

## Effect of the Temperature at (700 Hpa) on Surface Turbulence Over Iraq And Some Neighboring Countries

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**Abstract:** The temperature is considered as the most important variable that control air masses in all of the atmosphere, and it also effect on general circulation model over earth because it is the main source of energy transfer for air masses. The propose adopted in this work is based on daily data analysis sourced from national centre for environmental prediction (NCEP), The study select one turbulence day has cyclonic air mass with large dust storm on (5/6/2009), and wind source direction was from north-west country of Iraq. in depending on this analysis we obtained isothermals line maps of the same day with (700 hpa) and for another days before and after turbulent day to show the behavior of temperature on high levels with the turbulence near the surface for Iraq and some of regional country. The result shows that there is an indication of temperature lines with what happen near surface turbulence, the temperature value shows that there is a clear increasing in dust storm day as compared with the day after and before over Iraq, where the temperature value reaches about (286.8 k) over middle of Iraq in turbulent status day and become lower value in about (5.1 k), while before two days reaches about (281.7 k) and after two days from turbulent it reaches about (279 k) in lower value too with about (7.8 k). the result carried out that the gradient of lines interact with storm increasing and direction when the direction of turbulent moves. in generals it can depend on isothermal lines and its curvatures for reading surface status in a large value from (700 hpa) in particular.

**Keywords:** Temperature, Isothermal lines, Turbulence, National centre for environmental prediction, 700 hpa

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### I. Introduction

Studying the upper atmospheric behavior require clear understanding for meteorological variables of atmospheric levels from the climatic and weather ways or both of them, most of studies insist on one or many of meteorological variable or insist of studying one selected or many phenomena to show the range of correlation with other variables and phenomena. the meteorological elements correlate with each other's and with phenomena as effected or affected element depending on status type, It very important for such type of study the data availability for analysis [1]. The common data from radio sound device is used in most study like wind speed, direction, pressure and temperature, so this study depends on temperature data at level (700 hpa) that have a grate relation with most meteorological variables and has important position inside stratospheric layers [2]. also the study depends on day which have a turbulence with dust storm phenomena near the ground because of its effect on human life especially in Iraq and other surrounding countries. this study based on collecting one phenomena with one meteorological variable from other side, so the study found that there is a grate relationship between temperature and turbulence near the ground, where the analytic maps for this active level showed clear coherence that can depend on it to study turbulent status depending on temperature value for upper levels in atmosphere and depending on analytic maps for isothermal lines on the same day of turbulence. The development in numerical modeling came with grate development in meteorological data and that lead to appear many research centers because it consider as the main line for medium and long range of study, and also many researches depends on forecasting center to study the atmosphere and meteorological factors, where this centers export very important data can be depend on it to make more developed study about climatic system behavior and meteorological factors [3].

The study used data obtained from notational center for environmental prediction (NCEP) for limit period selected at the same time of a storm passage with huge dust, and this turbulence started from south of (Syria) and north of (Iraq) heading to (Saudi Arabia) and some regional countries. the study analysis isothermal maps with selected scales to describe the status, and selecting large scale of maps to cover all of turbulence path until its end in southern east countries of Iraq. the study period for this weather status obtained by selecting one turbulence day and two days before and also two days after turbulent day to show isothermal lines behavior before the turbulent and in turbulent day and also after turbulent decay, and this give a good analytic description of dust storm propagation and disappearance stages.

At the last period Popularized in the world making large researches by input one variable (temperature for example) inside numerical modeling programs for the atmosphere [4], and these studies showed that the temperature value vary with alternated months of year and also vary with vertical depth and potential value of air [5]. the study described turbulent status at (5/6/2009) by determining air mass path which started from

(Syria) and move clock wisely inside Iraq toward (Saudi Arabia ) as shown by (terra) satellite for (nasa) center , see figure (1) which shows the storm path over Iraq with visible spectrum [6].



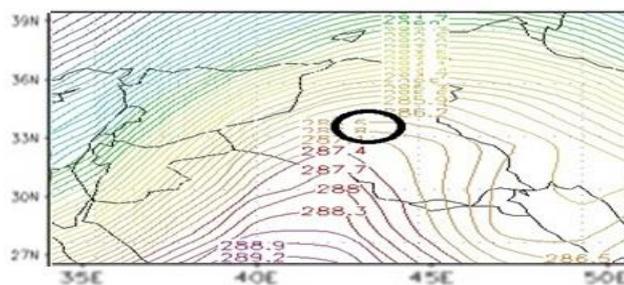
**Figure (1) the path of storm with visible spectrum from (terra) satellite of nasa center [6].**

## **II. Results And Discussion**

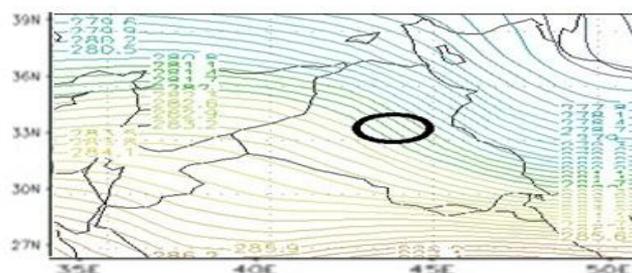
The study made an analytic maps of isothermal lines for pressure level (700 hpa) at turbulent day (5/6/2009) which accompanied with dust storm flow and heavy wind over Iraq , and its source from (Syria) and regional countries [6] , see figure (1) which show the storm path over Iraq . the study select this level because of its importance and its location near the ground and other atmospheric levels from other side [7] , and also to see if this level gives a clear indication to what happen at surface , and also the data availability for this pressure level .

