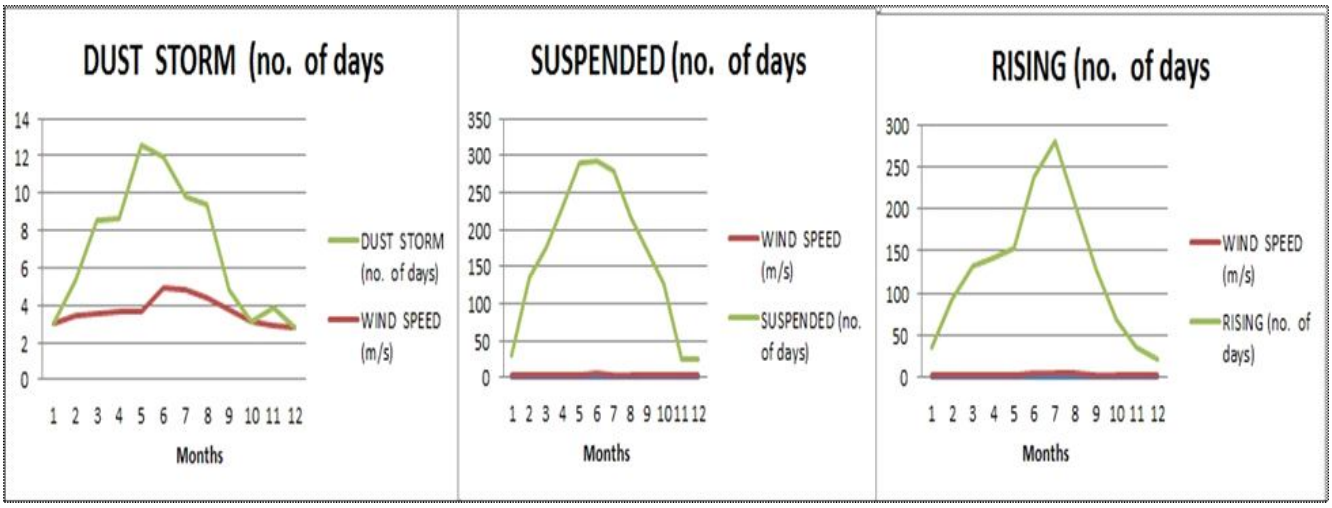

Fig. 4: Shows the monthly averages of winds speeds with dust phenomena for the period 1994-2016 of Al-Hay's station.

Table 11: Correlation coefficient values between the total of months for dust storms days and monthly average at the study's stations for the period 1994-2016.

Station	Dusty phenomena	Monthly correlation coefficient values	Type of correlation
Al-Aziza	Dusty storms	0,5	Trivial correlation
	Suspended dust	0,8	Trivial correlation
	Rising dust	1,0	Trivial correlation
Al-Hay	Dusty storms	0,7	Trivial correlation
	Suspended dust	0,8	Trivial correlation
	Rising dust	1,0	Trivial correlation

figures 6,7 we notice increase in the days number of hot months (little rain) and decrease in the total of days of cold months as (rainy months) following:

Al-Azizyah's station

The monthly averages of winds speed of the period from 1994 to 2016 had recorded a highest value of rains in January, whereas reached to (27.7) mm, and the days of dusty storms were (0) days, the suspended dust were (43) day and the rising dust reached to (33) days. The lower value for rain's quantity that has recorded in (June, July and August are) (0, 0) mm, and the total of dusty storms is (2, 10, 11), the suspended dust is (257, 360, 330) and the rising dust is (262, 380, 315).

Al-Hay's station

It had recorded a highest quantity of rains in June, whereas reached to 28.3m/s, days of dust storms were 0 days, the suspended dust were 29 day and the rising dust reached to 36 days. The lower value for quantity of rains that has recorded in August is 0, the total of dust storms is 5, the suspended dust is 218 and the rising dust is 204.

