Climate Significance of Land Cover Change in Iraq

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Abstract:

This study deals with the magnitude of influence of various geographical factors and meteorological variables on land cover among six meteorological stations Rabiah, Anna, Kirkuk, Mosul, Baghdad and Najaf.

The statistical analysis focuses on the means of annuals during 1961-1995 The geographical factors include distance from the Najaf station and the effect towards studied stations. The meteorological variables considered include wind speed, mean temperature and relative humidity. Regression analyses were performed with distance and surface temperatures. Results revealed that surface temperature affected land cover across all study. Temperatures in land cover (vegetated areas) were lower than those in other area in seasons. Relative humidity has significant on all the stations has been studied with land cover as getting increase as close to be near land cover, the relation stronger in the north and in winter season. Wind speed has no significant only minor influence in summer on the north stations,Rabiah,Anaa, Kirkuk and Mosul because the extension of the mountains from the northwest to the southeast is a responsible factor affecting the wind speed since, topographically ,lands are high in the west and east ,and depressed in middle and south. By calculating, adjusting and unified the studied station with same period for one high on sea level for mean temperature, it was found same result of effective of land cover.

Introduction

This is study is local influence and was studied for 34years means for the metrological factors as mentioned above with calculating missing data by using linearly interpolating data (Monim H. and Sana. A, 2010) . Rapid urbanization and industrialization have induced numerous environmental problems. Especially, urbanization has produced significant changes in the surface and atmospheric properties that can cause climate changes in most cities (Kim *et,al*. 2002). A well known phenomenon is the urban heat island (UHI), which can be Caused by various factors such as increased anthropogenic heat, reduced water evaporation, and increased flux in short wave absorption by the urban canopy, which is the assemblage of buildings, trees, and other objects composing a town or city and the spaces between them. Configurations of the urban canopy are characterized by building coverage, canopy height, orientation of roads, and building height distribution (Kondo *et al*. 2001). The urban heat island refers to

the phenomenon where the temperatures of the urbanized areas are higher than those in the surrounding suburban and rural areas (Streutker 2002 and Kim *et al*. 2004). It also causes "warmer nighttime temperatures in the core of the built environment when compared with the surrounding rural environment" (Hawkins *et al*. 2004).

Most of the studies are near to this study deal with point comparison, i.e one city station are compared (e.g.Chandler 1965, Yague et al.1991, Moreno_Garcia 1994).

A few studies the influence of geographical factors on the land cover climate .the distance from the Najaf's station seems to be important, as it is established that land cover influences its surroundings by decreasing the temperature (e.g.Sponken-Smith.1994.Spronken-Smith and Oke 1998 .Upmanis et.al-1998.

In this study has been used six stations from the north towards the south of Iraq where the stations are with station's number, longitude and latitude (Rabiah, 602, 42.10, 36.8),(Mosul, 608,43.15,36.32),(Kirkuk, 621, 44.4, 35.47) (Ana, 629, 41.95, 34.37) (Baghdad, 650, 44.23,33.23) and (Najaf , 670, 44.32,31.89) as shown in Fig(1) the distribution of meteorological stations in Iraq and the topography of mountains, lands and land cover.

By using Briarite regression attempts to determine how one variable relates to another.

