Reasons of Dust Storms Increase in Iraq

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ABSTRACT:

Currently regions in the world are much affected with dust storms, rising and suspended dust, as Iraq is suffering of this state as well within an eye-catching manner, whereas the storms leave negative traces on environment and public health and many of the other vital utilities.

This research aims to diagnosis of the reasons that resulted in increment of dust storms in Iraq basing on some recorded data and to be analyzed in conformity with the prevalent theories and concepts at the atmospheric science and environmental physics.

Generally the study, has illustrated that the climate changes and increase of temperatures averages because of green house effect, that followed by clear changes at thermal wind and jet stream, that caused to instability state and occurrence of an increasingly generated severe loading streams to dust storms.

Thus, violation at the environmental criteria by human plays and important role at the increase of the suspended and rising dust percentages and increasingly via desertification, dryness and soil disassembly and daily fuel by energy means.

Therefore, we conclude from this study as well that dust storms, suspended and rising dust can't completely be controlled upon the damages, but it is possible to partially control on its spread via solving the problems, connected with human activities and violation with environmental equilibrium.

INTRODUCTION: -

Now a days the occurred climate changes in our world have caused too many phenomena, whereas the volcanoes, earthquakes and flood tide waves, temperatures at the most areas of the world, as the dust storms have noticeably increased, basing to the Australian metrology [1], in which one of the dust storms, has stroke Victoria city on march 19, 2003, That storm had covered the city with severe darkness, as the fires were burned and caused to excessive losses and wind speed was more than 100 km / hr. Thereby the asthma and sensitivity because of the dust storms at Florida state in Las Vegas and in Nevada state.

In Asia, China and Taiwan were suffering from dust and sand storms gusts at the recent years because of middle desert of Mongolia and followed by desert crawl and the Arab gulf area and Middle East are suffering that for containing wide desert. In North Africa it's accompanied with high temperatures that were recorded more than (57° C), with severe sand storms gust which are circumstances similar to the one of the

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Death Valley in the American State of Nevada.

Iraq is exposed to dust storms, particularly at the region located west of Al- Basra and South of Al- Nasriyh, that includes Al- Samawa, and Al- Salman as well as for the area located at the southwest of Baghdad. Thus the summit of this phenomenon reaches at the last of spring and the first of summer, whereas Iraq is being effected with number of depressions that moves on these areas, usually accompanied by active northwest or southwest winds and as dust phenomenon is constituted as consequence of strong storms, and it is known that suspended dust is consisted of particles that its radius doesn't exceed for more than 1 micron and its available during and after the occurrence of storms and surface winds quietness and continues in suspended remaining at the atmosphere for long period . Thus the atmosphere never been clarified except after passing some days and sometimes result to the decrease of horizontal range of vision to limits that reaches to 4 km.

Actually the dust storms are that makes the dust as consequence of speed severe winds that might reach from (37-60) km/hr. The dust elevated to several kilometers over the ground surface and the horizontal range of vision to less than 1 km.

Concerning the sand storms, which occurs under similar circumstances of dust storms and the size of the sand particles ranges between (80 micron to 1 millimeter) and the components of these storms, never rose to more than (15) m over the surface of earth because of its large size.

Thus the climate data, generally refers that Iraq is effected with the dust suspend upon in number of frequencies in the year to the rising dust and dust storms at the third degree, so table no. (1) represents the annual average of the number of days, in the three cases take place in three regions of Iraq. It is worth mentioning that the last decade has testified a noticeable increase in the number of dust storms for the three regions and within (30%) of the general average if the annual average of dust storms was over Baghdad was within (20) storms and (30) storms over Al-Basra before two decades except if being changed at the current decade, as illustrated in table No. (1), [2].

Table (1); represent the annual average of the number of days, which the case of the dust phenomenon appears in three region of Iraq.

Region	Type of Dust			Total
	Suspended	Rising	Dust Storm	
Baghdad	62	51	26	139
Al-Nasriyh	143	83	33	259
Al- Basra	91	53	34	178

The data illustrates that (50%) of the dust cases in Baghdad region is being accompanied to the northwest winds, (30%) of the dust cases is accompanied to the southeast and (20%) of the rest directions.

The data refers that the absolute maximum temperature was observed in Al- Mousl since 1941 – 1995, which is (51.1°C) and in Al- Rutba (47° C), in Baghdad (51.1° C) as in Al- Nasriyh and Al- Basra was observed (49.8°C) & (50.6° C), Respectively. But these averages for the absolute maximum temperature has changed in the current decade, as if the increase ranges between (4° – 6° C) at the above – cited regions and that has resulted in to that deviation at the general averages of temperatures.

