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The Synoptic Relationship Between Days of Thermal Extremes and Pressure Systems During the Year 2020 in Iraq (Baghdad as An Example)

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Abstract

Temperature is one of the most important elements of weather and climate that directly and indirectly affects other weather and climatic phenomena. The study aims to daily detect thermal extreme days during the year 2020 over the months of the year for the maximum temperature (hot extreme days) at the Baghdad Climatic Station as well. The pressure systems varied in their strength or shallowness in each case. The study concluded that the number of days (cases) of thermal extremes during one month, with one day being unique in recording the highest or lowest extreme values, according to the prevailing lows or highs in the atmosphere, as the maximum extremes in the average maximum temperature (extreme hot days) during the study year were evident on the twenty-eighth day of July at a rate of (51.8) °C, followed by the high temperature extremes on the thirtieth day of the month. August, around (47.3)°C, and the cause of the extremes on the two days mentioned was the strongest pressure system controlling Iraq's climate during the summer months, represented by the Indian seasonal low, and its deep appearance at the level of 850 millibars, accompanied by tropical air in the middle of the troposphere, that is, at the level of 500 millibars, in the form of a dent or barrier. My pressure, which increases the severity of the daily thermal extremes for that month, citing in our study the daily weather maps on each thermally extreme day.

Keywords: pressure levels, thermal extremes , maximum temperature.

1-Introduction

Extremism is the amount of change in climate elements that is less than the lower limit of the general average and more than the upper limit of moderation, that is, it represents the maximum and minimum temperature (Farih, 2013). Therefore, climate is one of the important factors controlling various aspects of life by explaining the variation and change that occurs in its elements. Its phenomena are prevalent in various regions of the world, including Iraq. Therefore, the state of extremes in climatic patterns is one of the cases that requires studying, investigating its causes, and identifying the extent of its danger, especially during the past years until the present time, due to the changes witnessed in the atmosphere in terms of climate rates and cycles, and changes in the locations of cells. Hadley, the expansion of the subtropical range towards the north, the decline of the cold polar masses, in addition to floods and heavy rains on one side, the dominance of drought and low rainfall rates on the other side of the Earth, and an increase in the number of warm days and nights and a decrease in the number of cold days and nights.

The World Meteorological Organization report for the year (2021) indicated that extreme phenomena are the new norm for the planet Earth and not an exceptional case, and it will also witness more extreme weather episodes due to climate change, which necessitated delving into this study, explaining the reason for choosing thermal extremes in Iraq (station Baghdad) is a model, as well as the progress and decline in the nature of cold and warm pressure systems, whether they are high pressure systems or low pressure systems, and the interpretation of thermally extreme days, an increase or decrease through the high or

low prevailing in its atmosphere, and tracking the extent of its depth or shallowness in the pressure level of 850 millibars, along with what It is accompanied by a pressure pattern at the level of 500 millibars, as our study is unique from all previous studies that dealt with the subject of thermal extremes and specialized in extracting the extremes through statistical equations or mathematical operations to show the day on which the minimum or maximum temperature rates are more extreme than their general average, but without clarifying the real reason for this. Extremism, so our study came to be unique in clarifying the climatic cause and explaining and interpreting the cause of extremes through the use of weather maps for the three pressure levels of 1000, 850, and 500 millibars in order to clarify the climatic condition for each day that records an extreme in its rates. .

Of the studies that dealt with thermal extremes, a study by (Efthymiadis et al., 2011) confirmed that the trend of rise in temperature rates is consistent with global trends in temperatures and extreme extremes, as cold maximum temperatures decrease and warm/hot maximum temperatures increase in the western part of the Mediterranean Sea. The average, where the changes have been more evident since the mid-seventies, and the study (Kadhim , 2013) explained the frequency of climate extremes in minimum and maximum temperatures and rainfall rates and the extent of the correlation between them to build models of thermal extremes, especially the positive extremes, and the study (Deniz and Gonençgil, 2015) He studied maximum daily temperatures, where the analysis shows an increase in the frequency of warm and very hot days, while cold days show a decreasing trend. A study (Lavaysse et al., 2018) discussed in its pages an analysis of the climate of extreme events over the past 21 years to highlight the The spatial and temporal variation in monitoring extreme temperature anomalies in Europe, which provides utmost importance to help decision-makers develop a system for monitoring extreme temperature anomalies and their environmental impacts, and (Sulikowska and Wypych, 2020) used the empirical distribution to determine the extreme extreme temperatures affecting the summer months in The climate of Europe, emphasizing the analysis of its trends, frequency of occurrence, and geographical patterns in summer (Al-Nasrawi , 2023) pointed to the monthly and periodic changes in the extreme and anomalous climatic characteristics in Iraq, including extreme temperatures whose monthly frequency increased significantly during the period 2010-2020. Iraq is witnessing an increase in the number of extreme days. Thermally, it is compatible with the climate change the world is witnessing, and the same applies to the Baghdad station .

2- Method and data

First: Research problem

Choosing the appropriate problem is the main motivation for the research, so the main problem can be formulated with the following question:

(What is the effect of pressure systems in explaining the occurrence of extremes in maximum daily temperature averages in Iraq in general and Baghdad in particular) and there are sub-problems, including:

1- How do we explain the days of temperature extremes, whether they increase or decrease during the months of the year in Iraq (Baghdad specifically), and what is the effect of pressure systems in explaining their occurrence.

2- Does the presence or absence of the presence and deepening of the pressure system at the pressure level of 850 millibars play a role in explaining the extremes in maximum temperature rates during 2020 in Baghdad, and what is the contribution of the pressure level of the middle of the troposphere of 500 millibars to the increase or insignificant of the temperature extremes.