n=number of observations

$$r^2 = \frac{\sum y_e^2}{\sum y^2}$$, r^2: coeffcient □f determierminati on

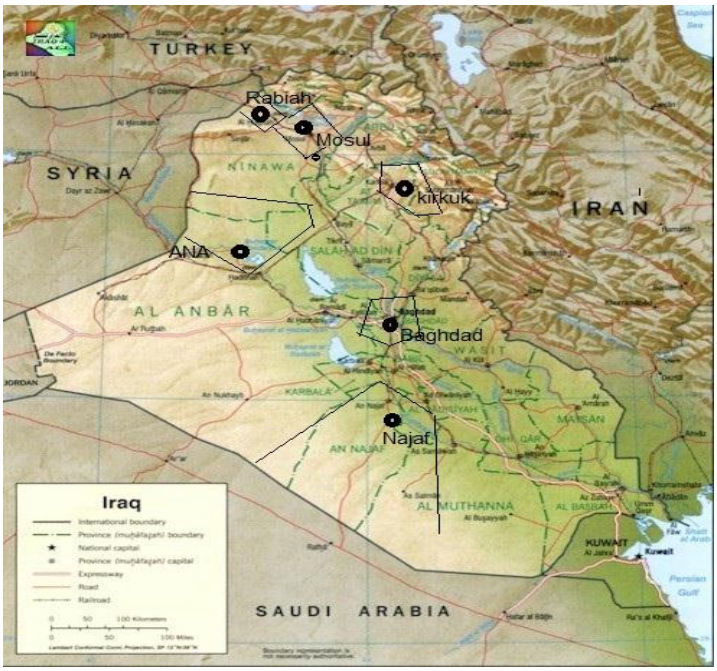
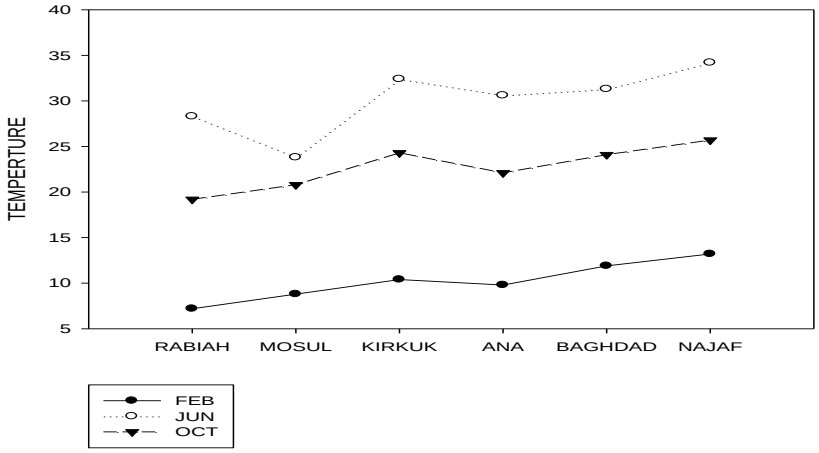


Fig (1) Distribution the meteorological studies stations and topography in Iraq .www.Iraqnaa.com with usingThiessen-polygon border

Results:

a. Annual changes of mean temperature



Fig(2-a) shows the annual changes of mean temperature at six stations located from left side (Rabiah) to the right side (Najaf) which is considered as zero station ,air temperature in (Rabiah)was about 7.2 C lower

than the mean temperature in (Najaf) at February , 19.2 C lower than 25.7 C at October, and 28.3 C lower than 34.2 C at June .Generally the mean temperature decrease from(Najaf) station to(Rabiah) station.

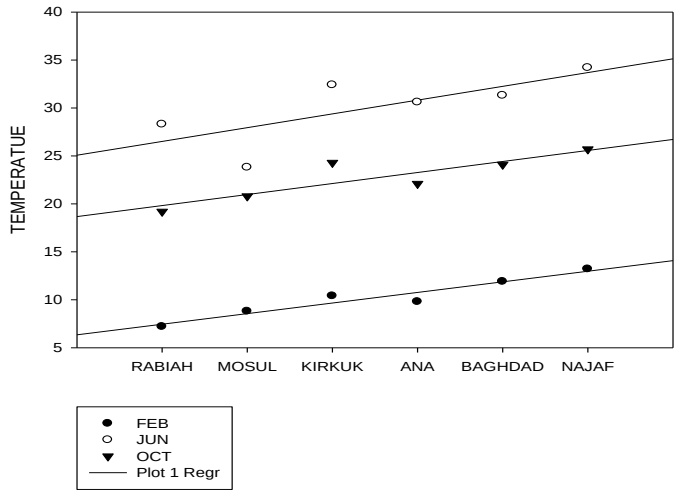
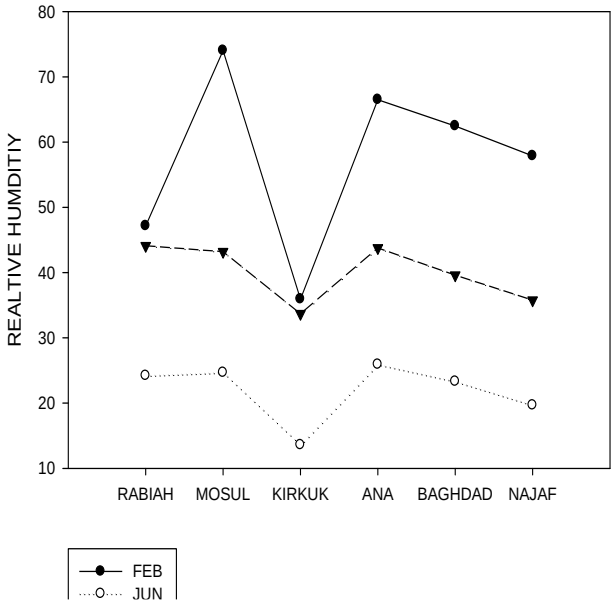