Thereby the difference and variation in the number of frequencies for the dust cases between a year and other, which states to several factors and one of these factors are the daily atmospheric circumstances and nature of the earth surface is being effected with the climate circumstances round the year, as well as the general cycle of the winds [3], [4] and the period of return to the incident, and the annual climatic changes, in which earth planet is being exposed, whereas fig (1) illustrates a meridian cross section for the months January (a) and July (b)for the northern hemisphere .

The quantity of rain is strongly effect in the number of frequency of the total of dust phenomena (Suspended + Rising + Storms), as if incase of non falling of enough quantity of rain, then the soil is exposed to dryness and crumble and becomes prepared to be as source of dust when availability of the suitable atmospheric circumstances, that is to say that the relation is converse between the quantity of rain and annual average of dust phenomena [2].

Actually, it is well known that rainfall in Iraq mainly occurs in the winter season as it secondary takes place at the last of the autumn and the first of spring seasons respectively, as a consequence of aerial depression coming from the Mediterranean Sea. The rain season starts from the month October and ends at the month of May except for the mountain elevations at the northeastern, in which some rains fall at the beginning and end of the summer season. The difference in temperatures, near earth surface is considered to be of the main factors in the weather, whereas the differences cause variation in air density and atmospheric pressure, then winds movement are originated then the changes are followed at the climate elements [5].

In order to distinguish between the winds and rising currents, then the winds are considered to be the horizontal movement to air over the surface of earth, the rising currents, doesn't considered to be winds, in spite of its importance in forming the weather and moving heat and humidity [6].

Iraq is being affected with thermal wind, more than affected with the rest of the types of winds for being located among a large desert region and being distinguished with a semi-desert continental climate, in respect with rains littleness and existence of wide range in the season and daily variations in addition to the centralization of seasonal atmospheric depression that remains during summer days and causing to breeze up from northwest to southeast and according to the strength of this depression, the wind power changes [7].

Therefore thermal wind speed was measured by quantity and direction between any two layers by applying the balloon of metrology and then to know the hot and cold areas and probability of the atmosphere stability equality which are parallel to the temperature average lines, which means that thermal wind are parallel to thickness lines, [4], as it is possible to draw the maps to specify the hot and cold zones to advection at the higher atmosphere layers and its effect upon the stability.

Concerning, the higher winds, whereas it marches opposite to surface wind direction and one of the most of these higher winds are belts of fast winds called as (jet stream) as two ones at least are incompassing and located nearby the Tropopuse of the semi-tropic middle exposures and the elevations are confined between (8-15) km over the

surface of the earth, as the semi-tropic jet stream is available over Iraq, on an approximated height of (15) km and centralized at the latitude of 24 ° east in the winter, whereas the wind speed occasionally reaches at its pivot more than (100) knots and it is restricted between the latitudes (30° – 50°) and it takes wavy path looks like the march of the snake around the globe and reaches to it maximum speed at the zones , in which the differences of temperatures are increased such as Iraq and Kuwait , thereby most of its speed are resultant from thermal wind.

The study aims to present the relevant relation between the temperatures averages increase at the last years and between the jet stream activity and atmospheric phenomena over Iraq that occurs below these winds, such as dust storms, and thunder hurricanes.

MATERIALS AND METHODS: -

The data and tables, that were utilized in this study was acquired from the Iraqi state commission of metrology, which includes monthly details to dust storms, rising and suspended dust for the period from (1941-1997), in addition to some detailed reports and climatic maps to the weather and for different zones in Iraq.

These were studied and statistically treated, and then thickness lines maps were applied to demonstrate the zones of heat and cool, after wards to calculate the thermal wind, and the entropy maps of strain temperatures maps as well to produce the humidity regions and follow the conversions that take place on air masses during movement.

Concerning analyses and equations, that according to and its basis some of the results were extracted, as it during analysis the equation of anticipation were applied from the zones of the disturbed weather zones at the atmospheric depression, as the main equations of air movements were applied to calculate the difference between coriolis force and pressure regression, as well as for vorticity, as taking into consideration the study site nature and barotropic , adiabatic and baroclinic , as well as the hypsometric equation were applied

RESULTS & DISCUSSION: -

If we take two points on the same height of the earth surface, as to say approximately (1Km) and managed to measure the temperature of both points and as it well known that the difference was some degrees, then air pressure over the cold point will be less than the warm one. Thereby on that basis the geostrophic wind speed in quantity and direction with the height when horizontally the temperature changes among aerial column [6].