The study depend on analysis data taken from national center for environmental study (NCEP) for temperature , and cutting a part of map (from longitude (200) to (600) and latitude (120) to (390) ) and that is to cover south countries of Iraq beside Iraq which is affected by this turbulence . the temperature value given in (Kelvin) to show the difference in wider value as compared with using ( Celsius ) . the study analysis isothermal lines at (5/6/2009) beside two days before at (3 ~ 4/6/2009) and two days after (6 ~ 7/6/2009) to show the difference between turbulent day and other little turbulent days and also to show the effect of isothermal lines by turbulence movement and decay toward (Saudi Arabia) .

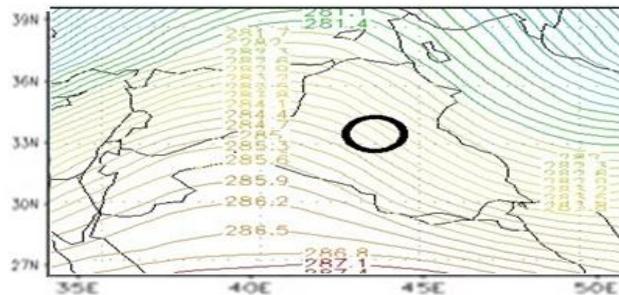
From observing temperature values at the turbulent day which is accompanied with huge air mass movement over central of Iraq especially pointed in circles at figure (6 2) the temperature value reaches approximately (286.8 k) but when observing it values at the days before it reaches ( 281.7 k) before two days at (3/6/2009) and its value is (284 k) before one day at (4/6/2009) for the same region in figures ( 2 6) , that means it increased in about (4.9 k) from minimum value before two days .



**Figure (2) isothermal map with a circle sign in the middle of Iraq at turbulent day on (5/6/2009) .**

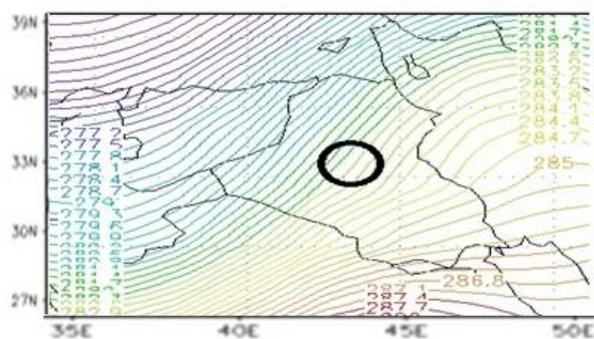


**Figure (3) isothermal map with a circle sign the middle of Iraq before two days from turbulent on (3/6/2009) .**

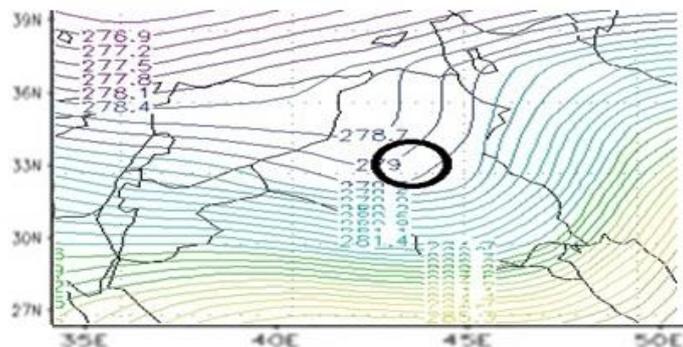


**Figure (4) isothermal map with a circle sign the middle of Iraq before one day from turbulent on (4/6/2009) .**

By observing two days after turbulence it shows similar behavior where it reach (283.5 k) at (6/6/2009) after one day and also after two days reach (279 k) at (7/6/2009) , and that means it become lower in about (7.8 k) , this may be because of air mass activity and increment in mixing ratio and vertical movement of wind resulting from higher energy as compared with other days , and this clearly shown in temperature values at level (700 hpa) , see figures (5 and 6) with pointed positions in the middle of Iraq for these days .