Fig (2-b) the mean monthly values of temperature are plotted against the six stations as liner regression calculation the corresponding correlation coefficient is 2.25 in February, 3.83 in June and 2.55

in October adding calculating the standard error is found 0.8765 in Febarury, 1.4913 in June and 0.995 in October with estimating the standard division is 2.147 in February, 3.652 in June and 2.438 in October .The lack of a strong positive slope is caused by the uniform surface which is more covered area and if the surface is covered by full vegetation, there are no pixels of low vegetation coverage and all pixels are cool.

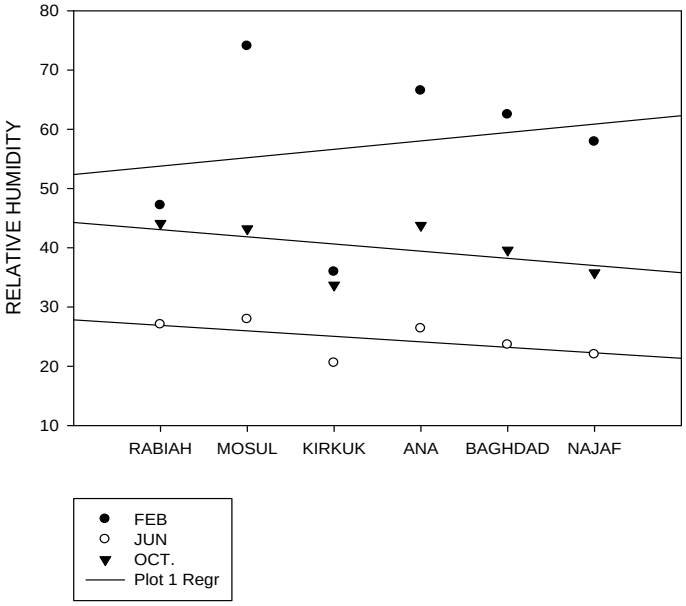
b. Annual changes of relative humidity

Fig(3-a)shows the annual changes of relative humidity in (Rabiah) was about 47.15% lower than in (Najaf) was 57.88%at February , 27.04 % higher than 21.99 % at June and 44.12 % higher than 35.78 % at October. Relative humidity increase from (Najaf) station to (Rabiah) station except on February.



Fig(3-a) Monthly mean relative humidity for three months (February,June,October)

Fig(3-b) the mean monthly values of relative humidity are plotted against the six stations as liner regression calculation the corresponding correlation coefficient is 14.47 in February, 3.11 in June and 4.67 in October adding calculating the standard error is found 5.6311 in Febarury,1.211 in June and 1.818 in October with estimating the standard division is 13.793 in February ,2.971 in June and 4.4544 in October.

