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Website: jceps.utq.edu.iq Email: jceps@eps.utq.edu.iq

Global Climate Models (GCM) has been developed to perform climate projection to simulate and understand climate change in response to emission of greenhouse. The aim of this study is to use simple numerical climate models to investigate effect of various parameters, functions, and components of climate system on the temperature rise. Two climate changes scenarios used to estimate and explore the future rise surface air temperature over Iraq until 2050. The result of the surface air temperature of scenario A for July has been 31.6 C in the first decade (1961 - 1970), while the last decade of study has been more than 37 ºC, while scenario C less than scenario A 3.8 ºC for most cases. January's surface air temperature for last decade has been 10.0 ºC, while observation data is more than model by two times. Anomaly surface air temperature focused on the behavior of variable more than value of it, so that this study carried out the fluctuations of two scenarios have been close together for first five decades, while the difference appears in the last three decades for example for Baghdad city in winter the difference between two scenarios began form 2030 about 2 ºC. Summer surface air temperature for Baghdad city has been higher value than surrounding regions for both scenarios A and C to reach 2-3 ºC.

Keywards: Surface air temperature, General Circulation,model

Assessment of Monthly Surface Air Temperature in Iraq Using General Circulation Model.

Ahmed S. Hassan, Jasim Hameed Kadhum, Ali H. Hashem.
Department of Atmospheric Sciences, College of Sciences,
Al- Mustansiriyah University.

الخلاصة

تعد نماذج المناخ العلمي (GCM) التي تطورت لغرض محاكاة المناخ وزيادة في فهم التغيرات المناخية لمعرفة التغيرات التي تطرأ على الغازات المسببة للانبعاث الحراري. ان الهدف من هذه الدراسة هو استخدام نماذج مناخ بسيطة من تشخيص تاثير الذي يحدثه من تباين على العوامل والدوال التي يتكون منها النظام المناخي والتحديد على ارتفاع درجة الحرارة. استخدم نوعين من سيناريوهات التغيرات المناخية لتقييم الزيادة المتوقعة في درجة للعراق لغاية ٢٠٥٠. كانت نتائج درجة حرارة سطح الهواء للنموذج A لشهر تموز هو 31.6 °C للعقد الاول (١٩٦١-١٩٧٠) بينما كانت في العقد الاخير 37 °C ، اما بالنسبة للنموذج C الذي هو اقل من النموذج A بمقدار 3.8 °C لمعظم الحالات . وكانت درجة حرارة كانون الثاني 10 °C للعقد الاخير من الدراسة ، بينما تكون درجة الحرارة الحقيقية اكثر من النموذج بضعفين. ان شذوذ درجة الحرارة يركز على سلوك المتغيرات اكثر من القيمة العددية ، لذلك هذه الدراسة انتجت ان التذبذبات لدرجة الحرارة متقاربة لكلا السيناريوهيين في العقود الخمسة الاولى، ولكن تظهر هذه الاختلافات في العقود الثلاثة الاخيرة وعلى سبيل المثال ظهر اختلاف درجة الحرارة لمدينة بغداد شتاءاً بعد عام ٢٠٣٠ بمقار درجتين مئوييتين. كانت درجة الحرارة لفصل الصيف لمدينة بغداد اعلى من المناطق المجاورة ولكلا السيناريوهات (A, C) ليصل من (2-3 °C).

الكامات المفتاحية: درجة حرارة الهواء. الدورة العامة للرياح .الانموذج

Introduction

The sun forces the earth's climate, radiant power into at most short wavelengths, mostly in visible or semi-visible (and ultraviolet) portion of the spectrum. Nearly a third of the solar energy that reaches the Earth's highest atmosphere is directly reflected into space. The residual two thirds are absorbed from the surface and, to a less extent, from the atmosphere [1].To equilibrium, the receiving energy that absorbs the earth, the earth must, on average, radiate the same amount of energy into space but the earth is a lot cooler than the sun, it radiates at vary lengthy wave, firstly in the infrared portion of the spectrum. Much of that thermal radiation emitted from the earth and the oceans is absorbed by the atmosphere, including clouds, and reradiated Return to earth. This is the so-called the effect of

global warming [2]. The glass walls in the greenhouse reduce airflow and increase the air temperature inside. Similarly, but out of a several physical process, the greenhouse effect of the earth protects the surface of the planet. Without natural greenhouse effect, the rate temperature on the earth's surface would be lesser than the freezing degree of the water [3]. The global temperature is a standard scale for brief the condition of worldwide atmosphere. Atmosphere impacts are felt locally, yet the worldwide dissemination of atmosphere resound to numerous worldwide atmosphere constraining's is sensibly consistent in atmosphere models, proposing that the worldwide metric is shockingly valuable. Those estimations in the Western Pacific and Indian Oceans give a decent sign of worldwide temperature change [4]. The refresh examination of surface temperature change in view of instrumental information and contrast watched temperature change and expectations of worldwide environmental change made in the 1980s. At that point look at ebb and flow temperature inconsistencies in the tropical Pacific Ocean and examine their conceivable criticalness. At long last, look at paleoclimate and late information, utilizing the earth's history to evaluate the extent of an unnatural weather change that is probably going to constitute hazardous human-rolled out atmosphere improvement [5].