Thus it is possible to apply the geostrophic equation to calculate the change with thermal regression affect, as if after the substitution operations, not worth mentioning with the calculations, then we can acquire upon the following two expressions of the western and northern winds components, [5], [8].

$$\Delta Vg = \frac{g}{ft}\frac{\partial T}{\partial x}\Delta Z \quad \text{Northern Winds}$$

$$\text{Western Winds } \Delta Ug = \frac{g}{ft}\frac{\partial T}{\partial y}\Delta Z$$

Δ Vg & Δ Ug are considered to be the thermal wind components, because they are resultant from the horizontal regression of temperature average during the thickness ΔZ and g represents the ground acceleration constant, f is coriolis force and equals $2\Omega \operatorname{Sin} \phi$ and its value

$1.458 \times 10^{-4} \sin \phi$, because the angular velocity to earth $(7.29 \times 10^{-5}$ R/Sec) , T is air temperature and it is called the component $\frac{\partial T}{\partial y}$ is called thermal wind , in which this study regards the importance in changing then climate status when affected and increase its averages , and the thermal wind resultant of the horizontal regression and is parallel to the lines of temperatures and focuses around the cold temperature zone[9],[10] ,[11].

It was illustrated when conducting the accounts and data analysis, that the component $\frac{\partial T}{\partial y}$ is different from it previous averages and perhaps the occurred changes in the last years are due to the thermal wind.

Therefore it is possible to explain thunder storm occurrence that particularly takes place in Iraq at the middle and south of Iraq whereas surface windflaws which are humid thermal wind from southeast and the higher winds are dry cold winds from Northwest. Furthermore that will cause to non-stability as a consequence of heavy air availability over the light air, which inevitably results to then occurrence of strong loading streams, generating dust storms. [12] .

In Bartropic atmosphere, the centers of high and low pressures, as to be centers of the higher and low temperatures as well [13], [14], as fig no. (2) [a & b] illustrates this condition, in which winds speed is increased with height and this condition is absolutely reflects when geostrophic wind speed decreases with height, even that wind direction might be changed according to the temperatures change.

When returning back to the first law of thermodynamics, that concerns the dry air when adiabatic rising, then we can find that the main criterion to the equations is the change in temperatures, especially what is called as the Potential Temperature [4] and the occurrence at summer in Iraq, then warm air nearby the earth surface when adiabatically rising it marches upwards with a straight line and it temperature during rising higher than air temperature, nearby the surface. Therefore it is continuous in rising for its lightness till reaching a certain point then the temperature equals to the adjacent air temperature and stops at this limit, because its continuation in rising, makes it cooler than the adjacent air, so it drops for heaviness, for instance air between the layers (1000 & 800) mb (mille bar) is not stable and between (800 & 600) mb is stable. Thereby in the first case, the adiabatic regression value of the humid air is larger than the one for the dry air. In the second case the contrary takes place, which means that the value of the adiabatic regression of the humid air is less than for the dry air and for instance Iraq and the Arabic Island according to the illustrated circumstance during the summer and this study as found as well when temperatures intensification especially in the afternoon whereas violent streams occurs, leading to upward dust diffusion, soon as it horizontally spreads in wide areas.

In addition to that the thermal depression over the Arab gulf affects at summer season too on the Mediterranean zone, in respect with its summer winds, as well as Cyprus depression over the Mediterranean sea at the winter as an example of the thermal depression that much affects on the weather in Iraq, whereas cold polar winds gusts on the

Mediterranean sea zone, resulting to non – stability and consequently, these depressions are a cause of the dust whirlpool activity reasons and thunder cyclone in Iraq .

The rise of temperature averages in the current decade and the sufferance of earth from the green house effect that resulted to series of successive results, as the effect of wind speeds and annual averages.

Therefore, we can find that dust effect is a consequence of wind speed and averages increase, if these were passing on seas or forests, then dust would never occurred but its pass in desert and sand regions gave it the attribute of dust or sand storms. Thereby the dryness in which large areas of Iraq are suffering from the abandonment of the planted land plot and water surfaces, and soil taking part as a consequence of the machineries movement, in addition to that destruction in lands and buildings, water left behind during the previous three decades, has resulted to non coherence to soil surface, and increase the particles percentages on the part of, and increase of the storm content from dust and particles when blowing on the other hand.

Accordingly, it is prior illustrated that winds can't be controlled upon for being connected with climatic factors since million of years and may be astronomical, and the increase in the magnetic activity or sunspots are one of the causes in temperature averages increase, as most of the explanations and theories in this domain at the present time still weak, concerning the scientists view of points.