Second: Research hypothesis

It is an answer that the researcher arrives at by setting a number of hypotheses that serve as a prior guess of tentative solutions that we prove to be correct. Accordingly, the main hypothesis is summarized as follows:

(Pressure systems both cold and warm, influence the scientific explanation for the increase or decrease in the intensity of daily thermal extremes in maximum temperature averages in Iraq and the Baghdad station in particular)

From this hypothesis emerge other sub-hypotheses that can be formulated as follows:

1- The extremes in temperature rates are explained by an increase or decrease in the normal rate of more than five degrees Celsius, excluding some summer months, to 3 degrees Celsius, in addition to the main role of the pressure system in achieving extremes above the average.

2- The depth or shallowness of the pressure system at the level of 850 millibars affects the strength or weakness of its effect on thermal extremes, in addition to the important effect of the pressure pattern at the level of 500 millibars and the extent to which it supplies the surface system with cold air (groove) or warm air (dent) or other pressure patterns. arising in it.

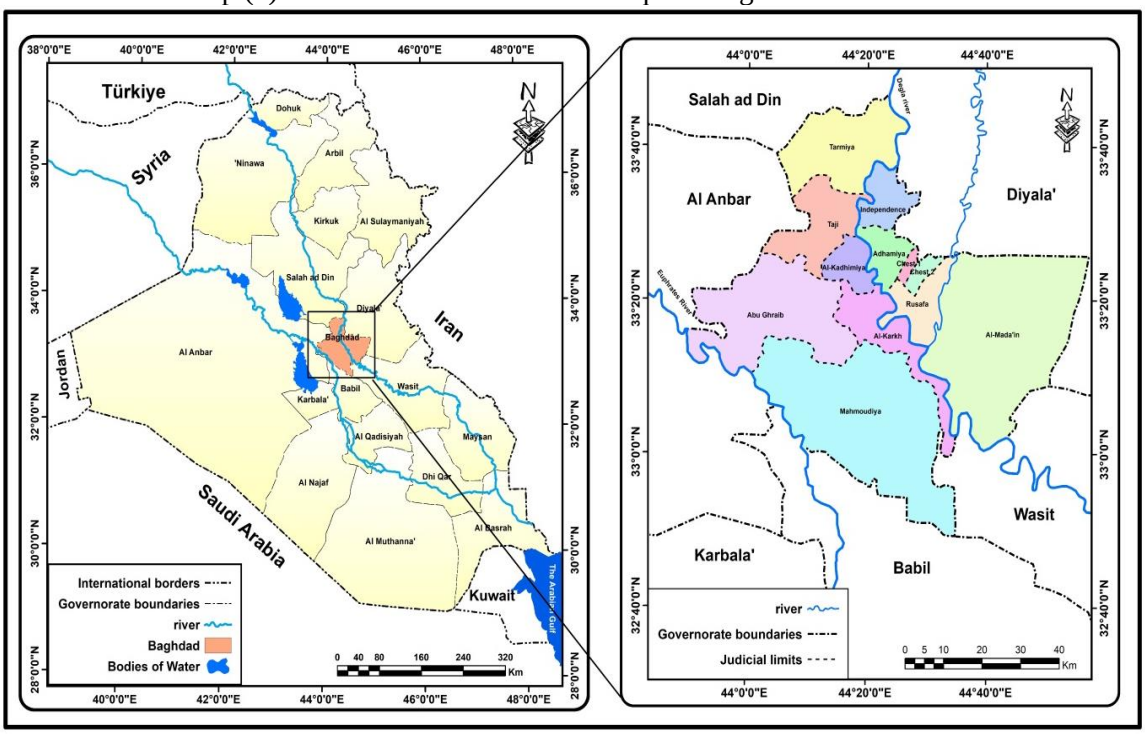
Third : Data used in the study

We relied on the daily and monthly averages at the Baghdad station during the study year issued by the General Authority for Meteorology and Seismic Monitoring, as well as downloading the daily weather map received from the National Oceanic and Atmospheric Administration (NOAA) for each day of extremes to track the climatic reason behind the occurrence of thermal extremes in Some days of each month, as the calculation of the rates of daily thermal extreme days revolves around when the temperature rises or falls during the day from the general average for that month, about (5)°C for all months of the year, and approximately (3)°C in the months of June, July, and August, which prepares An opportunity to clearly explain the contrast and extremism in those days.

Fourth: Study area boundaries

The boundaries of the study area spatially represent the total area of Iraq, which is located in the southwestern part of the continent of Asia within the subtropical latitudes between two latitudes (37° 22′- 29° 05′) north, and between two longitude arcs(48° 45′ – 38° 45′) to the east, and Iraq is geographically located in the southwest of the continent of Asia and in the northeastern part of the Arab world. The spatial boundaries of the study are represented by the Baghdad climate station, which is located at a latitude (33° 18′) and an arc of longitude (44° 24′) map (1). As for the temporal boundaries, they are The maximum daily temperatures for each month during the year 2020 in order to achieve an accurate synoptic analysis of cases of thermal extremes and explain their causes in the upper and surface layers of the atmosphere.

Map (1) Administrative location of Iraq and Baghdad Governorate



Source:-Republic of Iraq, Ministry of Water Resources, Directorate of Public Survey, Map Production Department, Administrative Map of Iraq and Baghdad, scale 1,000,000:1, Baghdad, 2023.
-Arc Map 10.8 program outputs .