Educational General Circulation Model and Easy General Circulation Model

Climate models are trying to simulate the behavior of climate, in an attempt to understand the key physical, chemical and biological processes which govern on climate. Climate models therefore provide a better understanding of the climate system, providing a clear picture of past climates compared to records of mechanical and climate observations, and enable comparison and comparison of future climate change [6]. Models can be used to simulate climate on a variety of geographical scales and over different periods of time. The basic laws and other relationships necessary to model the climate are expressed as a series of mathematical equations. The climate however, is a very complex system, and supercomputers are needed for the task [7]. Global climate models have been widely used to ignite global warming in the 21st century because of the atmospheric pollution of human greenhouse gases. assessment of future increases in greenhouse gases are included in the model, which then calculates how the global climate can evolve or respond in the future to the impact of enhanced reserves. Although climate models can help to understand processes that govern climate, you should always question the trust placed in such models [8]. More importantly, it should be remembered that all climate models represent a simplification of the climate system, a system may ultimately prove that a complex model also accurate. Therefore, you must use climate models carefully with the interpretation of the results with caution. Results from climate models should

always be validated or tested against real-world data, including both instrumental and palaeoclimatic records where available [9]. Global climate models, driven by computers (GCMs) are one of the main tools used today in climate research. Few undergraduate educators have access to GCMs, which have generally required supercomputing facilities and skilled programmers to operate. In addition, the lack of familiarity with climate modeling techniques often engenders public distrust of important scientific findings based on methodology. As a result, graduate-level programs end up teaching fundamental techniques that could have been taught much Sooner and younger students miss out on excellent opportunities to participate in real-world research projects [10]. EdGCM change all this by providing cloud search class with GCM an easy to use interface that can be run on your computer. For the first time, students can explore the subject of climate change in the same way that doeth actual research scientist. In the process of using EdGCM whose aim is to get better the quality of teaching and knowledge from climate change science by expanding access to global climate models and providing appropriate technology and materials to help teachers use these models effectively [11]. With study-quality resources in place, bind classrooms to actual research projects is not only possible, but can as all be useful to the education and research communities a like. The EDGE project has sometimes been supported by the Bali Climate Program of the National Science Foundation and the NASA Department of Earth Sciences as well as the NASA Global Climate Change Program and NASA's Climate Education Innovation Program [12]. Goal from is to improve the quality of students of climate change science and learning by expanding access to global climate models, by providing appropriate support, technology and materials to use these models effectively. With the availability of research quality resources, linking classrooms with actual research projects becomes possible, to the benefit of students. In order to achieve this goal EZgcm was created, a software suite that allows students to run a 4-D climate model on desktop computers. The GCM at the core of EZgcm was developed at NASA and is currently used by researchers to study climates of the past, present and future. EZgcm itself has a user-friendly interface that simplifies the management of climate simulations. Experiments are automatically archived in a searchable database, and easy-to use utilities for mapping, plotting, and data analysis are fully integrated, through ease of use and data provision, students will be involved in scientific and technological processes used by scientists to verification climate change. So students become aware of a subject that will certainly affect their lives, and the next generation of scientists who are wrestling with innumerable complex climate issues will be better prepared [13].

Results and Discussion

The Data run by EZgcm model has been calculated and estimated monthly (January and July), where this model had shown good ability to estimate for surface air temperature for two scenarios (A, and C). so that shown significant case for January and July. The surface air temperature for January is represented winter season. Where is lower temperature than other months of year even lower than December and February. This fact is clearly shown in the figure (1) and figure (2), which Baghdad city was lower temperature than surrounding regions. The lowest surface air temperature was 5.6°C in first decade (1961- 1970) for scenario C. The scenario C was less than scenario A for all cases. Higher surface air temperature was 10.0° C in scenario A in the last decade in this study. The comparison between estimate surface air temperature and observation temperature data for (IMSO) for first decade carried out the observation temperature is more than run Ezgcm by proximity two times. The different temperature between January and July was about 26°C, the same this difference was found in observation temperature data (IMSO).