So the suspended particles and dust can be partially controlled via the increase of water surfaces and agricultural lands areas, as well as to stop the desert crawl and sand hills, prevention the unjust pasture, interest in forestation of cities edges, oases areas and green zones and others. Undoubtedly that the workers, in respect with the domain of agriculture, irrigation and urban planning have awareness and effective role in preparation of the required programs in this domain to partially control regarding this problem in addition to national economy refreshments.

Conclusion:

1. Mainly one of the reasons of dust storms increase is the increase in temperature averages, as thermal wind and jet streams are the active elements for dust storms.
2. Dust storm can't be completely controlled, but it is possible to partially control via fixing the soil surface with different approaches, and solving the problems of soil disassembly, dryness and desertification.
3. It is very important to control the problems connected with human activities and violation with environmental equilibrium.

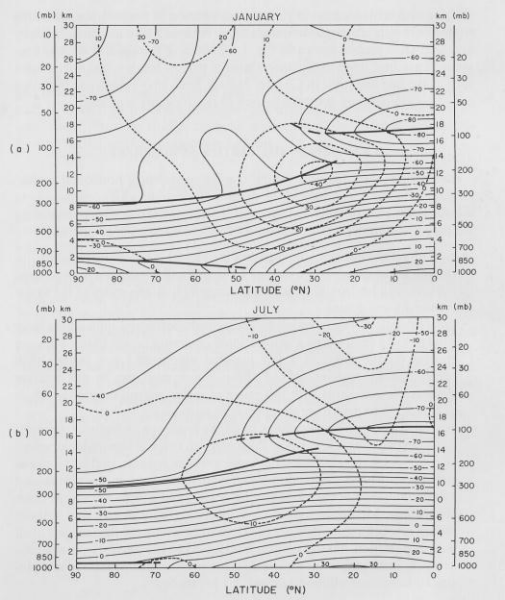

Fig (1) Meridional cross section of longitudinally averaged temperature in degrees Celsius{ — } and zonal wind in meters per seconds (- - -) .

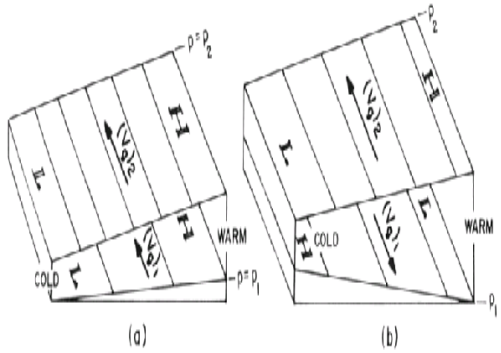

Fig (2) the change of the geostrophic winds with height in equivalent barotropic flow in the Northern hemisphere:
(a) Vg increasing within the layer.
(b) Vg reversing direction within the layer.

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أسباب ازدياد العواصف الترابية في العراق

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الخلاصة:

تتأثر الكثير من المناطق في العالم حاليا بالعواصف الترابية والغبار العالق والمتصاعد ويعاني العراق من هذه الحالة أيضا"بشكل ملفت للنظر ، إذ تترك العواصف أثارا" سلبية على البيئة والصحة العامة وكثير من المرافق الحيوية الأخرى .

يهدف هذا البحث إلى تشخيص الأسباب التي أدت إلى ازدياد العواصف الترابية في العراق، استنادا" إلى بعض البيانات المسجلة وتحليلها وفقا" للمفاهيم والنظريات السائدة في علم فيزياء الجو والطبيعة .لقد أظهرت الدراسة بأن التغيرات المناخية عموما" وازدياد معدلات درجات الحرارة بسب ظاهرة الاحتباس الحراري (green house effect) والتي تبعتها تغيرات واضحة في الرياح الحرارية (Thermal wind) وأحزمة الرياح النفاثة (Jet stream) أدت إلى حالة عدم استقرار وحدوث تيارات حمل عنيفة مولدة عواصف ترابية وبشكل متزايد .

أن الإخلال في المعايير البيئية من قبل الإنسان تلعب دور مهم في زيادة نسب الغبار العالق والمتصاعد وذلك عن طريق التصحر والجفاف وتفكك التربة والمحروقات اليومية لوسائل الطاقة وبشكل متزايد . يستنتج من هذه الدراسة أيضا" بأن العواصف الترابية والغبار العالق والمتصاعد لا يمكن السيطرة على أضرارها بشكل تام ألا انه يمكن السيطرة على انتشارها جزئيا" عن طريق حل المشاكل المرتبطة بنشاطات الإنسان واخلاله بالتوازن البيئي .