Vol-3, Issue-4 PP. 283-289 ISSN: 2394-5788

GLOBAL JOURNAL OF ADVANCED RESEARCH
(Scholarly Peer Review Publishing System)

THE RELATION BETWEEN CLOUD COVER AND SOME ATMOSPHERIC VARIABLE OVER BAGHDAD CITY

Husain Abodi
Department of Atmospheric sciences,
college of sciences
Almustansirya University,
Iraq.
husean_abudi@yahoo.com

NaghamThari
Department of Atmospheric sciences,
college of sciences
Almustansirya University,
Iraq.
Naghamth_nm@yahoo.com

Nagham Abbas
Department of Atmospheric sciences,
college of sciences
Almustansirya University,
Iraq.
basuny.basuny@yahoo.com

ABSTRACT

Cloud cover considered as the variable that highly impact on most of other meteorological variables, where it has an effect on radiation that imported to the boundary layer from atmosphere, and there for it control the energy in this range. The purpose adopted in this study depending on daily data for cloud cover and evaporation taken from Iraqi meteorological organization and seismology for period from year (2000) to (2005) of Baghdad city , and also solar radiation data for three component (direct – diffuse – reflect) and for the same location and period taken from European centre of solar energy services for professionals study (SODA) , the study extract monthly and annual mean to show the coherence between these three variables.

When making the statistical operation and converting the cloud cover value to percentage of eight parts for showing cloud cover percentage and from making comparisons diagrams, the result shows that there is a high effect of evaporation process on cloud cover formation, where the high value of evaporation accompanied with the high cloud cover range and has a high positive correlation coefficient reaches (0.74) on some times. And the result also shows that the cloud cover inversely intense on direct and diffuse component of solar radiation to reach negative correlation coefficient in about (-0.93) as a highest value. This effect be less on reflected component, and in general it can depend on cloud cover to guess some other atmospheric variable especially on winter seasons.

Keywords: Cloud cover, Correlation coefficient, Evaporation, Radiation, SODA data.

1. INTRODUCTION

To understand exact variable behave must come with understanding and studying other variables behave especially that have direct effect on it , as the cloud cover considered a factor that has direct effect on human life's there for the study based on changing value of cloud cover and its interaction with other variables such as evaporation and solar radiation (direct – diffused – reflected) , where the cloud cover defined as the amount of cloud which cover the sky dome , and its amount depend on the space that occupies about one

over eighths according to the world metrological organization agreement. In case of little parts of cloud we said that the cloud cover equal to (1/8), and in case of the sky is fully covered with cloud we said that the cloud cover is (8/8) [1].

The evaporation defined as the basic process for losing heat and water from lakes therefore it considered as the main variable of energy and water balance [2]. And the evaporation is very important for hydrological cycle that has a huge effect on climate and environmental system [3] . The sun emit radiation as electromagnetic radiation throw space that traveled at speed of light as straight lines and arrive the atmosphere in approximately (8) minute after sun rise [4] . The direct radiation arrive earth surface without scattering and poses 85% of global radiation , the diffused radiation arrive the surface in a different directions because of scattering and absorption factors and poses approximately 15% of global radiation and The reflected radiation affected by clouds and surfaces albedo . [5]

The development of science leads to appear many measuring centers for atmospheric variables, thus the study depends on two main centers for obtaining statistical data, the first is obtained from French center for solar radiation (SODA) [6], and the other obtained from Iraqi meteorological organization and seismology for period (from 2000 to 2005) over Baghdad city [7] , thus we calculate monthly and annual averages to show the common behave of interaction between study variables . the historical study shows many studies about this case , for example at 2001 there is a study about evaporation in Iraq by (Esraakahtan) which about the relation between evaporation , temperature , dew point , wind speed and solar radiation , the result of its study shows that the temperature has a huge effect on evaporation while wind speed have a little effect on evaporation .[8]

2. RESULTS AND DISCUSSION

The study examine relationship between cloud cover with evaporation and three components of radiation for six years from (2000) to (2005) over Baghdad city , these variables were selected due to their importance and direction impact on daily life and earths weather, As well as to determine the correlation between them and the general behavior , as well as the possibility of obtaining their own data.