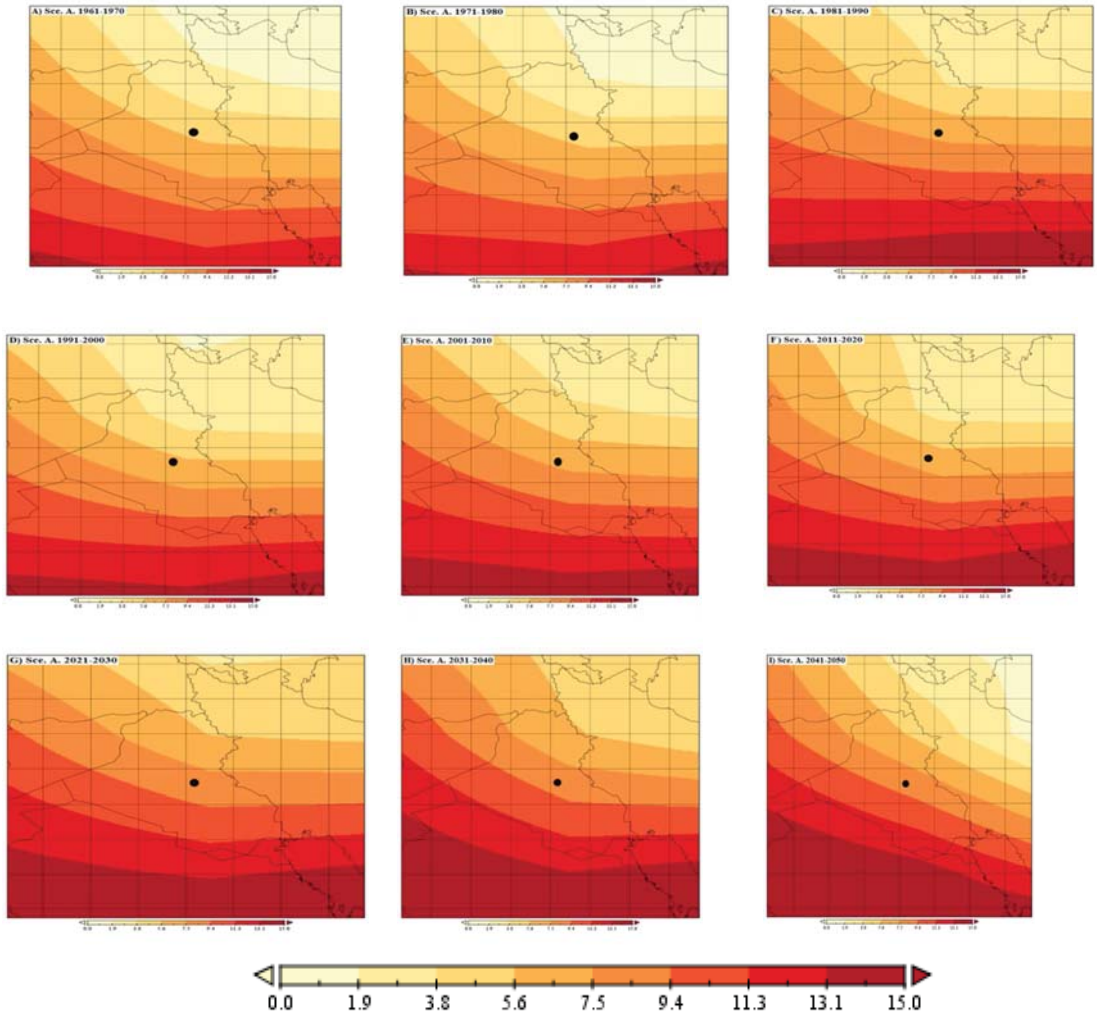

Figure (1): January Surface Air Temperature, Scenario **A** Shaded Interval 1.9°C for Iraq.