Monthly correlation of dusty phenomena with rains quantity

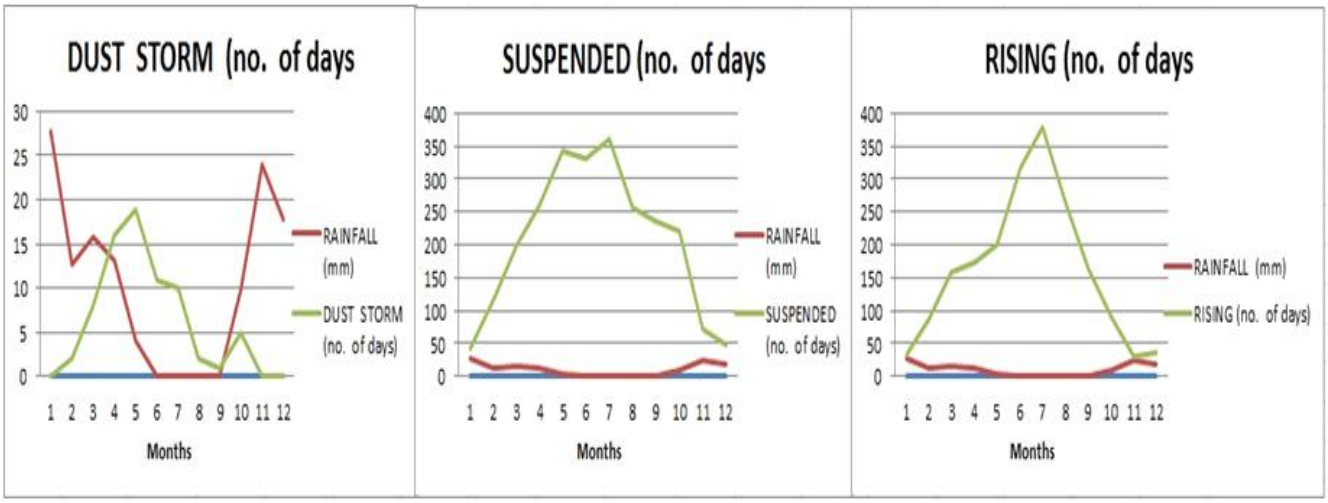

Fig. 5: Shows the monthly averages of rains quantity with dust phenomena for the period 1994-2016 of Al-Azizya's station.

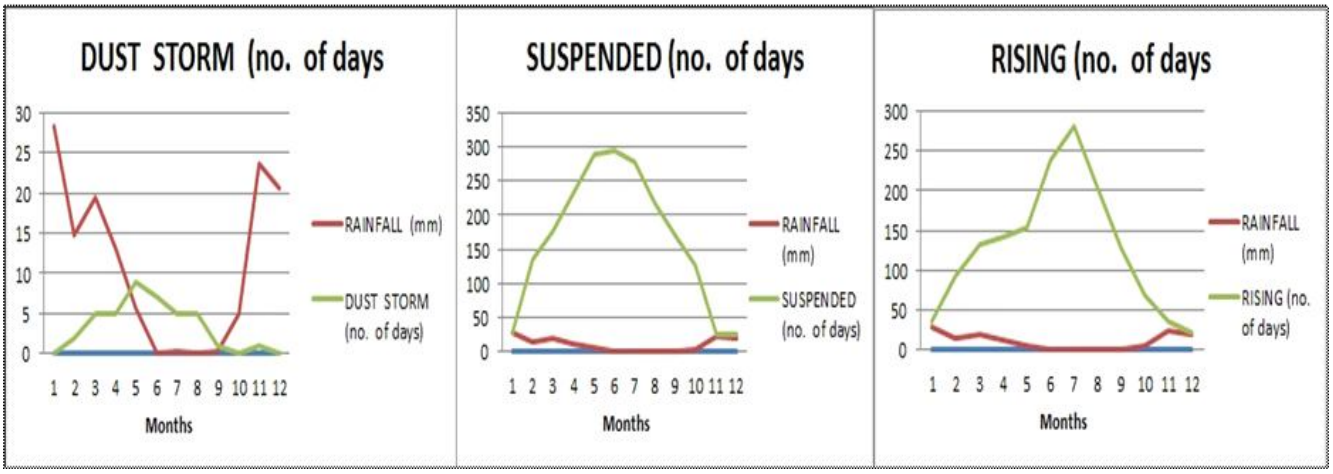

Fig. 6: Shows the monthly averages of rains quantity with dust phenomena for the period 1994-2016 of Al-Hay's station.

Table 12 shows coefficients values of monthly correlation between the total of months of dust storms days of rains quantity at study's stations during the period 1994-2016. It was noted that the monthly coefficient of correlation between monthly total of dust storms days and the monthly average of rains quantity indicated inverse relationship at the two study's stations.

Table 12: Correlation coefficient values between the total of months for dusty storms days and monthly average at the study's stations for the period 1994-2016.

Station	Dusty phenomena	Monthly correlation coefficient values	Type of correlation
Al-Aziza	Dusty storms	-0,4	Trivial correlation
	Suspended dust	-0,9	Trivial correlation
	Rising dust	-0,8	Trivial correlation
Al-Hay	Dusty storms	-0,5	Trivial correlation
	Suspended dust	-0,8	Trivial correlation
	Rising dust	-0,8	Trivial correlation

3. Humidity

The relative moisture means the percentage for what is existent really of water vapor in the air to a much more of humidity quantity that air can carry it in the same temperature and atmospheric pressure [17].

The days of dusty storms are different based on the months of the year through the (Tables 6,7,8 and 9) and through the Fig. 9, 8 we notice increase in the days number of hot months (dry) and decrease in the total of days of cold months (humidity) as following:

Al-Azizyah's station

The monthly averages of humidity for the period from 1994 to 2016 had recorded a highest value of humidity in December, whereas reached to (%73), and the days of dust storms were (0) days, the suspended dust were (43) day and the rising dust reached to (33) days. The lower value for rain's quantity that has recorded in July is (%27) and the total of dusty storms days is (10), the suspended dust is (360) and the rising dust is (380).