The study relied on daily data taken from Iraqi meteorological organization and seismologyAnd then calculating monthly averages to show the general behavior for months and also obtaining annual averages to study of the general relationship on annual term, As it has been convert cloud cover values In proportions of eight sections Ranging from (0 \ 8) which indicates the lack of cloud cover to (8 \ 8) to denote the overcast skies. The study obtained diagrams to explain that relationship as well as the strength of the bonding through accounting the correlation coefficient. The study also showed that there are varying intensity relationship between those three variablesBut in general they fluctuate within a structured format along the months the year as in the table (1)Which shows the values of the variables As well as the direct, diffused and reflected radiation in (2005) As a sample of the overall data, where the value of the evaporation change is (0.0001) in Maximum rate.

It is noted from the table that the evaporation values changing between (0.0002) in winter and (0.0001) in summer, As well as cloud cover values changes between the highest value (4/8) in the winter months and lowest value (0/8) on summer months. To Represent the case of three variables we can obtain Figure (1), which shows the relationship between evaporation and the cloud cover along the study period as annual ratesWhere we note that the amount of clouds that reach rate of (3/8) and (4/8) are associated with the evaporation of the highest ,but the evaporation become lower with cloud cover decreasing in about (1/8) and (2/8) of range, While most less evaporation values associated with the amount of cloud cover which recorded the percentage values (0/8), and this may be due to the high evaporation process considered as a cause of clouds formation , And little or no evaporation reduces the cloud cover formations ,so the evaporation is the major factor of formation of cloud cover. See Fig. (1) which shows the annual rate of evaporation and cloud cover.

Direct radiation has positive behavior where it at highest level when the sky is clear (0/8)But less than this percentage with increasing of cloud cover gradually until it reaches its minimum value when clouds are present by (4/8), this may be a logical and gives meaning that the cloud cover is the main reason for reducing the amount of direct radiation, see Fig. (2).

Table (1); Evaporation values and cloud cover and (direct, diffuse, reflect) radiation at year (2005)

Monthes	Evaporation (ml)	Cloud cover (m^2)	range	Direct radiation (W/ m^2)	Diffuse radiation (W/ m^2)	reflect radiation (W/ m^2)
Jan.	0.000219	41.3	4/8	100622	45926	4356
Feb.	0.000106	32.2	3/8	100805	53674	4340
Mar.	0.000001	28	3/8	127237	70513	4695
Apr.	0.000127	31.3	3/8	141353	78442	4337
May.	0.000128	17.1	2/8	173711	90312	4497
Jun.	0.000107	0.099951	0/8	213549	89050	4734
Jul.	0.000102	2.09995	1/8	228661	86445	4978
Aug.	0.000115	0	0/8	204477	85420	5089
Sep.	0.000126	0.599951	0/8	166974	78230	5168
Oct.	0.000142	25.1	3/8	111756	64385	4693
Nov.	0.000189	37.3	4/8	98231	44553	4097
Dec.	0.000206	32	3/8	115135	43366	4413

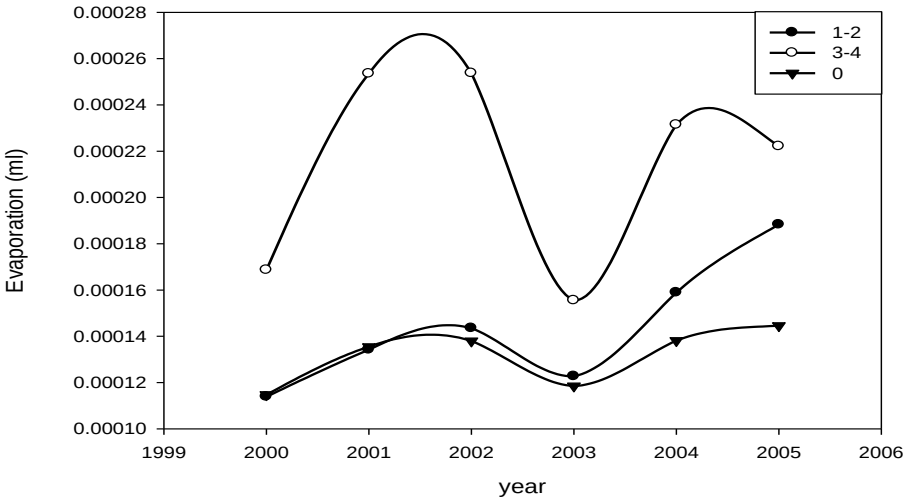

Figure (1):Evaporation relationship with the cloud cover annual rates along the period of study