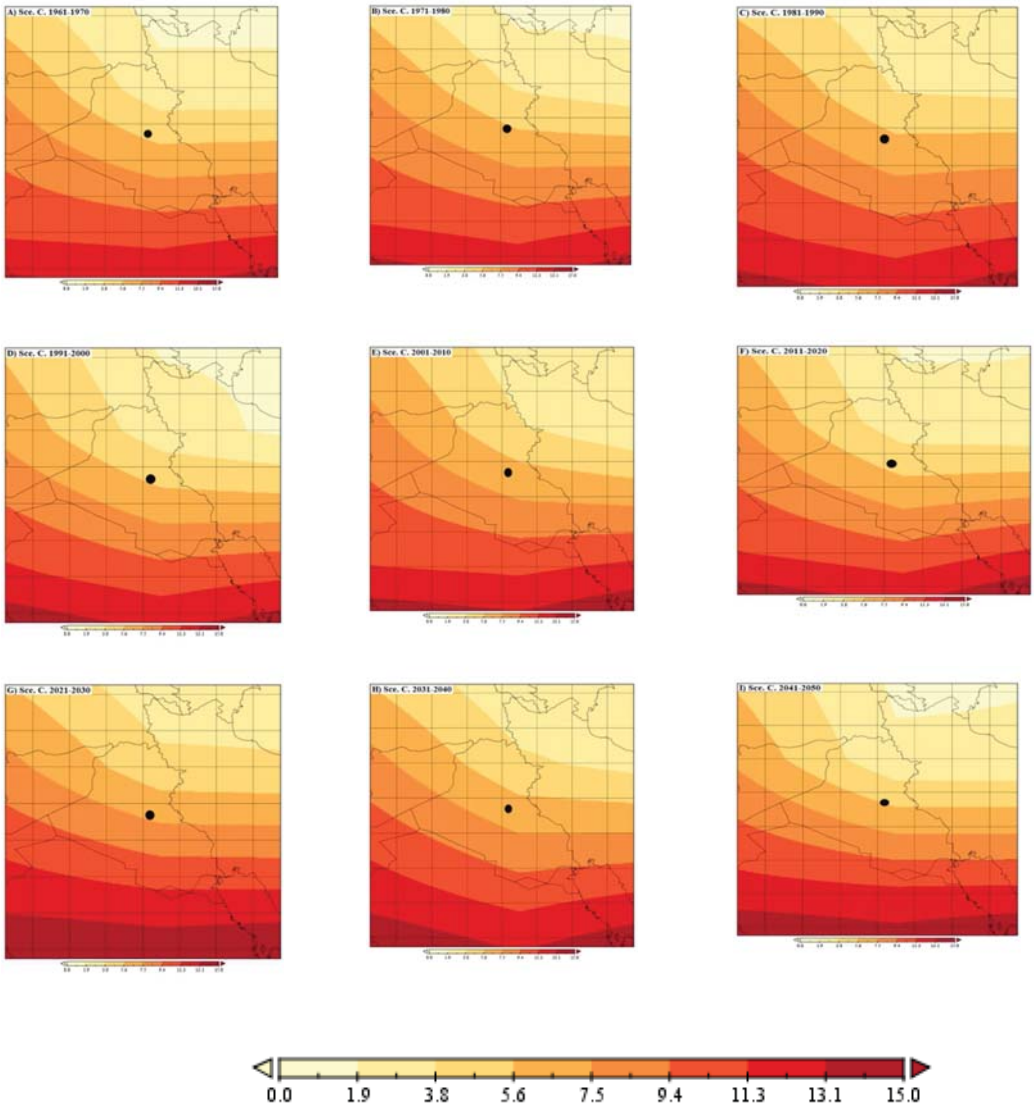

Figure (2): January Surface Air Temperature, Scenario **C** Shaded Interval 1.9°C for Iraq.

The surface air temperature anomaly of the Baghdad city for January and scenario A, and C were compared. At the early of the study period there was an anomaly less than anomaly and the difference was about 0.6 °C as shown in figure (3) shows. The change in temperature anomalies is a wave-like shape with a frequency of the wave every 20 years and there is an increase above the average for both the scenarios but an increase in the Scenario A and a turning point occurs where the temperature anomaly of scenario A becomes larger than scenario C and keep on increase and then intersects in 2030, scenario A will continue to increase until the difference is 2 °C at the end of the

study period. Temperature anomalies for the same month, but for the point in north of Baghdad where the first time period of anomalies and both scenarios are almost similar to the Baghdad as well as the change over time in the form of a wave and the congruence greater than Baghdad and the point of the coup was in 2020 and then continue scenario A an increase and the largest possible in a year 2035 and the difference between the scenario A.C at the end of the study period and this is greater than 2.5 °C of the city of Baghdad, that was clear in figure (4). From 1990 to 2030, the abnormality of Baghdad city and both scenarios is less than the temperature anomaly of this point, where it is heated even though it is located north of Baghdad, but this diagram represents an anomaly of temperature than the average and not the temperature and from 2030-2050 the temperature anomaly is less from the city of Baghdad, The temperature anomaly of the study period for the city of Baghdad is greater than the temperature anomaly of the point north of Baghdad, where this change applies to the temperature anomaly in fact that the north of Iraq is characterized by temperatures less than the city of Baghdad

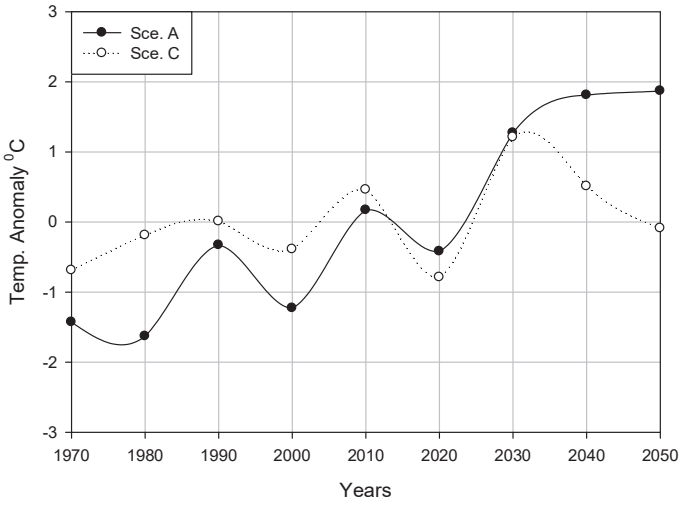

Figure (3): Time series of Surface Air Temperature Anomaly for Scenarios **A** (solid), and Scenarios **C** (dash) for Baghdad City for January.

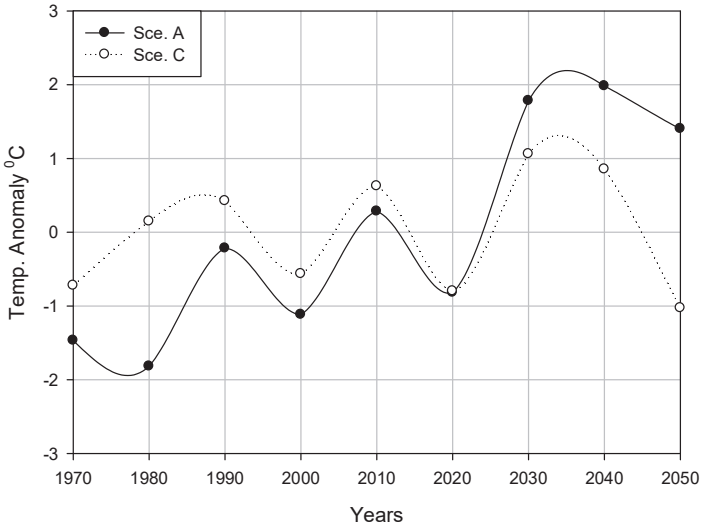

Figure (4): Time series of Surface Air Temperature Anomaly for Scenarios **A** (solid), and Scenarios **C** (dash) for case Lat. 36 – Long. 45January.