3- Synoptic analysis of the relationship between days of maximum temperature extremes and the variation of systems and pressure patterns at the levels of 1000, 850, 500 mbar at the Baghdad station

The maximum temperature is the highest temperature recorded during daylight hours, and its averages are often recorded according to the seasons. In the summer, it is recorded at three o'clock in the afternoon, and in the winter at one or two o'clock in the afternoon (Hassan and Matter, 2016), because it is the hour of the greatest solar brightness and the perpendicularity of the solar rays. The Earth's surface has acquired sufficient terrestrial thermal radiation, which affects the extremes of daily maximum temperature rates for all months of the year. A diverse group of high and low pressure systems leaves clear effects on the nature of their recordings in all regions of Iraq, including the study area (Baghdad**).**

indicates Table (1) the nature of the extremes in daily maximum temperatures for each month during the study year 2020, which number about (26) days. It is clear from the table the thermally extreme days during the study year, as there are no extremes in the average during the month of January to appear. A clear extreme during February on the twenty-second day of February by (24.5) °C, and the surface weather map (2) showed the level of 1000 millibars. The reason for this is the advance of the Sudanese depression from the western and southwestern side of Iraq. It is a thermal depression that moves north and south with the apparent movement of the sun, and is supplied with moisture from African lakes, so its effect is less severe in temperature compared to the dry Indian depression (Al-Dazii, 2013) and its arrival in all regions of Iraq, including the Baghdad station. The map of the level of 850 millibars proved its deepening into the upper layers of the atmosphere, accompanied in the map of the middle of the troposphere by 500 millibars, the dominance of the ridge pattern (convexity) over Iraq, with the presence of the rising arm pattern of the ridge that carries warm air. Which works to enhance and strengthen the upper ridge , and as a result of the thermal differences in the air advancing towards the east, it will lead to the deepening of the upper wave with the variation in the weather condition, which becomes more severe in the center of the depression with an abundance of precipitation. If the upper trough deepens, it will lead to the deepening of the surface depression, and since what is at the level of 500 millibar is a ridge , which means that the depression is not deep and its effect does not reach the middle of the troposphere, map (2). However, it caused a clear thermal extreme in the maximum temperature rates for the day in question.

There were two consecutive extreme days in maximum rates during the month of March, reaching a maximum on the eleventh day of the month, map (3), at a rate of (30) °C. The reason for this is attributed to the dominance of the Siberian high pressure, which appears with a shallow extension in the surface level map over all regions of Iraq except the parts The western part of it, which is dominated by the Sudanese low, and the map of the pressure level of 850 millibars showed the strength and depth of the Siberian high, and thus its clear effect on the maximum temperature values, especially since the strong inverse relationship between temperature and atmospheric pressure reinforces the situation. The presence of the ascending arm of the upper ridge at the level of 500 millibars over all regions of Iraq, which supports The occurrence of extremes in maximum temperature rates during that day. The variation in atmospheric circulation affects the anomalies and extremes in the Earth's surface temperature. (Lehner, et al., 2016) through its effect on the action of energy-transmitting waves represented by jet streams and Rossby waves, which causes an increase in extreme cases for all climate elements .

It is noted from the data in Table (1) for the month of April that four days were more extreme than the normal average, reaching the highest extreme during the twenty-second day of the month by (37.5) °C . Map (4) explains that this occurred as a result of the presence of a state of merging between the Sudanese Low and the Mediterranean Low over Iraq. In general, and the Baghdad station in particular, what confirmed the deepening of the depression over the study area was its appearance in the map of the level of 850 millibars.

However, the condition of the upper air on that day, April 22, in the folds of the map of 500 millibars, a clear ridge over the region, but the transverse waves appear clearly over northern and central Iraq. Accurate and clear, which makes the thermal extremes of the maximum continue for several days without a major change occurring in it, due to the weakness of the air exchange process between the

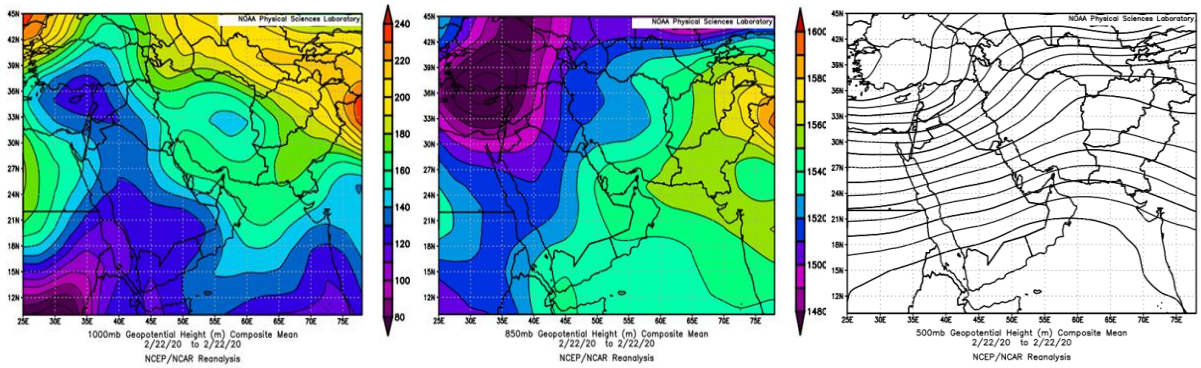
polar air and the tropical masses, which indicates the dominance of the transverse (straight) wave pattern due to the small exchange of energy between them.