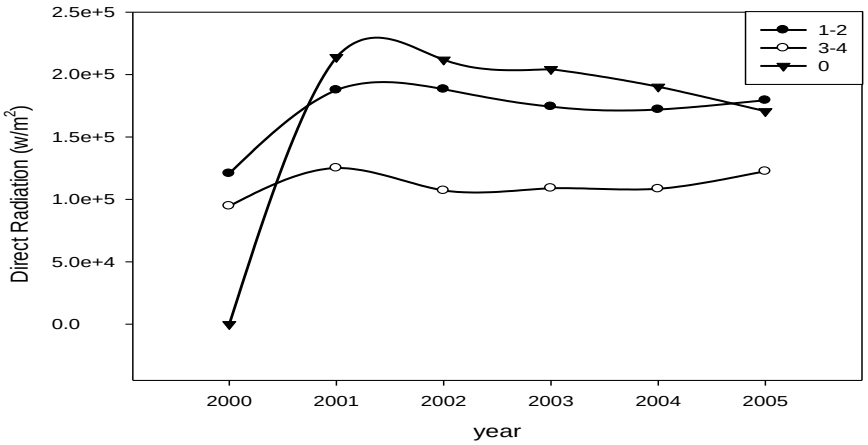

Figure (2): Direct radiation relationship of cloud cover annual rates along the period of study

Diffused radiation shows similar behavior to direct radiation Where we find that the value is inversely proportional to the amount of clouds and thus the lower value of diffused radiation correlate with a cloudy sky by (3/8) and (4 /8) and the highest value is correlate with ratio of (0/8), (1/8) and (2/8) It thus also recorded an inverse relationship. The reflected radiation gave somewhat less pronounced behavior where the minimum values of cloud cover overlap with others to coincide with reflected radiation values, But high cloud cover values (3/8) and (4/8) coincide with lower reflected radiation values This explains sometimes why we see overcast skies for long periods with high temperatures. Since the reflected radiation up to the lowest value in the case of Overcast skies and the radiation remains near the surface and will contribute to raising the ambient temperature, see fig. (3) and (4).

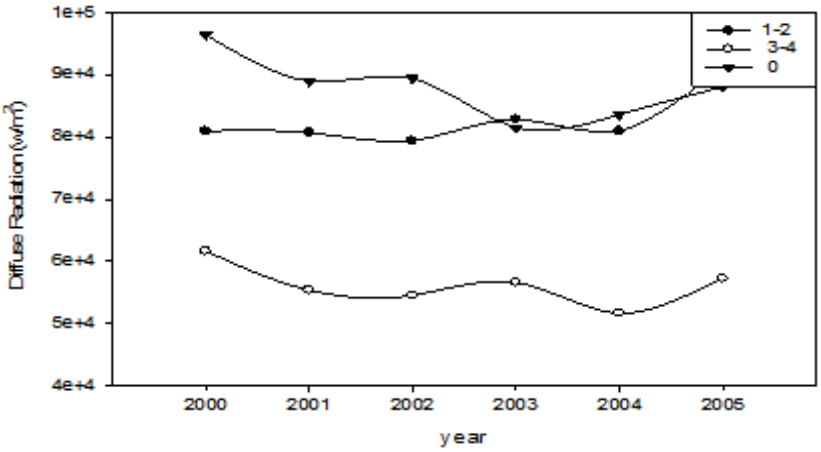

Figure (3): Diffused radiation relationship with the cloud cover annual rates along the period of study

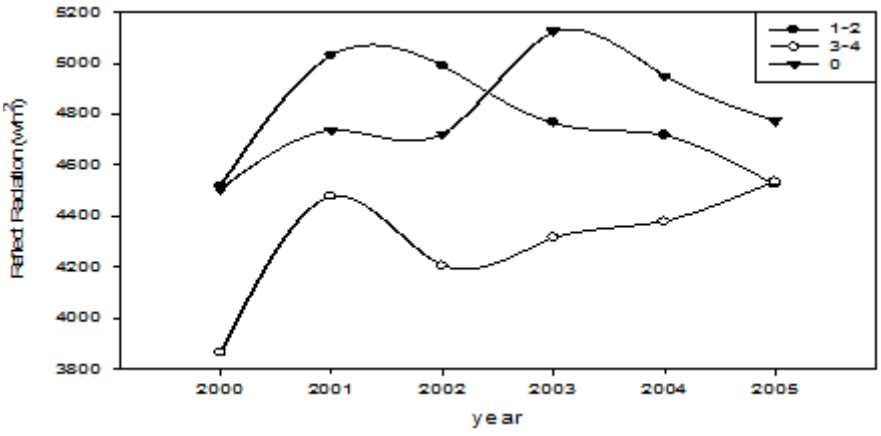

Figure (4): Reflected radiation relationship with the cloud cover annual rates along the period of study