When January's case preformed as the coldest month of the of winter, while July is the hottest month of the year in Iraq see the figure (5) where contour lines are not paralleled to the latitudes and are in a triangle shape, located Baghdad is within the axis of adjacent areas and the difference between the line and 21 °C is different from January and the temperature of Baghdad at the end of the first decade of the study was 31.6 °C and the temperature from 1961 to 2000, ranging from 31 °C to 32 ° C and after a year 2000 temperature begins to increase dramatically as the temperature begins to exceed 37 °C south of Iraq and the start of this contour line to rise to the city of Baghdad despite the emergence of an early temperature above 35 but the number of periods remained constant in the last decade of the study the temperature of Baghdad to more than 35 °C because of high temperatures over time that the temperature of Baghdad and most of the cities of Iraq are larger than just 35 some areas in the northern region are less than 35 °C. The same month's case Scenario C in figure (6) is the temperature of the first decade of study 32°C and the temperature continues to increase but less than the increase in scenario A where we notice a decrease in temperature by a little from 1971 to 1990 and after this period the temperature increases to be the largest possible in 2020 and after that the temperature will gradually decrease and be slight to 35°C. In 2050 the end of the study period where the difference is the temperature of 1961-2050 and the scenario of the largest difference and the period of the scenario A 3.8 °C a scenario C, 0.8 °C for scenario C.

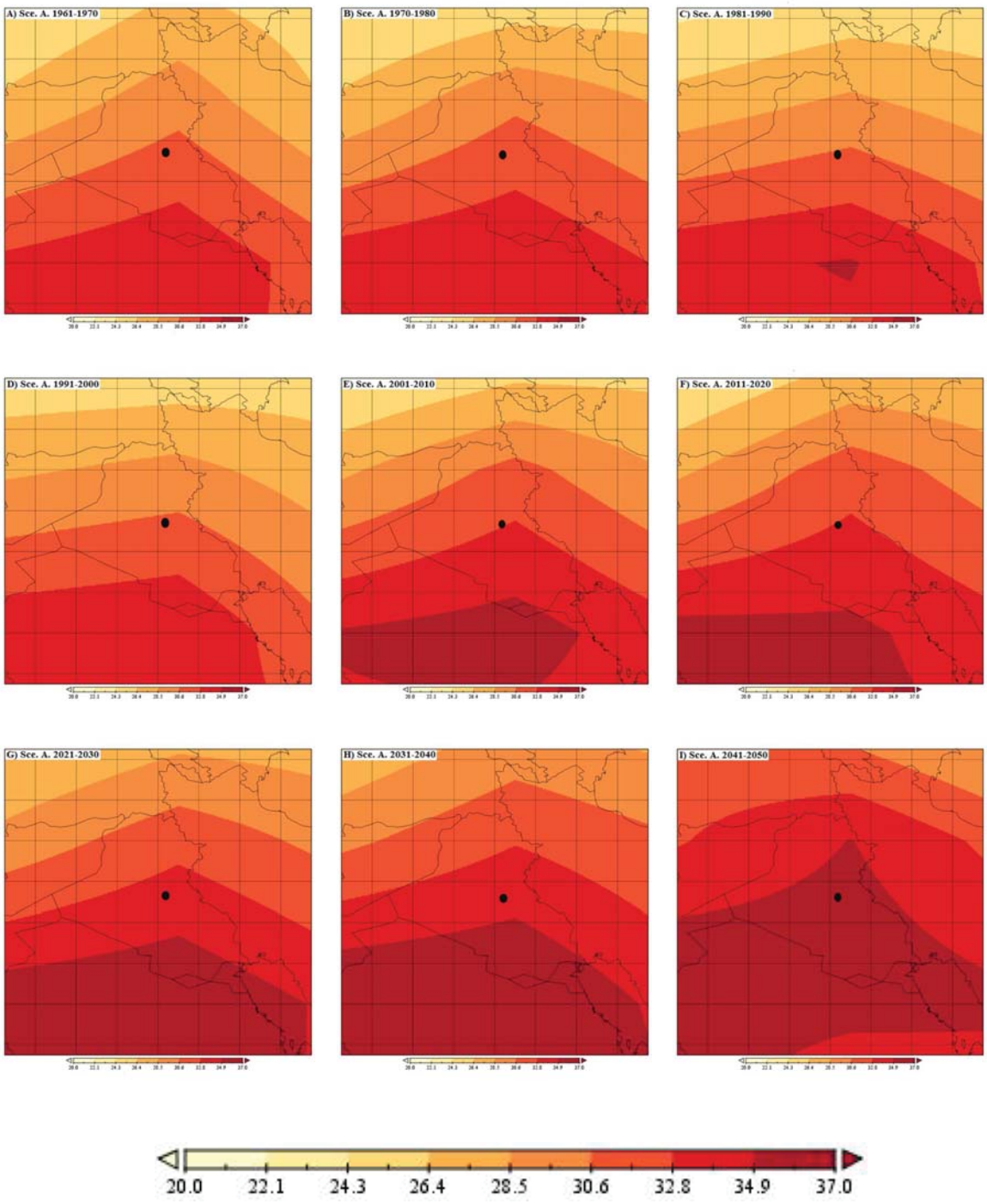

Figure (5): July Surface Air Temperature, Scenario **A** Shaded Interval 2.1 °C for Iraq.