Table (1) Maximum daily and monthly temperature extremes in Baghdad station during the year 2020

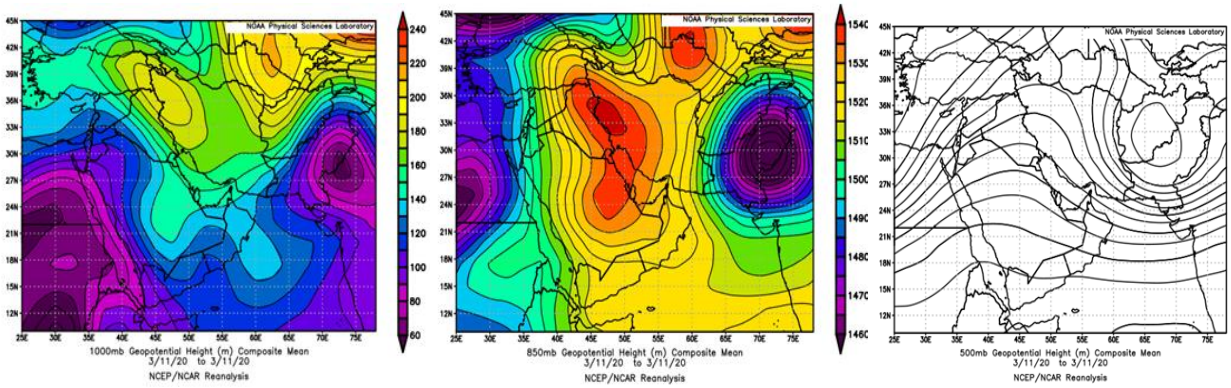
DEC.	NOV.	OCT.	SEP.	AUG.	JUL.	JUN.	MAY.	APR.	MAR.	FEB.	JAN.	Day
20.9	32.6	40.3	47	45.4	42.8	42.6	35.9	32	20.8	14.9	18.3	1
20.5	31.5	40.3	47.3	46.1	43.9	42.8	34	26	20.5	15.2	19	2
19.5	28.9	40.6	46	46	45.7	40.4	34	28.5	22.4	14.6	20.2	3
21.1	32.7	39.1	45	46	47.1	39.5	39.8	27.6	24	18.4	17	4
20	30	38.4	45	43	47.5	41.6	41.8	28.6	25.6	21	17.5	5
19.2	28.9	36.9	45.5	45	46.6	42.6	29.6	31.1	26.5	23.6	20.5	6
19.2	27	35.5	45.9	47.1	47	43.4	31.5	28.6	22.9	23.6	20.7	7
20.3	27.3	35	46.7	45.8	47.4	44	35.5	31.8	26.4	20.4	19.7	8
21.6	26.8	34.5	45.1	43.5	47.9	45.3	39.7	29.9	28.7	11.5	18.3	9
19.6	27.2	34.4	45.5	40.6	48.5	46	31.9	28.6	29.9	7.6	17.6	10
19.8	28.5	36.2	45.5	40.7	48	44.1	34.2	27	30	6.9	17	11
20.3	26.6	36.8	46.3	42.4	44.6	39.5	34.5	27.4	28.8	11.5	15.8	12
21.5	26.2	37.3	46.9	44	44.4	39	37.5	28.8	25.1	18.2	16.9	13
23	25.8	37.5	46	44.4	45.5	41.8	39.5	29.5	20.5	18.6	15.9	14
23	26.1	37.1	45.1	43.4	46	44.8	40.5	31.3	23.3	18.5	15.1	15
19.3	25.5	36.4	45.4	43.8	46.5	43.7	40.5	21.4	25	18.8	18	16
14.5	23.4	36	44.7	42.5	46	41.3	43	33.5	28.2	19.9	21	17
15	22.6	35.9	45.2	42.2	47.5	42.3	43.3	31.2	22	23.1	17	18
16.5	23	35.6	41	43	47.6	39.5	43.5	31.7	20.5	23.2	17.9	19
16.8	24	35.1	41.8	43.1	48	39.2	41	34.6	22.9	20.4	20.5	20
19.2	19.5	36.1	43.2	44	48.4	38.2	43.5	36.5	22	23.2	16.2	21
20	21	36.4	43.9	43.3	46.5	41	45	37.5	19.5	24.5	10.9	22
18.8	21	36.5	41.3	41	47.8	43.9	39.2	37.1	23.9	22.7	14.7	23
14.9	21	36	40	41.1	49.9	42.3	38.8	32.8	26	23.8	14.6	24
14.2	20.7	34.3	40.3	42	47.7	41	31	36.2	27.5	18.5	12.5	25
15.5	21.7	34.5	42.1	43	48.5	45.1	35.9	28.4	29	18.4	14.6	26
14.5	22.5	33.5	39.5	43.5	50.6	44.6	40.2	30.1	26.3	22.6	15.4	27
18	20	32.6	41.5	43.6	51.8	44.5	44.5	32.5	24.1	23	16.7	28
18.7	19.7	33.6	40.5	44.3	51	43.7	39	30.5	24.1	23.6	18.9	29
20.8	20.6	32.6	39.5	47.3	50.5	43.6	36.4	32.2	25.2		19	30
20.5		33		47	48		39.4		27.7		20.5	31
18.9	25.1	36.1	44.0	43.8	47.4	42.4	38.2	30.8	24.8	19.0	17.4	Avarg

Source: Republic of Iraq, General Authority for Meteorology and Seismic Monitoring, Climate Department, daily data, unpublished data, 2023.

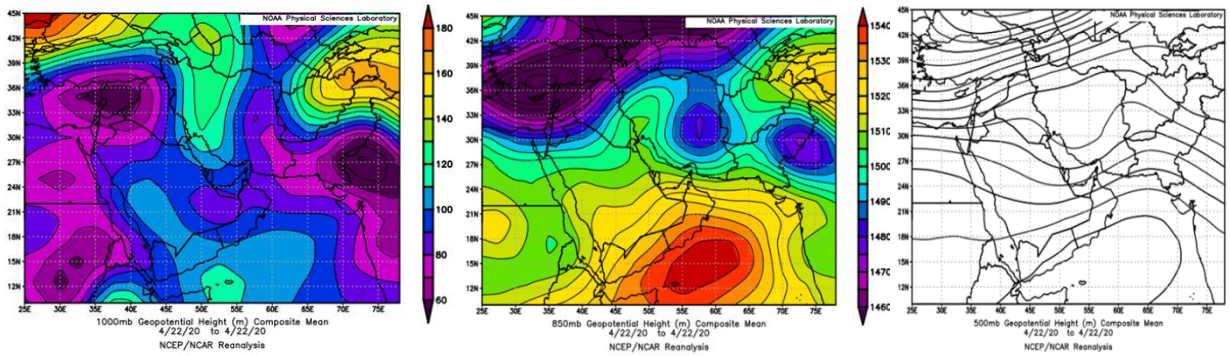
Map (2) pressure systems at the levels of 1000, 850 , 500 mbar that cause extremes in maximum temperatures during the month of February on 2/22