When taken monthly averages the common character for the relation between evaporation and cloud cover is clearly appear , there for we find that there is a disparity between months , so that it has positive relationship in general but increase and decrease depending upon outside other factors , see fig. (5) And (6) as an example for years (2002) and (2004) respectively where we can note that there is an anomaly especially at warmed summer seasons with little cloud cover ratio.

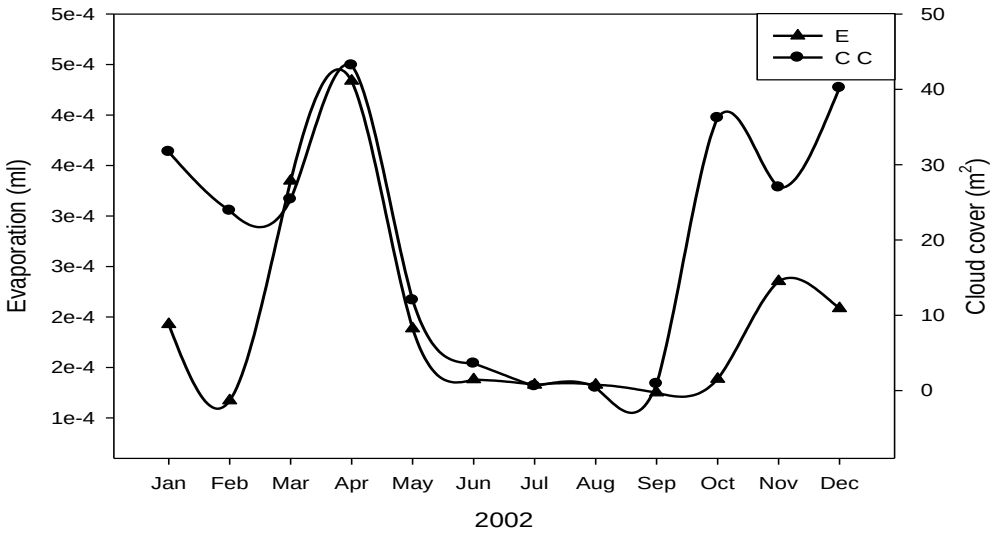

Figure (5): Evaporation relationship with cloud cover in (2002)

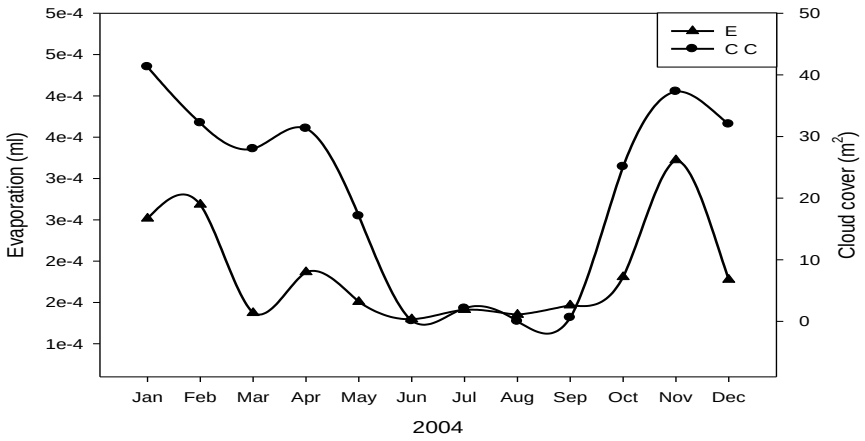

Figure (6): Evaporation relationship with cloud cover in (2004)

The annual cloud cover relationship with direct radiation shows clear behavior similar to the monthly means previously showed where the relation between cloud cover and radiation is inversely proportional shown in fig. (7) as a selected sample . And also for the remained component (reflect and diffuse) it also not differs from annual means , see fig. (8) and (9) for the exact year previously shown .