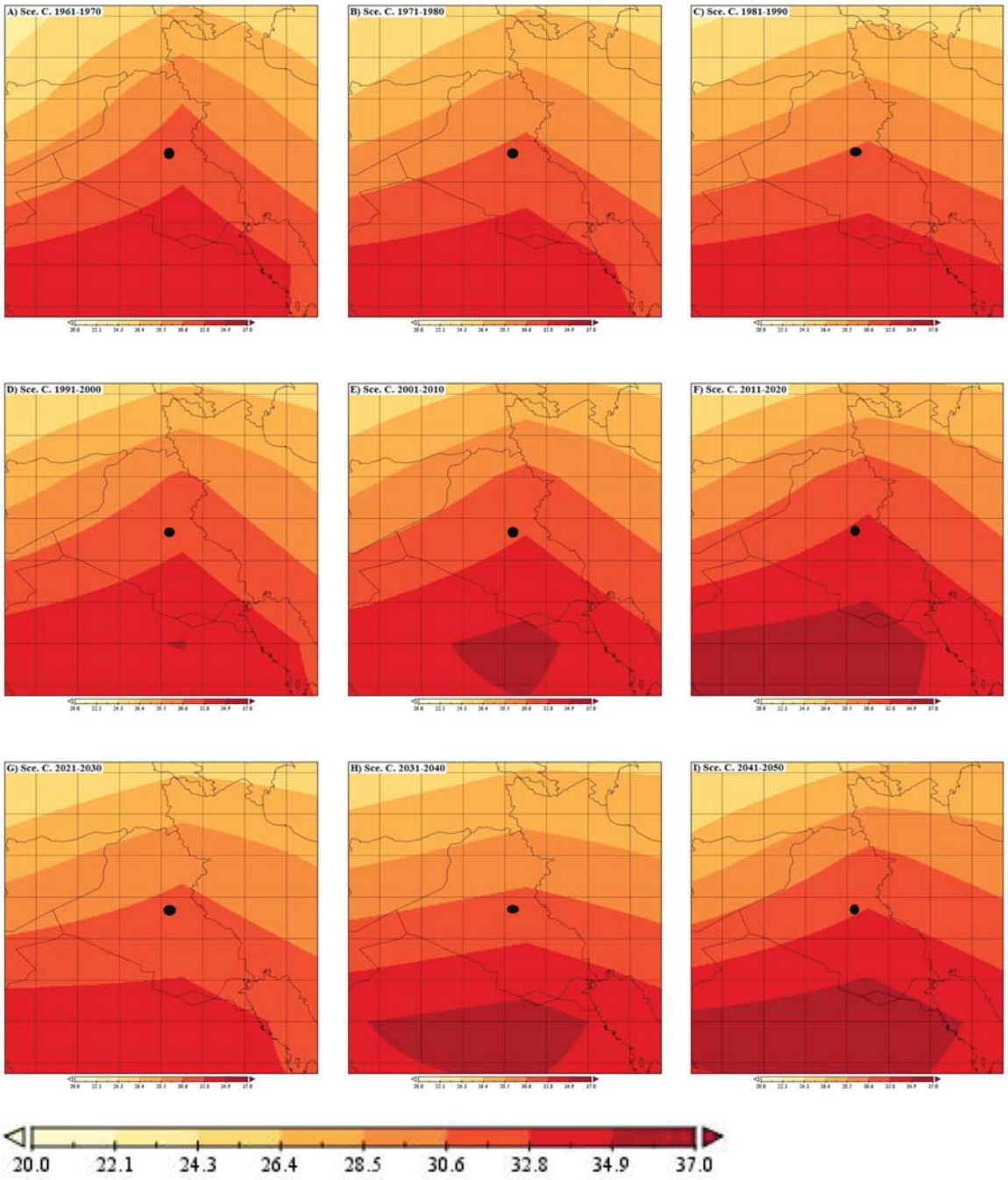

Figure (6): July Surface Air Temperature, Scenario **C** Shaded Interval 2.1◦C for Iraq.

Baghdad city July temperature anomaly was not a wave, but rather a descent and then increase as in January, the value of scenario C at the beginning of the contract is usually larger than scenario A and value 1°C and it is lower than the average in (1970-2000). (A and C) above the average until the scenario C reaches the highest possible level in 2020 (1.2 °C) and then begins to descend until it

reaches its lowest value in the year 2000. In 2035 and then continuing to rise from the year 2000 to 2050, the path of the scenario is as a single wave, and a scenario A after 2000 years is a continuous increase in the rate even intersects with the C scenario in the year 2025 and continue to rise to the end of the study period, as shown in figure (7) where the value of temperature anomaly higher than the C in 2050 and about difference (2 °C). The case of northern Baghdad city for July had some diagram with little higher temperature anomaly in the middle of time period study scenario A was height in north than scenario A for Baghdad city by one degree C This can be observed in figure (8) where the difference between the scenario (A and C) is a greater than the one in Baghdad city, for the first decade of the study in the first half is the behaviour of a scenario as a wave, but this wave with the years are rising until 2020 to continue to rise to the end of the study period, There were two points close to the A and C scenarios and the intersection point was the first point of convergence in 1980 and the point of convergence of the second 2010 and the intersection point in 2025, was temperature anomaly for scenario C greater than scenario A and later A is the largest at the onset of the scheme in 1970 was scenario C greater than A (1.5 °C) but at the end of the 2050 study period a scenario was greater than scenario C (3°C).