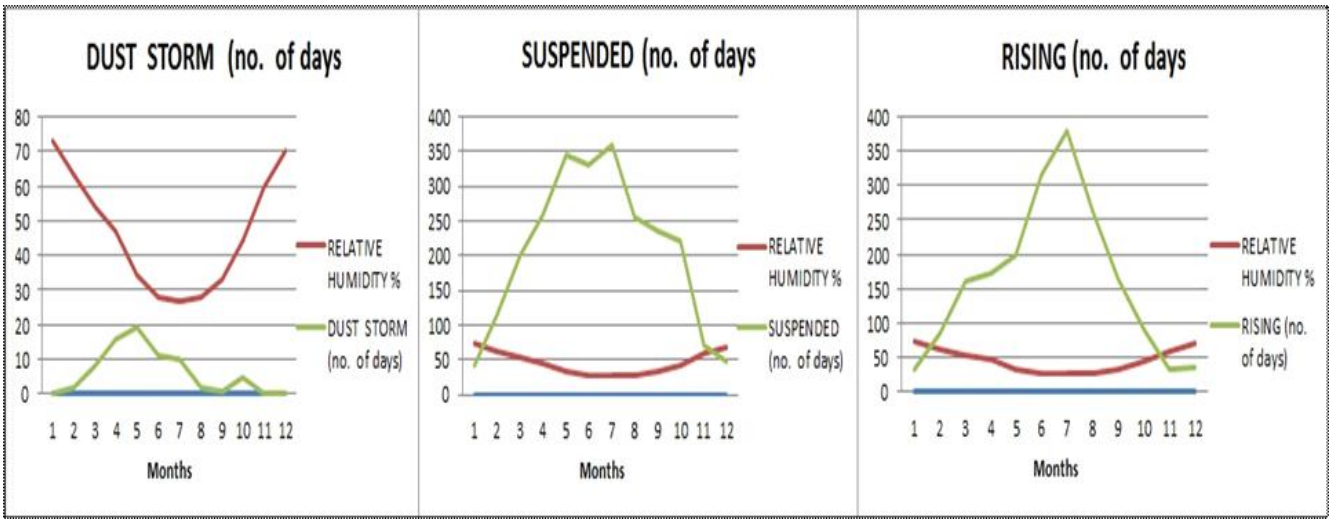

Fig. 7: Shows the monthly averages of relatively moisture with dust phenomena for the period 1994-2016 of Al-Azizyah's station.

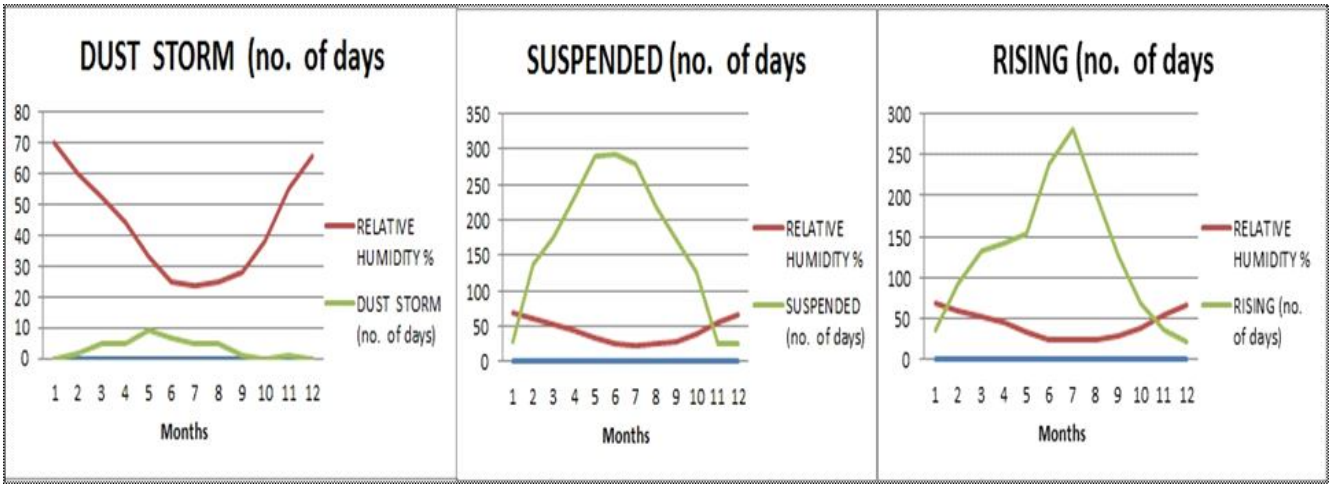

Fig. 8: Shows the monthly averages of humidity with dust phenomena for the period 1994-2016 of Al-Hay's station.

Al-Hay's station

It had recorded a highest quantity of relative moisture in January, whereas reached to (% 69.7), days of dusty storms were (0) days, the suspended dust were (29) day and the rising dust reached to (36) days. The lower value for quantity of rains that has recorded in August is (%23.5), the total of dust storms days is (5), the suspended dust is (281) and the rising dust is (279).

Monthly correlation of dust phenomena with humidity

Table 13 shows coefficients values of monthly correlation between months total of dust storms days of humidity at study's stations during the period 1994-2016. It was noted that the monthly coefficient of correlation between monthly total of dusty storms days and the monthly average of relatively moisture indicated inverse relationship at the two study's stations.

General Trend of repeating dust phenomena

Dust storms

Al-Aziza station

Through Fig. 9, that includes annual total of repeated days of the dust storms of Al-Azizyah's station, it has registered in the first decade of the period of study 1994-

Table 13: Correlation coefficient values between months total of dust storms days and monthly average of humidity at the study's stations for the period 1994-2016.