**Figure (5) isothermal map with a circle sign the middle of Iraq after one day of turbulent on (6/6/2009) .**

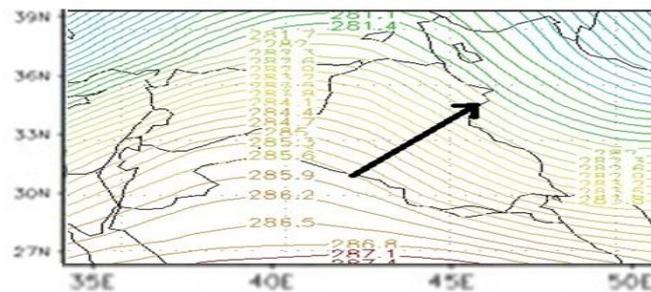


**Figure (6) isothermal map with a circle sign the middle of Iraq after two days of turbulent on (7/6/2009) .**

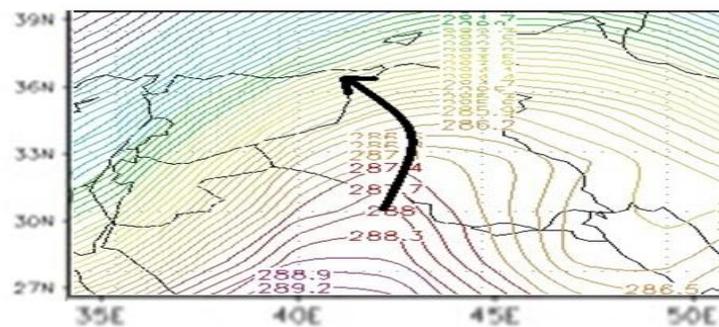
When showing maps with larger scale we can observe that there is a coalescence of higher value center in south ward of Iraq toward Saudi Arabia (similar to trough shape) at status day on (5/6/2009) , where the days before and after this time shows another shape with simple coalescence before and after one day . but there is no indication before and after two days , that can used as an indication for isothermal lines interaction with formation and movement and decay stages of turbulence , from other side the two days after turbulence (6 ~ 7 /2009) shows retreat in system make similar behave to that days before turbulence but in little intense . from observing temperature line values the isothermal lines with high value moves toward center of turbulence at study day , for example the line with (287.4 k) is located at latitude (240) before one day or two days but become closer to central of Iraq in turbulence day at latitude (330) and then returns to lower level at latitude (250) after one or two days , see figures (7 to 11) at regional countries in south of Iraq .



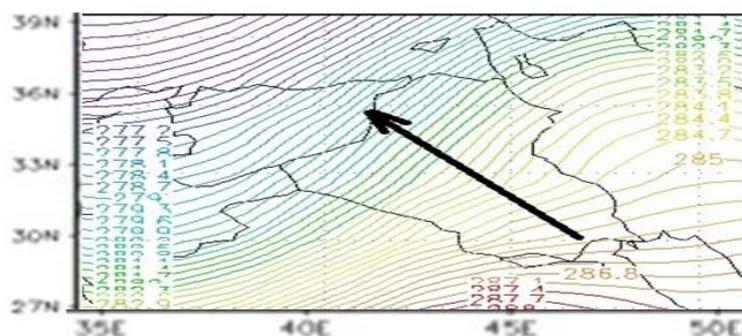
The gradient of contour lines especially in west ward of Iraq at turbulent day is grater than as compared with the days before and after , and the observation of maps shows gradient shape become lower at two days before status and started to become closer when the event day reach and then become wider with low gradient after turbulent day , where the closing lines came with flowing of dust storm like a curved line at figure (1) , and the direction of gradient is inversely to the direction of the storm , that may be because of the propagation of this air mass is depending on energy and that energy have a big importance for air masses movement where it clearly seen from temperature value and direction of gradient . from other way we can see that the direction of lines is parallel to direction of storm before it reach the region but it changes to be horizontal at the storm day and after . also the gradient value is equal over all the surrounding of low pressure center that came with turbulent , see figure (12 to 14) that showing direction and intensity of gradient and also direction and curvature of isothermal lines after turbulent mass arrival .



**Figure (12) isothermal map with a gradient and direction for Iraq before one day of turbulent on (4/6/2009) .**



**Figure (13) isothermal map with a gradient and direction for Iraq of turbulent day on (5/6/2009) .**



**Figure (14) isothermal map with a gradient and direction for Iraq after one day of turbulent on (6/6/2009)**

### III. Conclusion

Temperature values become grater at (700 hpa) on turbulent day as compared with a day with little turbulence where the difference in value reaches (5.1 k) or grater than it (7.8 k) for days before and after turbulence respectively , and the analysis maps of isothermal lines at turbulent day shows there is a coalescence of higher value center over Saudi Arabia and moves toward center of turbulence in shape like a trough and this is not available at non turbulent day . the direction of lines gradient vary depending on the storm movement where it changes from northern east to northern west inversely to the storm direction , and the gradient value is

equal in all over the surrounding area of low pressure system . in general the study shows that the contours lines of temperature with higher value rushes toward center of turbulence at study day in harmony with surface .

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