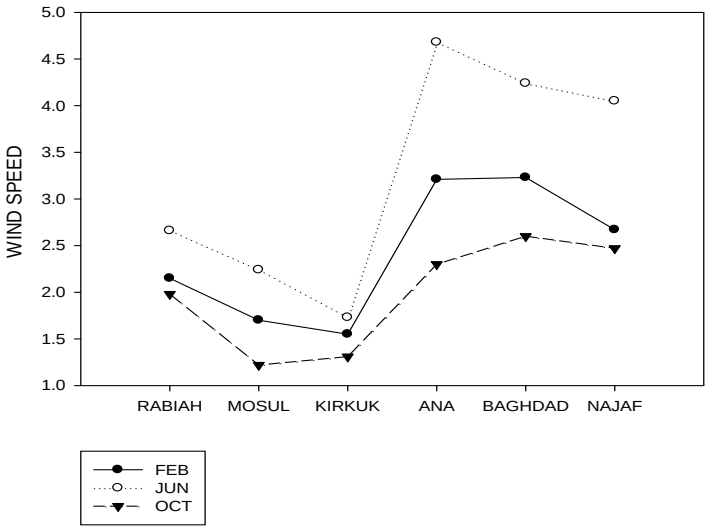


Fig(3-b)result of statistical analysis of relative humidity as liner regression

c. Annual changes of wind speed

Fig (4-a) shows the annual changes of wind speed with same six stations,

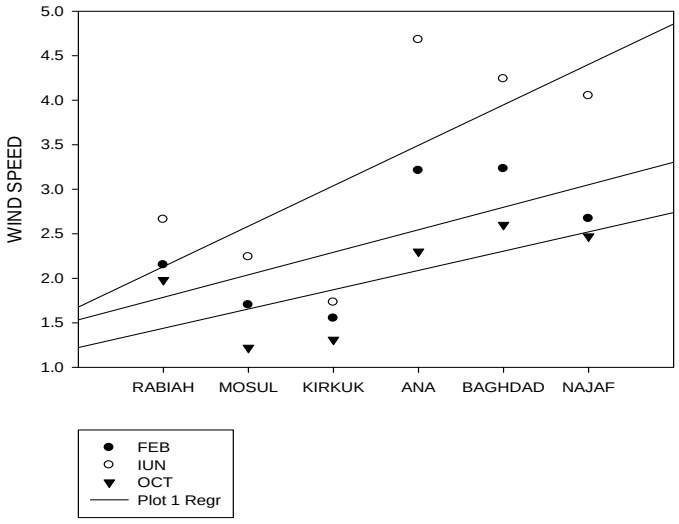
wind speed in (Rabiah) was about 2.15 knots lower than in (Najaf) was 2.67 knots at February ,2.66 knots lower than 4.05 knots at June and 1.98 knots lower than 2.47 knots at October. Wind speed decrease from (Najaf) station to (Rabiah) observed in the north stations in Rabiah, Mosul, Kirkuk and Ana.



Fig(4-a)Monthly mean wind speed for three months (Febaruary,June,October)

Station with minimum difference 0.52 knots and maximum is 1.39 knots. The fig (4-a) shown the relation is smooth and getting minor.

Fig(4-b) the mean monthly values of wind speed are plotted against the six stations as liner regression calculation the corresponding correlation coefficient is 0.769 in February, 1.2717 in June and 0.6215 in October adding calculating the standard error is found 0.2995 in Febarury,0.4947 in June and 0.2418 in October with estimating the standard division is 0.7336 in February ,1.2118 in June and 0.5970 in October