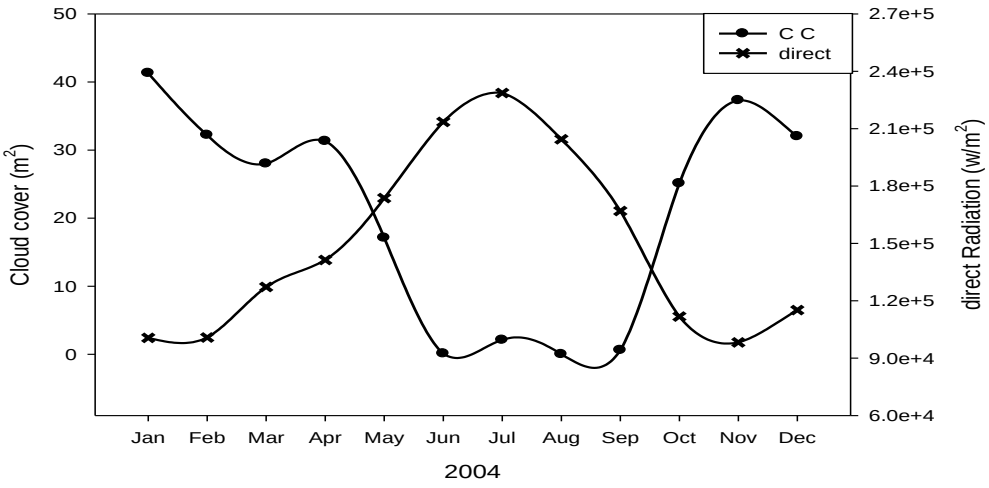

Figure (7): Direct radiation relationship with cloud cover in (2004)

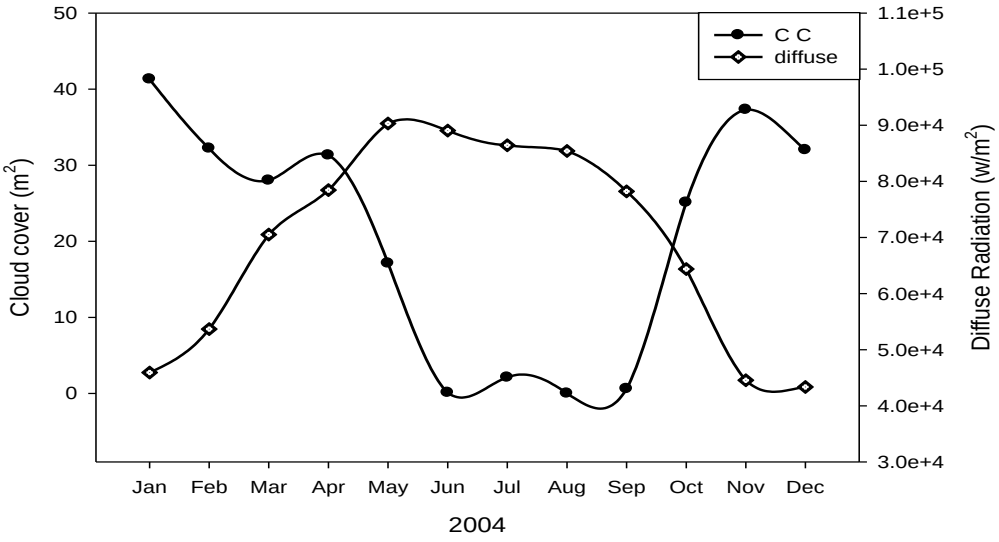

Figure (8): Diffused radiation relationship with cloud cover in (2004)