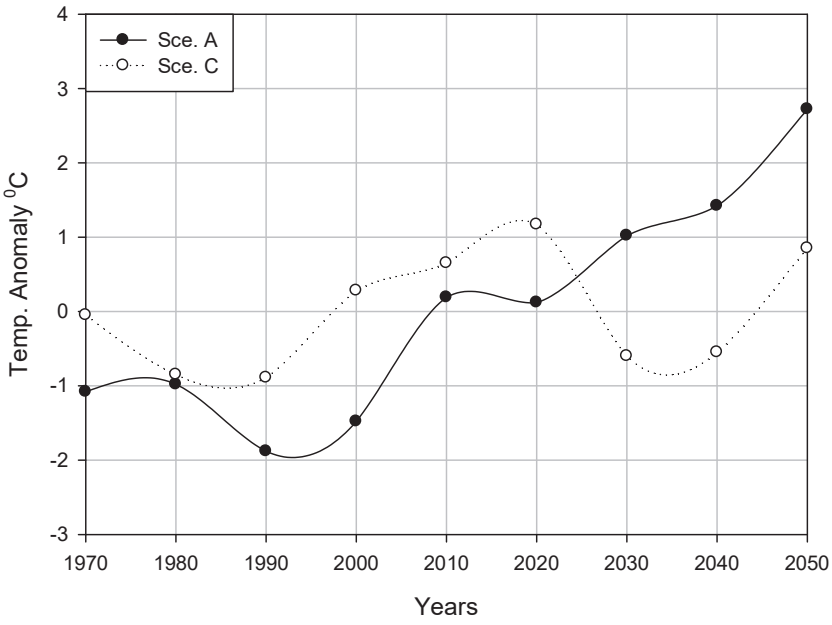

Figure (7): Time series of Surface Air Temperature Anomaly for Scenarios **A** (solid), and Scenarios **C** (dash) for Baghdad City for July

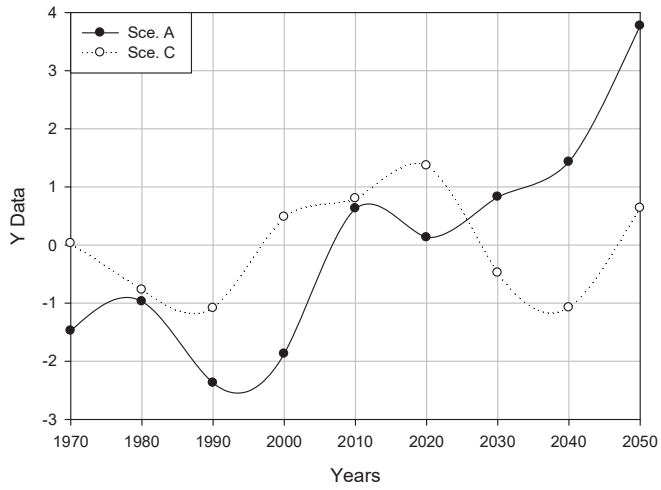

Figure (8): Time series of Surface Air Temperature Anomaly for Scenarios A (solid), and Scenarios C (dash) for case Lat. 36 – Lon. 45 for July.

Temperature anomalies for the rest of the month of Baghdad for a city, that shown abnormalities for February for scenario A were two points of convergence and a point of inversion with Scenario C, and in March there was a great convergence between the temperature anomalies for scenario A and C until the last decade of the study spacing occurs the opposite of what was spacing in the first period of the study and the second period of convergence and after the point of the coup in the third period is a period of spacing, the month of April recorded the highest temperature anomalies of the rest of the months where the temperature anomaly of a scenario A ranged from (-3.13 to 6.87), which means that the temperature anomalies ranged from 10 degrees where it proved that the biggest change occurs in April, The temperature anomaly of scenario C is no different from scenario A, where there is a wide range around the average and there is one point of a reversal, The May temperature abnormality of scenario A is like a wave and there are periods of great convergence between scenario A and the last period of study in which the difference between scenarios increases to A (1.5°C), most months have a temperature abnormality for a scenario higher than the temperature abnormality to be considered at the end of the study period, but there are some cases where scenario C becomes higher than scenario A. This is evident in figure (9) of June .There are two points of the first coup in which a scenario A becomes bigger than the scenario C of 2015 and the second coup, which first appeared in 2045, where scenario C becomes bigger than scenario A, for the rest of the month, their behaviour is closed to the rest for two months (August and November) where the temperature abnormality of scenario C is greater than the temperature abnormalities of scenario A at the first and end of the study period.