Station	Dusty phenomena	Monthly correlation coefficient values	Type of correlation
Al-Aziza	Dusty storms	0.5 -	Trivial correlation
	Suspended dust	0,9 -	Trivial correlation
	Rising dust	0,9 -	Trivial correlation
Al-Hay	Dusty storms	0,6 -	Trivial correlation
	Suspended dust	0,8 -	Trivial correlation
	Rising dust	0,8 -	Trivial correlation

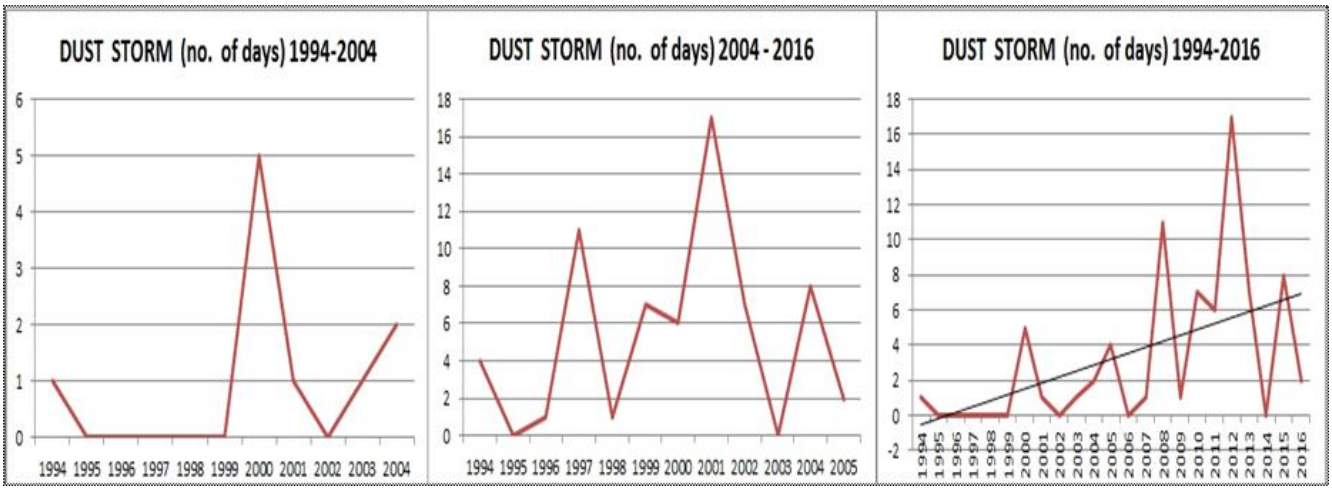

Fig. 9: Shows annual total of repeated days of dust storms of Al-Azizyah's station.

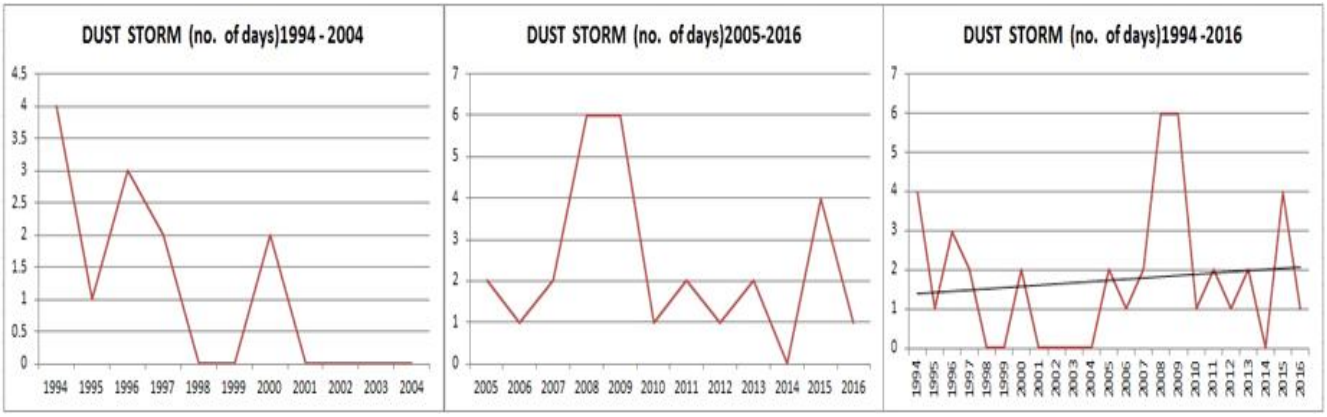

Fig. 10: Shows annual total of repeated days of dust storm of Al-hay's station.

2004 the total of repeated days of dust storm was (5) day, while in the second decade of the period of study 2004-2016 the total of repeated days of dust storm was (6) days. The general trend of the total of repeated dusty storms days for the period 1994-2016 was up.

Al-Hay's station

Through Fig. 10, that includes annual total of repeated the days of dust storms of Al-Hay's station, it has registered in the first decade of the period of study 1994-2004 the total of repeated days of dust storm was (4) day, while in the second decade of the period of study 2004-2016 the total of repeated days of dust storm was (6) days. The general trend of the total of repeated dusty storms days for the period 1994-2016 was up.

Suspended dust

Al-Aziza station

Through fig. 11, that includes annual total of repeated days of suspended dust of Al-Azizyah's station, it has registered in the first decade of the period of study 1994-2004 the total of repeated days of suspended dust was (143) days, while in the second decade of the period of study 2004-2016 the total of repeated days of suspended dust was (201) days. The general trend of the total of repeating dust storms days for the period 1994-2016 is in increase.