Map (3) pressure systems at the levels of 1000, 850 , 500 mbar causing extremes in maximum temperatures during the month of March on 3/11



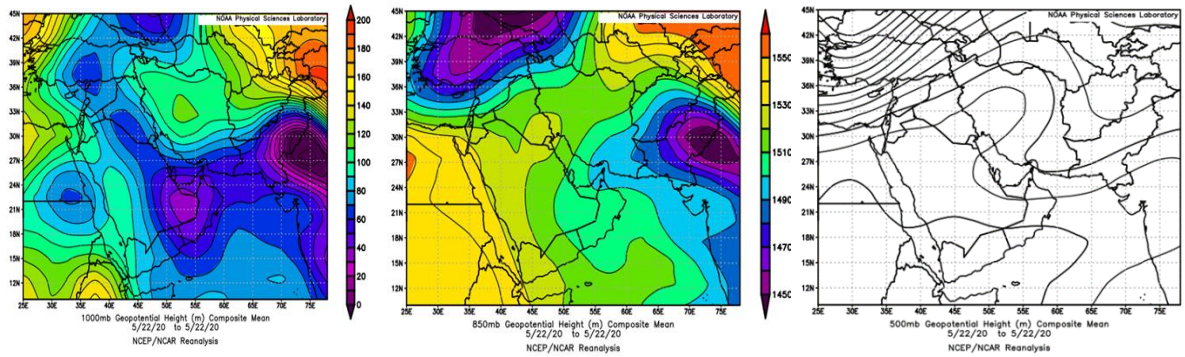
Map (4) pressure systems at the levels of 1000, 850 , 500 mbar that cause extremes in maximum temperatures during the month of April on 4/22



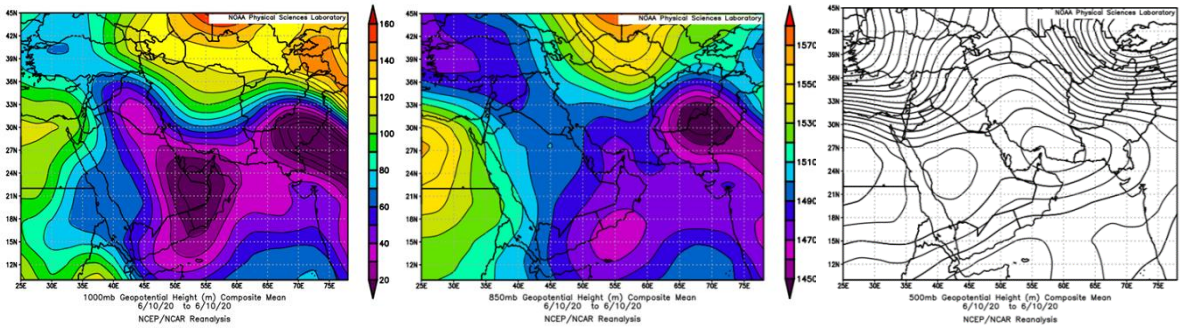
Source: National Oceanic and Atmospheric Administration(NOAA), Level 1000,850,500 mbar

The data in Table (1) showed the frequency of extremes in maximum temperatures during the month of May by five days. The lowest extreme rate was about (43.3) °C, while the maximum extreme rate was recorded on the twenty-second day of the month at about (45) °C as a result of a shallow advance of the Indian monsoon thermal low. Above the study area is map (5) and the dominance of the subtropical high at the level of 850 millibars, accompanied by the dominance of a tropical ridge at the level of 500 millibars, which confirms the strength of the tropical high and the extension of its influence to the upper layers of the atmosphere and the occurrence of thermal extremes (hot) in the maximum temperature for that day. The month of June witnessed the recurrence of thermal extremes on two consecutive days, with the highest rates reaching the tenth day of the month at approximately (46) °C, Contributions to its occurrence were the dominance and deepening of the strongest system that Iraq is exposed to in the summer, which is the Indian seasonal low, map (6), accompanied by the penetration of the upper ridge over Baghdad at the level of 500 mbars, which influences the extremes and increase in the maximum temperature of the aforementioned day and most days of the summer months in Iraq.

Map (5) pressure systems at the levels of 1000, 850 , 500 mbar causing extremes in maximum temperatures during the month of May on 5/22



Map (6) pressure systems at the levels of 1000, 850 , 500 mbar causing extremes in maximum temperatures during the month of June on 6/10



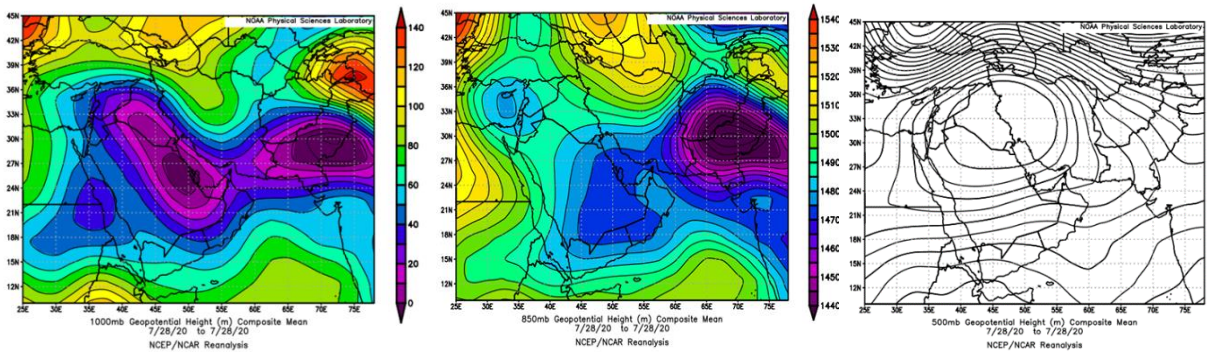
Source: National Oceanic and Atmospheric Administration(NOAA) , Level 1000,850,500 mbar