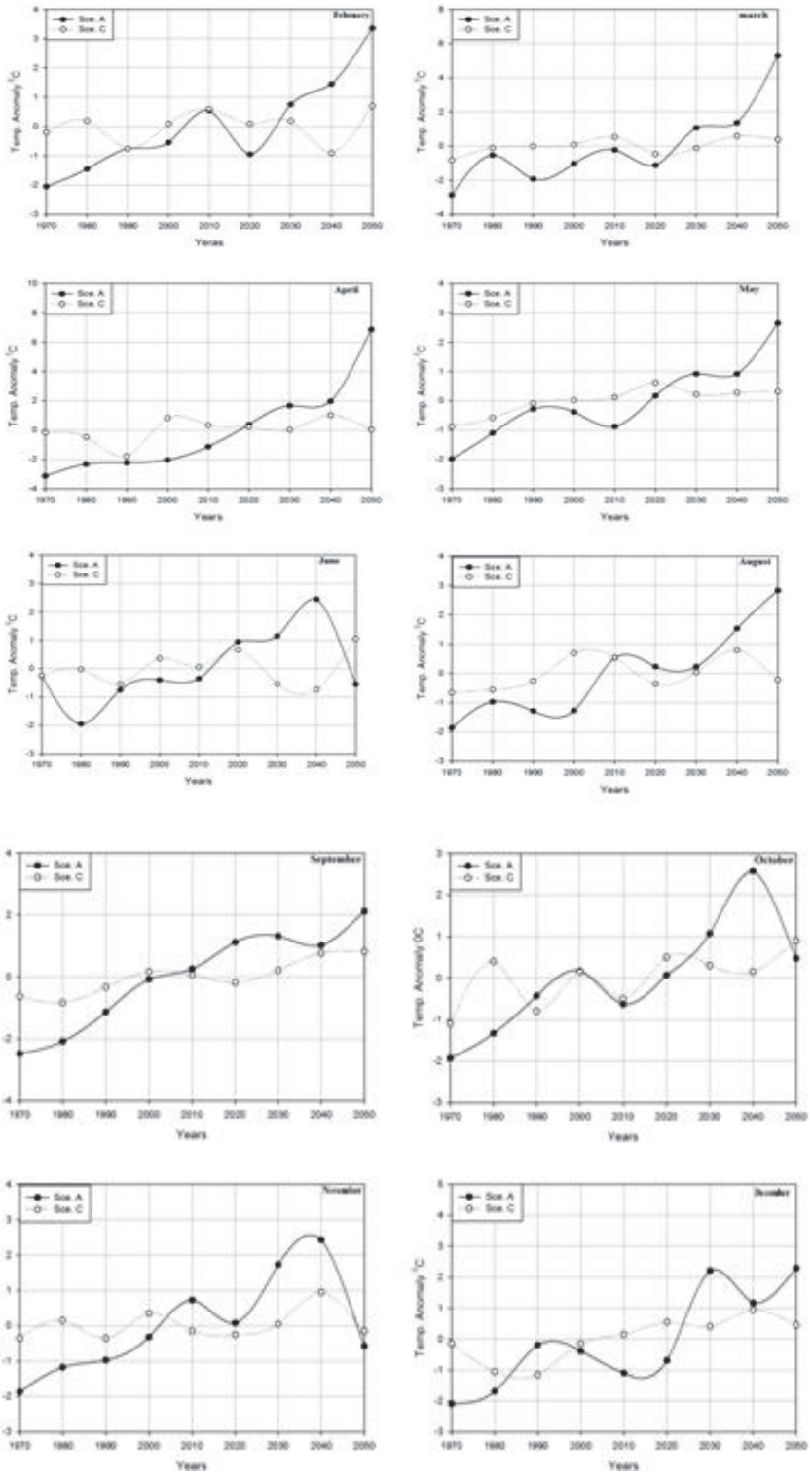
Sce. A
Sce. C
Temp. Anomaly °C
Years

Figure (9): Time series for monthly air surface temperature anomaly for Scenarios **A** (solid), and Scenarios **C** (dash).

Conclusions

1. Surface air temperature increased about 1.5 ºC for each decadal scale and for both two scenarios A and B.
2. The comparison between estimate surface air temperature and observation temperature data for (IMSO) for first decade carried out the observation temperature is more than run Ezgcm by proximity two times. The different temperature between January and July was about 26°C, the same this difference was found in observation temperature data (IMSO).
3. Model scenario A has been difference between the values of the temperature anomaly of the start and end of the period is a very large difference is a greater than 3 ºC, in contrast to model C, which is ranging about the average value.
4. The highest temperature anomaly was for April (6.87°C) followed by the month of March and the temperature anomalies (5.29°C) above the average for scenario A, as for scenario C, the highest temperature anomaly were in June (1.02°C) in the last decade of the study 2050, The highest temperature anomaly for seasonal cases were in the spring season (3.29°C) for scenario A, while the temperature anomalies for scenario C were in the Autumn season and the value of (1.22°C),
5. Surface air temperature of Baghdad city from Scenario C is always greater than scenario A in the first decade 1970.
6. The pattern of temperature anomalies for scenario (A and C) for Baghdad city and the selected point north of Baghdad is three stages first, starter below the average and the temperature anomaly of scenario C is higher than the temperature anomalies for the second stage, which is the convergence of the scenarios between them and what is in the middle of the study periods, the last stage that starts with the point of the coup, after which the temperature abnormalities become a scenario of the largest temperature occurrence scenario C and are at the end of the study period.
7. The temperature Anomaly the northern point in Iraq for Scenario (A and C) are more contrast lines than the temperature anomaly of Baghdad City.

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