Al-Hay's station

Through fig. 12, that includes annual total of repeated days of suspended dust of Al-Hay's station, it has registered in the first decade of the period of study 1994-2004 the total of repeated days of suspended dust that was (85) days, while in the second decade of the period of study 2004-2016 the total of repeated days of suspended dust was (223) days. The general trend of the total of repeated dusty storms days for the period 1994-2016 is up.

Rising dust

Al-Aziza station

Through fig. 13, that includes annual total of repeated days of rising dust of Al-Azizyah's station, it has registered in the first decade of the period of study 1994-2004 the total of repeated days of rising dust was (111) days, while in the second decade of the period of study

Fig. 11: Shows annual total of repeated days of suspended dust of Al-Azizyah's station.

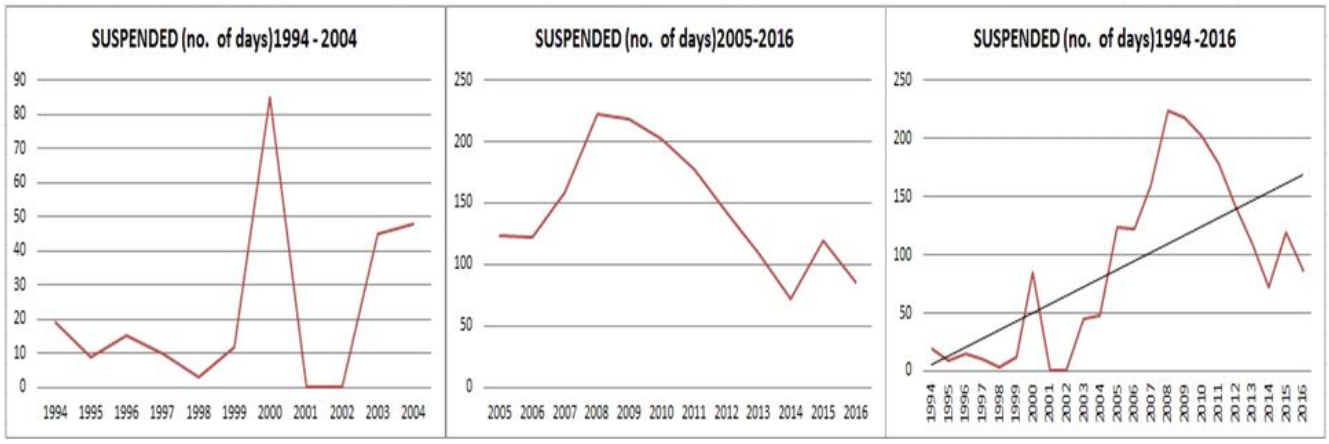

Fig. 12: Shows annual total of repeated days of suspended dust of Al-Hay's station.

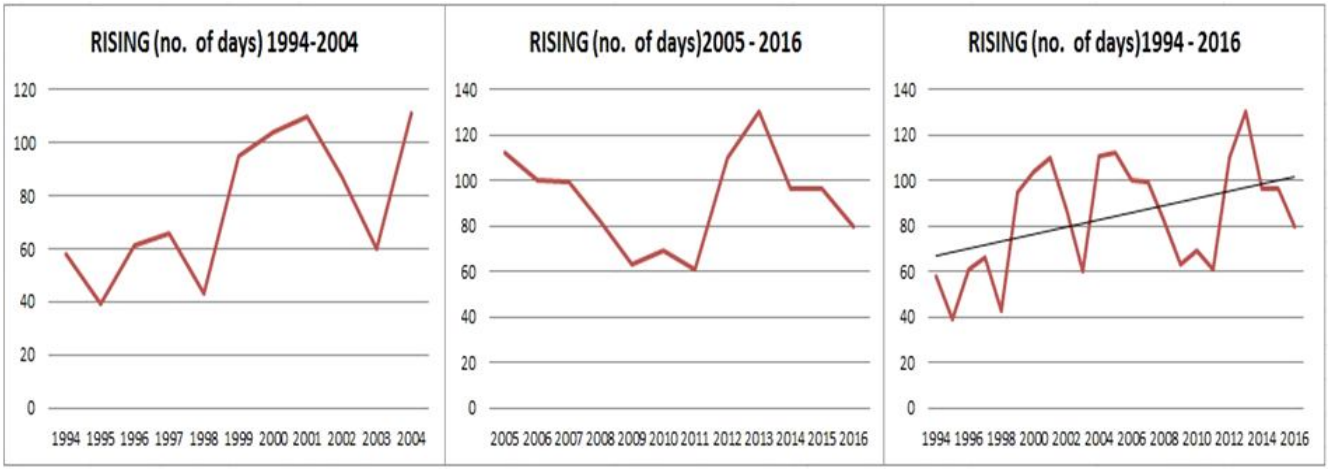

Fig. 13: Shows annual total of repeated days of rising dust of Al-Azizyah's station.

2004-2016 the total of repeated days of rising dust was (130) days. The general trend of the total of repeated dusty storms days for the period 1994-2016 is up.

Al-Hay's station

Through fig. 14, that includes annual totals of repeated days of rising dust of Al-Hay's station, it has registered in the first decade of the period of study 1994-2004 the total of repeated days of rising dust was (133) days, while in the second decade of the period of study 2004-2016 the total of repeated days of rising dust was (111) days. The general trend of the total of repeated dusty storms days for the period 1994-2016 is Down.