The month of July had a recurrence of four thermally extreme days, as shown in the table. The highest temperature extreme (hot) was reached on the twenty-eighth day of the month by (51.8) °C. The data of the weather map for the three levels, Map (7), demonstrated the reasons for this continuous and increasing extremes at maximum rates, which are: The dominance of a seasonal low on the surface above it at the level of 850 millibars is the complete control of the subtropical high (hot tropical air masses) over the study area. What increased the severity of the extremes in the extreme temperature of July 28 is the control of the closed pattern over Iraq in general, including Baghdad, which is a type of The air waves that appear in the middle of the troposphere at the level of 500 millibars, especially during the summer, create wide pressure extensions in the form of closed waves from the south, allowing tropical influences to push towards the north, enhancing their strength in the event of a rise in temperatures at the surface level, as the hot air penetrating to the north is isolated in the form Closed pressure cells because the thermal contrast in the summer is less intense than it is in the winter ((Al-Husseinawy, 2016). It is worth noting that these closed air waves are not linked to the state of the large thermal contrast between the polar region and the tropical region, as they serve as a driver for pulling influences Orbital direction towards higher latitudes (Al-Zanad, 2018).

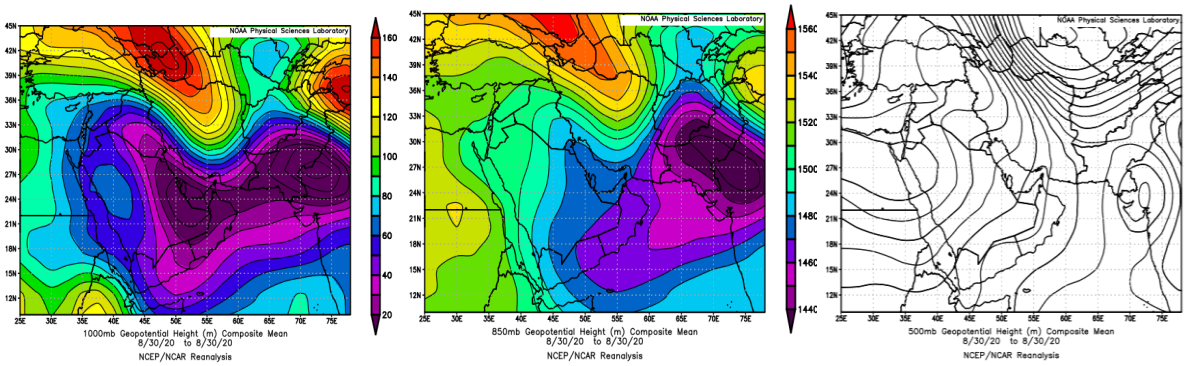
The daily data during the month of August shows the recurrence of three thermally extreme days, during which the highest rate reached about (47.3) °C on the thirtieth day of the month. The weather map (8) indicated the entry of the Indian seasonal low through the Arabian Gulf to include all regions of Iraq, including the Baghdad station, while The deepening of this low to the level of 850 millibars was limited to the southern part of Iraq and covers the northern and central regions (Baghdad), extensions of the subtropical high centered most days of the hot season in the middle of the atmosphere and is often accompanied by the seasonal low, but the influence of the latter dominates the surface while the high The tropical ridge at the upper pressure levels supports the intensity and strength of its influence on temperature characteristics and the creation of conditions of thermal extremes. The effectiveness of supplying it with hot tropical air is represented by the domination of the ridge pattern at the 500 millibars level over the region, thus creating conditions of thermal extremes for some days, as the tropical ridge works to draw hot, dry air from the south. It prevents the cold air coming from the north from penetrating

into the region, and therefore this process is the greatest support to the Indian surface seasonal low pressure in raising surface temperatures (Ismail, 2001) .

Map (7) pressure systems at the levels of 1000, 850, 500 mbar causing extremes in maximum temperatures during the month of July on 7/28



Map (8) pressure systems at the levels of 1000, 850, 500 mbar causing extremes in maximum temperatures during the month of August on 8/30



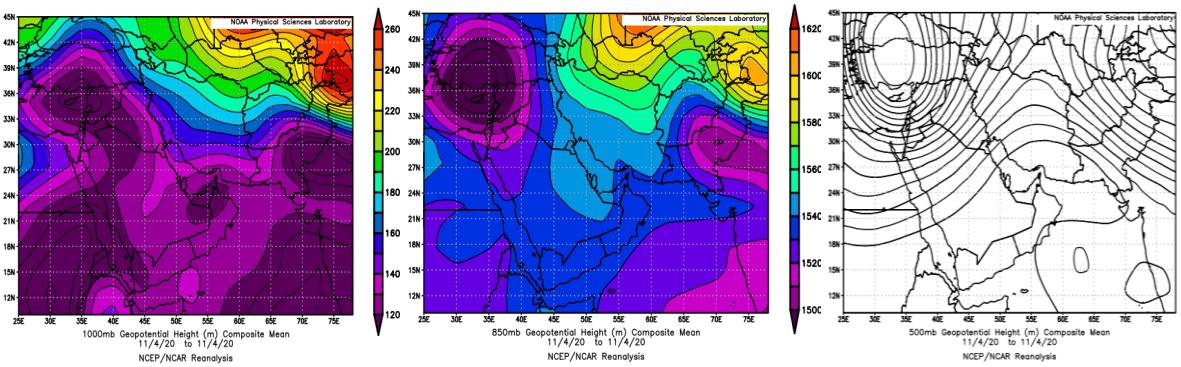
Source: National Oceanic and Atmospheric Administration(NOAA) , Level 1000,850,500 mbar