Fig(4-b)result of statistical analysis of wind speed as liner regression

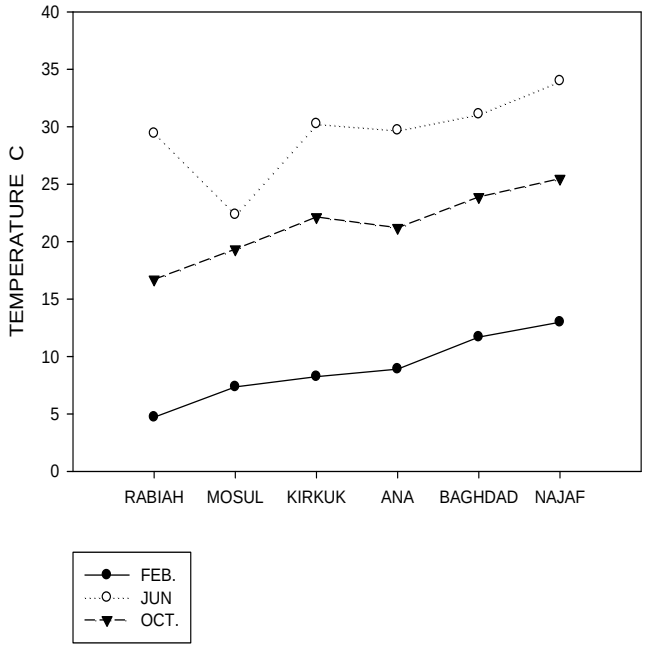


Fig (5) Monthly Mean temperature of air for three months (February, June, October) adjusted and unified for sea level.

Fig(5) shows the annual changes of mean temperature adjusted and unified all station with one high on the sea level to know the real effective about land cover Air temperature in (Rabiah)was about 4.717 C lower than the mean temperature in (Najaf) 12.992 at February , 16.717 C lower than 25.49 C at October, and 29.41 C lower than 33.99 C at June .Generally the mean temperature decrease from(Najaf) station to(Rabiah) station. The result was approximately near to real mean temperature measurements and therefore no significant for sea level on this station.

Conclusion and discussion

The land cover change has significant local and Far-reaching effects on regional climate over Iraq. Surface air temperature remarkable increasing over the test region,

as a result, the local climate become more arid. Vegetation change also has obviously effects on the geographic area in Iraq, including the summer monsoonal

Flow in east Iraq weakening whiles the winter monsoon enhancing. In general ,the more vegetation covering an area of land ,the cooler its contribution to surface temperature, local and regional changes in land use more often result in warming than in cooling, urbanization and conversion to bare soils have the largest warming impact .wind speed has no remarkable significant over the stations and the dominate wind is north westerly .

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الخلاصة:

تتناول هذه الدراسة مقدار التأثير للمتغيرات الجغرافية والمتغيرات الانوائية على سطح الأرض المغطاة لستة محطات انوائية هي ربيعة،عانة،كركوك،الموصل،بغداد والنجف.التحليلات الإحصائية ركزت على المعدلات السنوية خلال الفترة من (١٩٦١-١٩٩٥) إن العامل الجغرافي تضمن المسافة عن محطة النجف ومدى التأثير كلما اتجهنا نحو المحطات المدروسة.إما بالنسبة للمتغيرات الانوائية هي سرعة الريح ،معدل درجة الحرارة والرطوبة النسبية .وبحساب معامل الانحسار للمسافة مع معدل درجة الحرارة النتائج أشارت بأنه هنالك علاقة بتأثير الغطاء مع درجة الحرارة حيث تكون اقل لسطح الأرض المغطاة بالغطاء النباتي بغير المغطاة لجميع فصول السنة.إما بالنسبة للرطوبة النسبية لها إشارة واضحة مع كثافة الغطاء النباتي وتزداد بالاقتراب من الغطاء النباتي والعلاقة تكون كبيرة في القسم الشمالي وفي فصل الشتاء.لا يوجد تأثير لسرعة الرياح فقط تأثير بسيط على المحطات الشمالية ربيعة،كركوك،عانة والموصل وذللك بسبب امتداد السلاسل الجبلية من الشمال الغربي إلى الجنوب الشرقي وهذا العامل المؤثر اعتمد على طبوغرافية الأرض حيث تكون مرتفعة في الغرب والشرق ومنخفضة في الوسط والجنوب .كذلك تم حساب وتعديل وتوحيد المحطات المدروسة لنفس الفترة الزمنية المذكورة أعلاه لارتفاع موحد عن مستوى سطح البحر لمعدل درجة الحرارة وقد استنتجت نفس التأثير لغطاء سطح الأرض.