Wind erosion

Wind is one of the most influential geomorphological

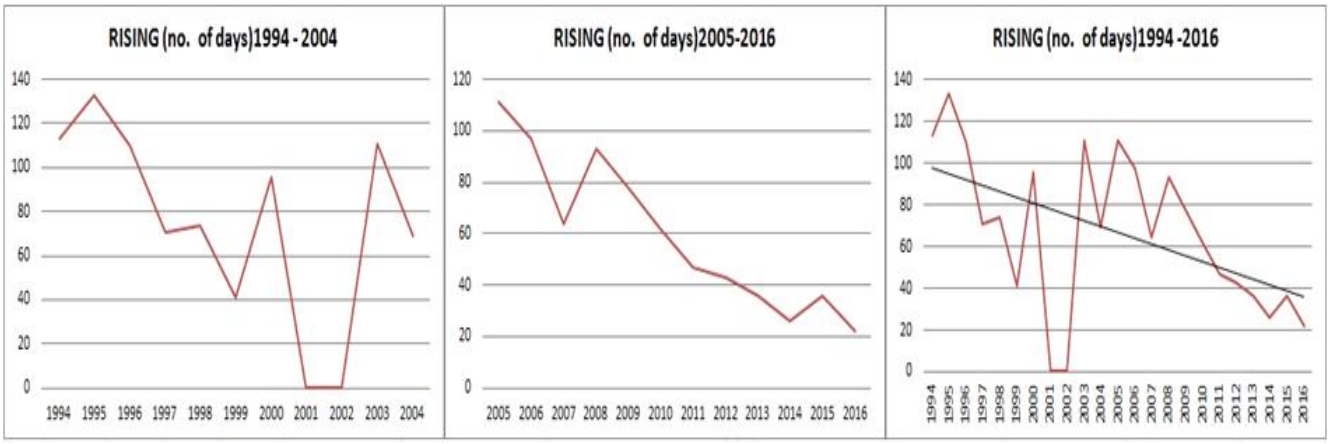

Fig. 14: Shows annual total of repeated days of rising dust of Al-Hay's station.

factors in the formation of the earth surface, especially the dry lands and it is the second factor after the running which is responsible for the erosion of the earth's surface. The scarcity of vegetation in the study area and the lack of air humidity that responsible for erosion of the earth surface. It is common knowledge that dry air has a great effect on sculpture rather than wet air. In general, the residual effects of wind in the forms of the earth surface depend on their speed, direction, periods of blowing, and in addition to the roughness and cohesion of the formation of earth surface, and plenty vegetation cover that is inversely associated with the wind. The wind speed increases with the decline of plant coverage which is reflected directly on its geomorphological ability in the processes of sculpture and sedimentation. The process of wind sculpting occurs in several stages. The process of deflation is to remove the rock breakers from the surface with the force of the wind while abrasion is the process of carving and destroying the surface of the earth with the force of the air rush and the ability or capacity of the wind holding rock fragments. These rock breakers are also eroded as a result of their friction with one another while they are transported in the air. The eroded fragments transported in several way such as suspension and traction or salutation. In the case of application of climatic viability of erosion, a Sideway and Chesilequation is used to determine the viability of wind erosion in the study area, which depends on ability to two elements which are the adequacy of the fall of the Thorutite and the rate of wind speed as follows:

$$E = 386\frac{V^3}{(PE)^2}$$

E = wind prove, V= speed in, PE = Effective precipitation of Thorutite

The results showed that the wind speed at Al Azizi and Al-Hay stations were 15.22 and 14.21 respectively and according to table 14 they can be classified as minor erosion values. Of course, this is due to increasing the amount of falling rainfall as Azazel as the presence of

Table 14: Wind proof of erosion.

Wind proof	Degree of erosion
Less than 20	minor
20-50	medium
50.1-150	stiff
More than 150	very severe

vegetation cover. Here comes the active role of chemical weathering and water erosion during the months of rainfall in which there is a surpluswater.

They also depend on the annual values of climatic viability of erosion, without taking account of the seasonal variation of that susceptibility. The formula suggested by FAO in 1979 is therefore used as follows:

$$c = \frac{1}{100}\sum_{i=1}^{12}\overline{U} \times \left(\frac{ETP - P}{ETOP}\right)d$$

Where

$\overline{U}$ = Monthly rate of wind speed (m/s).

ETP = Monthly evaporation / transpiration rate (mm).

P = Monthly rainfall (mm).

d = Number of days of the month.

The equation is classified into four categories Table 14.

Since this equation is used in many arid regions to estimate the climatic viability of erosion, it is possible to calculate the monthly values of viability of erosion. After possible calculating the monthly rate of evaporation / transpiration, which is the most important variable in the application of the equation, which depend on the experimental value of method Thernadite. When applying the equation to the climatic stations close to the study

Table 15: Monthly and annual rates of climatic viability of precipitation and climatic variables affecting them at Azizi station for the period 1994-2016.

Months	Wind speed m/s	Amount of precipitation mm	Evaporation/ Transpiration possible	Ablutionc	C%
January	3,2	27,7	6.9	zero	zero
February	3,4	12.7	12.9	zero	zero
March	3,8	15.9	38.9	10.05	0.10
April	3,7	13,2	97.6	13.14	0.13
May	5.0	4,0	233.4	38.08	0.38
June	5.0	-	366.6	37.5	0.37
July	5.1	-	460.3	41.12	0.41
August	4.3	-	409.2	24.64	0.24
September	3.5	0,1	245.1	12.85	0.12
October	3.1	9.8	125.7	8.51	0.08
November	2.8	23.9	31.4	1.57	0.01
December	3.0	17.8	10.3	zero	zero
Average	3.7	-	169.85	187.46	1.87

Depending on the scale (4, 5).