Global climate change, especially in the last millennium, has contributed to the occurrence of a state of rise and extremes in maximum temperature rates during the winter months over Iraq, as it is noted from the data in Table (1) for the month of November that three thermally extreme days (hot days) were repeated, with the highest rate of extremes reaching about (32.7) °C on the fourth day of the month. The reason for the extreme (Rising) in the maximum rates for this day, and as map (9) of the three pressure levels on November 4 indicated, is due to the integrate of the Sudanese depression with the Mediterranean depression, which is loaded with moisture and warmth at the surface level, accompanied by the Level 850 millibars, the depression deepened over the Mediterranean region with a concentration bloking Type, Cut Off Low in the eastern Mediterranean to the northwest of Iraq.

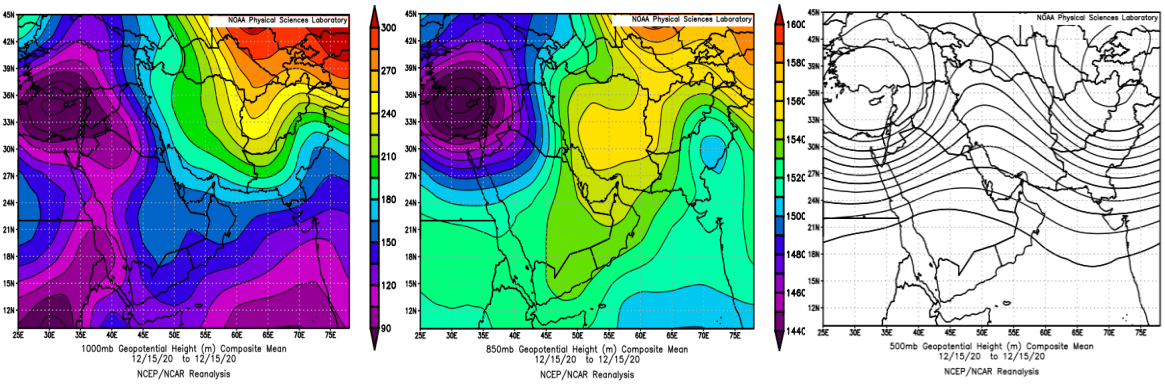
Cut Off Low are closed pressure systems with a center characterized by cold air and low pressure, separated from the general flow system of upper westerly winds, originating in the central part of the troposphere. As a result of the deepening and development of the air trough , this is what was proven by the weather map at the level of 500 millibars for the aforementioned day, as Iraq, including the Baghdad station, is located under the ascending arm of the trough , which is the zone of air dispersion and separation of its particles located directly below it on the surface, low (low pressure) with a relative rise in temperature rates (Ahrens , 2008), and the features of the Earth's surface may affect the preservation of the cut low , impede its movement, and prolong its duration (Al-Zanad, OP., 2018), which shows some cases of thermal extremes on some days. .

The table of maximum temperature extremes revealed the appearance of two daily thermal extremes during the month of December with the same extreme rate of (23) °C The synoptic map (10) for the fifteenth day of December indicated the explanation for the climatic condition causing the extremes, which is the dominance of a deep, merged surface depression extending Its impact over Iraq and parts of the Arabian Peninsula and the Red Sea region continues to deepen to the level of 850 millibars in the atmosphere of the Mediterranean.

Map (9) pressure systems at the levels of 1000, 850 , 500 mbar causing extremes in maximum temperatures during the month of November on 11/4



Map (10) pressure systems at the levels of 1000, 850 , 500 mbar that cause extremes in maximum temperatures during the month of December on 12/15



Source: National Oceanic and Atmospheric Administration (NOAA) , Level 1000,850,500 mbar

Region However, what covers Iraq and the study area is the ridge pattern at the most important and influential level of 500 millibars, which supports the supply of the surface depression with warm air as well as its qualities in convection. Large amounts of water vapor and the release of its latent heat create the opportunity for a relative extreme in maximum temperature rates for this day in December.

The results of the study (Alexander, et al., 2006) showed that there are large-scale changes in maximum temperatures associated with global climate warming, and more than 70% of the world's land area sampled is experiencing a significant decrease in the occurrence of cold nights annually and a significant increase in Warm nights occur annually. Some regions witnessed an increase in these indicators by more than doubling, and this means a positive shift in the distribution of daily temperature throughout the world .

4-Results and discussion

The results provide a new perspective on synoptic patterns in studying days of thermal extremes and explaining their continuation for successive days, as well as supporting them by studying the surface controls that affect their daily, monthly, and annual occurrence through the use of weather maps available from NOAA, the US Oceanic and Atmospheric Administration, which enables the researcher to find Sufficient causes of climate extremes include extreme daily maximum temperatures, which global climate studies have proven to be increasing in the last millennium in line with global climate change trends. The use of accurate data from the Iraqi General Authority for Meteorology also helped in sorting extreme days by referring to the law for extracting the extreme day that is increasing. Its average is about five degrees Celsius above the monthly average for all months of the year except for the summer months of June, July, and August, which are three degrees higher than the normal average, during which the highest rates of extremes appeared, which ranged between (45-51) °C at the Baghdad climate station during the 2020 study year. Which gave the researcher the opportunity to explore the synoptic situation

in the upper levels of the atmosphere and link it with today's extreme thermal rate, Accordingly the study demonstrated the role and importance of high-pressure and low-pressure systems at the surface level, as well as the role of pressure patterns at the 500 millibar level in terms of ridge and trough or closed patterns. It is used to formulate the climate on the Earth's surface in general and to monitor extreme climate conditions including thermal extremes in particular

5- Conclusions

1- The number of extreme days in maximum temperatures varied from month to month during the study year according to the presence and influence of the pressure systems that cause them to occur, which numbered approximately (26) days, and the number of extreme days for each month reached approximately (5) days per month. May and about (4) days in the months of April and July, and it reached about (3) days in the months of August and November, and it became about (2) days in the months of March, June, and December, while there was one extreme day in the month of February, and the days were non-existent. Extreme temperatures in the months of January, September, and October, due to the absence of records exceeding the normal average maximum temperature .