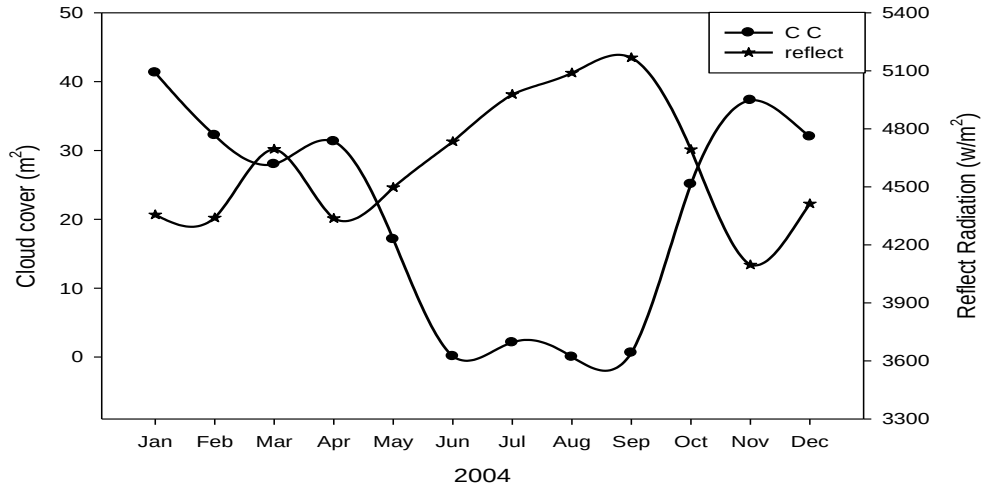

Figure (9): Reflected radiation relationship with cloud cover in (2004)

From calculating the correlation coefficient for evaporation and cloud cover and for solar component along study period as a yearly averages we obtain the table (2) , where we find that there is a strong negative correlation between the three component of radiation (especially the direct component) with cloud cover where it reach (-0.93) at some times . and for the relation between evaporation and radiations component it shows weak indication but in general it have negative correlation coefficient . in return to the cloud cover the correlation coefficient is positive with evaporation to reach (0.74) at some times , and it may be because of the evaporation is a cause and not a result for cloud formation .

Table (2): Annual values of the correlation coefficient between the variables involved in the study.

year	Evaporation (ml)				Cloud cover (m^2)		
	Cloud cover (m^2)	Direct Rad. (w/m^2)	Diffuse Rad. (w/m^2)	Reflect Rad. (w/m^2)	Direct Rad. (w/m^2)	Diffuse Rad. (w/m^2)	Reflect Rad. (w/m^2)
2000	0.491	-0.636	-0.779	-0.487	-0.809	-0.581	-0.510
2001	0.464	-0.379	-0.119	-0.427	-0.851	-0.790	-0.764
2002	0.598	-0.502	-0.082	-0.650	-0.936	-0.690	-0.841
2003	0.330	-0.289	-0.686	-0.025	-0.908	-0.690	-0.671
2004	0.742	-0.741	-0.784	-0.775	-0.917	-0.818	-0.876
2005	0.400	-0.412	-0.189	-0.689	-0.832	-0.881	-0.493

3. CONCLUSION

As we notice from graphs, we can conclude that cloud cover extremely changed with evaporation values. Where cloud cover with (3/8)&(4/8) amount companied with large values of evaporation as compared with cloud cover of (1/8)&(2/8) amount. And less values of evaporation came together with (0/8) of cloud cover amount.In other hand the cloud cover has inversely changed with direct, diffused and reflected radiation, where big amount of cloud cover (3/8)&(4/8) came with small values of direct and diffused radiation, while Increases with less cloud cover amount (1/8)&(2/8). The reflected radiation shows less inverse reaction with cloud cover. The correlation coefficient records high score between cloud cover and evaporation reaches to (+0.74) at (2004), and between cloud cover and radiation reaches to (-0.93) at (2002).

4. REFERENCES

[1] Tauchiy, A, K., (1969): "The clouds with the shapeofkarman vortex street in the waxier of Cheju sland" , Korea. Jour. Met, socJapan, 47,457-465pp.

[2] Giannio,Soultana K.,Vassilis Z. Antonopoulos, "comparison Of different evaporation estimation methods to lake vegoitis, Greece" Aristotle university of Thassaloniki,54124 thessaloniki , Greece*corresponding author,Tel:+30-2310-99875,fax:+30-2310-998767.

[3] Demin , V.V.,Zhevakin, S.A and Naumov, A.P.,(1971) : “The role of water vapor dimmer in satellite ,radiometric studies of the atmosphere at centimeter wavelength .” ,Atmospheric and Oceanic Phys., Vol. 6,No 1.

[4] Lion, K.N.(2002):"An Introduction to Atmospheric Radiation", Second Edition ,United States of America,p54 .

[5] Vardavas I.M., Taylor F.W.,(2007),"Radiation and Climate" Oxford University.

[6] French centre for solar radiation http://www.soda-is.com/eng/services/services_radiation_free_eng.php .

[7] ministry of transportation ,” Iraqi meteorological organization and seismology”,(2016), Iraq, Baghdad .

[8] alajrash,israakahtan,(2001):”evaporation modeling in Iraq” master thesis, university of mustansirya .