Table 16: Monthly and annual rates of climatic viability of precipitation and climatic variables affecting the living station for the period 1994-2016.

Months	Wind speed m/s	Amount of precipitation mm	Evaporation/ Transpiration possible	Ablutionc	C%
January	3.0	28.3	5.7	zero	zero
February	3.4	14.8	11.3	zero	zero
March	3.5	19.4	36.7	6.26	0.06
April	3.6	13.1	108.9	12.31	0.12
May	3.6	5.6	272.2	14.16	0.14
June	4.9	0.1	439.5	35.28	0.35
July	4.8	0.3	565.1	34.26	0.34
August	4.4	0.0	496.5	26.40	0.26
September	3.8	0.2	314.0	16.45	0.16
October	3.1	4.9	146.1	8.92	0.08
November	2.9	20.6	45,7	4.01	0.04
December	2.8	-	9.3	zero	zero
Average	3.7	-	218.66	158.05	1.58

Depending on the scale (4, 5).

area, such as Aziza and Al-Haystations (neighborhood station), the results of the equation indicate a variation in the monthly and annual values of the climatic viability of erosion, as there is no climatic susceptibility during the winter months (December, January, February) in the above stations. This comes as a result of the actual increase in rainfall over the monthly rates of evaporation/transpiration possible during those months. The increase in the rainfall at Azariah station for the above months are (17.8, 27.7, 12.7 mm) respectively, with a total of 58.2 mm. while the amount of increase in the rainfall at the stations of the neighborhood for the months above are (20.6, 28.3, 14.4 mm) respectively with a total of 63.3 mm and that the surplus of rain water finds an outlet in Soils through peculation with medium and high permeability become highly humid. But the surplus of rainfall remains on the surface forming temporary pond in the soil with few pores (impermeable). This leads to the cohesion of the surface layer of the soil and it is not affected by wind erosion. On the other hands, the gradual decrease in precipitation, relatively high temperatures, as well as increased wind velocity during the spring season, have a negative impact on soil moisture content, which helps to increase the climatic viability of precipitation during the spring months (March, April, and May). The total climatic viability at the stations (Al Azizi, Al Hay) for the spring months amounted to 61.27 and 32.73 respectively. In the summer, where there is no rainfall and high temperature rise with monthly wind speed reaching its peak in June, July and August leading to dryness of the surface layer of the soil and disintegration to minutes, becoming easy to transport by wind. Thus, monthly averages of climatic viability of erosion are highest during this season with a total of 103.26 and 75.94 respectively. Monthly averages of climate variables that have a direct effect on susceptibility during autumn months (September, October, November) causing a decrease in the monthly rates of climatic viability of erosion during fall season and a total of 22.93 and 29.36 respectively.

The total annual value of the climatic viability for erosion of Al-Azariah station was estimated at 187.46 and was classified as very severe erosion according to the classification of the wind hypothesis. While the total annual value of the climatic viability for the Al Hay station was recorded at 158.05 and it is also classified as very severe erosion. But the value of the climatic capacity at Al Azariah station exceeds the value of the Al-Hay station by 29.41. This variation in values may be due to spatial variation between the two regions as well as variations in the values of climate variables that are directly correlated with climatic viability. Al Azariah station recorded significant increases in the monthly and annual rates of direct-impact on climate elements such as wind speed and possible evaporation/transpiration that exceeded the Al-Hay station.

Soil susceptibility to erosion

Soil susceptibility to erosion is a quantitative measure of how much soil particles are lost per year from dry surface by wind. So, the stronger the wind, the greater the impact on the soil which lead to dry disintegrate and remove soil particles from the surface by wind erosion.

When the force of pressure and wind speed on the loose soil particles is overcome by the force friction of the grain on the surface of the earth and the weight of the grains themselves, resulting in their separation from the surface and then moving, as illustrated by the following law:

Wind pressure force (kg/m^2) = 0.006×Wind speed box (km/h).

Thus, the amount of wind pressure per square meter of the Earth surface is 0.12 kg if the wind speed is 4.5 m/s (16.2 km/h). This amount increases with the gradual wind speed increasing from March, in the monthly rates of wind speed to reach the highest rates in the station Azizi for months June, July and August, amounting to (0.15, 0.15 and 0.11 kg/m^2) respectively. However, in the Al-Hay station for the same months above, it was 0.14, 0.313, and 0.9 kg/m^2 respectively, and it gradually differs from September until it reaches its lowest level in December at Al Azariah Station and for the same month at Al Hay station. It is possible to estimate the intensity of the erosion in the region, depending on the surface of the earth from the aggregates and particles or scalable or non-ablution in the case of increasing the particles from (1 mm) and when the proportion of the aggregates to (60%). Soil aggregates are the adjacent and interconnected soil particles due to the presence of a quantity of interstellar materials such as carbonates, organic or moisture content which makes them aggregate and increases their diameter to (1) mm or (zero). The soil becomes almost completely resistance to erosion even at the wind speed (12.5 m/s). In the case of decreasing percentage of the aggregates, the soil is more vulnerable to erosion and soil needs to be protected against wind erosion.