2- The month of July recorded the highest extreme average in maximum temperatures, about (51.8) °C on the twenty-eighth day of the month, at (51.8) °C , as a result of the dominance of the Indian seasonal thermal depression on the surface, with the complete control of the subtropical high (hot tropical air masses) at level 850 Millibars over the study area, as well as the provisions for the control of the closed pattern over Iraq in general, including Baghdad, which is a type of air wave that appears in the middle of the troposphere at the level of 500 millibars, especially during the extremely hot summer season.

3 - The lowest thermal extreme in maximum temperatures appeared in the month of December, amounting to (23) °C, on two consecutive days due to the dominance of the Mediterranean low over Iraq and Baghdad in particular, its deepening to the level of 850 millibars, and the appearance of the ridge pattern at the pressure level of 500 millibars, which supports the supply of the surface low, With warm air and thus a relative extreme in the maximum temperature rates for that day.

4- The presence of pressure systems and patterns in the three atmospheric levels under study has proven an important role in influencing the characteristics of Iraq's climate and its general and extreme climate phenomena, because of their major role in influencing the climatic elements recorded on the Earth's surface, in support of the scientific fact that states that what The weather conditions or weather changes present on the surface are a result of the existing pressure systems in the upper levels of the atmosphere. Accordingly, the climate of Iraq is affected by a group of different pressure systems whose influence varies from season to season and from month to month.

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Conflict of Interest
No potential conflict of interest relevant to this article was reported

References

Ahrens. C. Donald , Meteorology Today , an Introduction to Weather, Climate, And the Environment, ninth Edition , Printed in the United States of America , 2008 , P319.

Al-Dazii. Salar Ali Khader, Practical Analysis of the Climate of Iraq, Al-Farahidi Publishing and Distribution House, first edition, Baghdad, 2013, p. 37.

Alexander. L. V. , X. Zhang, T. C. Peterson, J. Caesar, B. Gleason, et al , Global observed changes in daily climate extremes of temperature and precipitation ,Journal of Geophysical Research Atmospheres ,Vol 111 , Issue D5 ,2006 , 1 .

Al-Husseinawy. Aziz Kuti, closed air waves to which Iraq is exposed in the dry season, Al-Ustad Journal , Volume 2, No. 2109, 2016, 38-39.

Al-Nasrawi. Raghad Saad Abdel-Kadhim, periodic changes in extreme and anomalous climate characteristics in Iraq, doctoral thesis, University of Kufa, College of Education for Girls, 2023, 94

Al-Zanad. Shaima Sami Abdel Hafez, The impact of climate change on the recurrence of depressions and elevations over Iraq, Master's thesis, College of Arts, University of Basra, 2018, p. 27.

Deniz. Zahide Acar, Barbaros Gonençgil , Trends of summer daily maximum temperature extremes in Turkey , Physical Geography, Vol 36, Issue 4 , 2015 , 268.

Efthymiadis. D. , C. M. Goodess, P. D. Jones, Trends in Mediterranean gridded temperature extremes and large-scale circulation influences , Natural Hazards and Earth System Sciences , European Geosciences Union , Vol 11, Issue 8 , 2011 .

Farih. Mujeeb Razouki, Extremism in Temperatures for Selected Stations in Iraq, Master's Thesis, College of Education, Al-Mustansiriya University, 2013, p. 38.

Hassan. Ahmed Sami, Sarah Ali Matar, Variation of maximum and minimum daily temperatures in the summer in the city of Baghdad, Al-Mustansiriya Science Journal, Volume 27, Issue 1, 2016, p. 41

Ismail. Inaam Salman, The effect of the pressure extension of the Indian monsoon low on some elements of Iraq's summer climate (temperature - humidity - wind), Master's thesis, College of Arts, University of Baghdad, 2001, p. 150.

Kadhim. Ahlam Abdul-Jabbar, negative and positive deviations of temperature and rain from their general averages in the stations of Mosul, Baghdad and Basra, Basra Journal of Arts, No. 67, 2013.

Lavaysse. Christophe , Carmelo Cammalleri, Alessandro Dosio, Gerard van der Schrier, Andrea Toreti, Jürgen Vogt, Towards a monitoring system of temperature extremes in Europe , Natural Hazards and Earth System Sciences , European Geosciences Union , Vol 18, Issue 1 , 2018 , 91.

Lehner. Flavio, Clara Deser, Laurent Terray, Detection and Attribution of Extreme Temperature Using an Analogue- based Dynamical Adjustment Technique , Noaa Climate Diagnostics and Prediction Workshop Special Issue 40 th , 2016 , p32 .

Sulikowska. Agnieszka Sulikowska , Agnieszka Wypych, Summer temperature extremes in Europe: how does the definition affect the results , Theoretical and Applied Climatology, Springer , 2020, 20.

National Oceanic and Atmospheric Administration NOAA. at the link. https://psl.noaa.gov/cgi-bin/data/composites/printpage.p1