Conclusions and Recommendations

Through studying the relationship between the climate's elements (temperature, winds, rains, humidity) and the dust phenomena (dust storms, suspended dust, rising dust) for the two stations Al-Aziza and Al-Hay at waist province for the period 1994-2016, and counting correlation coefficients, shown the following :

1. Relationship between the climate's elements (winds and temperature) with dust phenomena (dust storms, suspended dust and rising dust) is a trivial relationship. It means whenever temperature and winds increased the days of dust phenomena increased.
2. Relationship between the climate's elements (rains and humidity) with dust phenomena (dust storms, suspended dust and rising dust) is an inverse relationship. It means whenever rains and humidity increased the days of dust phenomena decreased.
3. Dusty storms phenomena are repeated during all months of the year and they increase in summer due to the cease of rain, rise of temperature and increase in winds speed.
4. Annual total of repeated dust storms phenomena has registered the higher level at Al-Azizi's station more than the days of dust storms, it was (17) days in 2012, and less total of dust storms days was (0) in the years 1995,1996, 1997,1998, 1999, 2002, 2006 and 2014. As for the suspended dust, it has registered the higher total in 2016 and it was (192) days, and lower total has registered in 1995 and it was (12) days. As for the rising dust, it has registered a higher total in 2013, and it was (130) days, and lower total was in 1995, it was (39) days.
5. Annual total of repeated dust storms phenomena has registered the higher level at Al-Hay's station more than the days of dust storms, it was (6) days in 2008 and 2009, and less total of dust storms days was (0) in the years 1998,1999, 2000, 2001, 2002, 2003 and 2014. As for the suspended dust, it has registered the higher total in 2008 and it was (223) days, and lower total has registered in 1998 and it was (3) days. As for the rising dust, it has registered a higher total in 1995, and it was (133) days, and lower total was in 2016, it was (22) days.
6. The erosion equation indicates a variation in the monthly and annual values of the climatic viability of precipitation at the stations. There is no climatic susceptibility during the winter months (December, January and February) in the above stations, The monthly rates of evaporation / transpiration possible during these months. The increase in the station of Azariah for the above months (17.8-27.7 - 12.7 mm) respectively, with a total of (58.2 mm), while the increase in the station for the above months (20.6-28.3-14.4 mm), respectively, with a total of (63.3mm)

Reference

Al-Dahi, H.A.J. (1989). Rains in Iraq, Master Thesis (non-published), Al-Eskandryah University, College of Arts.

Al-Juburi, S.H.A. (2005). Climatic budget of Al-Mousl's Station, Baghdad and Al-Basrah, PhD. Thesis, (Not published), University of Baghdad, college of Education, Ibn-Rushud, 104.

Al-Jourani, S.K. (1990). Studying dust phenomena in Iraq, Master Thesis (Not published), University of Al-Mustansiryah, college of science, p1-87.

Al-Neamee (1991). Rasheed Hamood Saleh, long term predicting of dust manners in Baghdad, college of science magazine, University of Al-Mustansiriyah, **3(1)**: 10.

Ali Saheb, Al-Mosai and Abdul-Hasan Madfoon AbuRehail (2013). Climate of Iraq, University of Kufa, Al-Mezan press house, 270-271.

Ali Saheb, Al-Mosai and Abdul-Hasan Madfoon Abu Rehail (2013). Climate of Iraq, University of Kufa, Al-Mezan press house, 273.

Ali Saheb Al-Mosai and Abdul-Hasan Madfoon AbuRehail (2013). Climate of Iraq, University of Kufa, Al-Mezan press house, 276.

Al-Samraee, M.J. (1999). Spatial Variation for climate's elements in Iraq and determine the water territories, Iraqi Geography Association Magazine, **42**.

Al-Saraf, S.J. (1980). Climatology, Press house of Dar Al-Kutub, p80.

Ismaeel, S.A. (1999). Dust and soil storms in Iraq, classification and analysis, *Iraqi Geography Association Magazine*, **39:** 111-128.

Kromov, S.F. (1990). Studying dust phenomena in Iraq, Master Degree (not published), Weather, Climate and Metrological Monitor, translated by Fadhil Baqer Al-Hasani and Mahdi Al-Sahaf, firstpart, University of Baghdad's Press, 339.

Majed, A.J. (2010). Effect of Air dust phenomena on the early planting for Tomato at Al-Chebayesh district, *Literature of Thiqar Magazine,* **1:** p103.

Mohammed, E.S. (1982). Dust in Kuwait during Summer, Gulf and Arabian island Magazine, **30:** Kuwait, p60.

Sami, A.A.Al-Qaisi and M.Y.H. Al-Heti (2011). Scientific research curriculum, University of Baghdad, p171.

Seood, A.A. (1996). Repeating some climate severe phenomena in Iraq, A study geographic climate, PhD. thesis, college of Arts, University of Basrah, p77.

Sulaiman, A.I. (1999). Dust and soil storms in Iraq (classification and analyses) Iraqi Geography Association's magazine, **39:** 132.

Tagreed, O.A. and Al-Kadhi (2001). Influence of superficial and higher-pressure systems in formation dust storms in Iraq, Master Thesis, college of Arts, University of Baghdad, 23-24.