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Analysis of Teleconnection Patterns on Autumn and Winter Temperatures in Iraq

By

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Abstract

The recorded temperature rates for five climatic stations distributed over the main regions of Iraq were used in order to find the reflected effect of the pressure oscillation values on them. The changes that occurred over two climatic cycles (1950-1961/2008-2019) were followed. It was also adopted at two levels of statistical significance in the research outputs in order to know the most influential vibrations on the temperature element. AO, EA-WR, WOMI, NCP, while the relationship in some recorded cases, despite its strong correlation, is without a significant level of significance.

Keywords: Distance correlation, Teleconnection patterns, temperature, Pearson correlation

1. Introduction

For several decades, man has been interested in climatic studies based on his fears related to climatic changes, which led to an increase in his detailed knowledge of the climatic indicators that most affect the globe and the climatic phenomena whose changes led to the great oscillations in the climate, especially with regard to the elements of heat and rain in many regions of the world. Since the long-distance correlation patterns are among the phenomena that receive attention through their relations with the climatic elements that contribute to the knowledge of climatic anomalies and their changes. Therefore, the researcher in this study relied on the most important pressure oscillations in his study, and their relationship with the climatic elements in order to analyze them and know the results of the relationships between them. The Pearson correlation coefficient was also used in order to extract the results of the correlation between the variables, and the monthly rates between the variables were also employed in the analysis. The study of climate change is one of the important topics that have attracted the attention of climate researchers. Understanding the causes and nature of climate changes is considered one of the most important goals of collecting climate data, so climate oscillations are one of the long-distance correlation patterns and are of great importance.

The climate of a particular region is not only subject to the influence of solar radiation and humidity for that location but is also affected by distant phenomena that are in themselves a consequence of the atmospheric circulation (Ghavidel et al., 2016). long-distance correlation means the relationship between the oscillation of the climatic elements of a particular region with the changes in the pressure and temperature patterns for the seas and oceans in certain geographical places, where any change in the pressures and temperatures of the seas due to the energy stored in them is capable of causing major changes in the climate of the neighboring areas, whose effects are reflected on the displacement of the locations of the presence of the main air masses in these places. Bhutiyani al., (2010) studied the climatic changes as well as the change in the amount of rain northwest of the Himalayas for the period 1966-2006 and concluded that the NAO index during the winter seasons and the Southern Oscillation in the monsoon months recorded the highest effect on the Oscillation of rainfall. In addition, they did not find a general trend of rain during the winter season, but there was a significant decrease in the seasonal rainfall, as well as an increase in the annual temperature, so the effect of warming is worthwhile during the winter. Räsänen and Kummu, (2013) studied the effects of the southern oscillation on climatic changes in the Mekong River basin in Southeast Asia. The results of their research showed that the rainfall in the basin is clearly affected under the influence of the ENSO phenomenon.

In addition, Kutiel et al., (2002) studied the role of the remote correlation patterns on the eastern region of the Mediterranean basin, and they concluded with results that the NCP oscillation is considered the main Oscillation among the other patterns, and it is also considered the most influential on temperatures in the Antalya region. Hatzaki et al., (2006) showed through their study related to the follow-up of climatic changes in the Mediterranean basin under the influence of pressure oscillations, that the NCP oscillation, as well as the EA, NAO frequency, is one of the most influential oscillations in determining the prevailing climate pattern in this region. López-Moreno et al., (2011) In their study on the role of NAO on temperature and rainfall during winter for mountainous regions, they found that the effect of oscillation was slightly and not significant for the eastern regions of the Mediterranean, while the other regions had a significant correlation between the studied variables (Räsänen and Kummu, 2013). In a study of the effect of the polar oscillation on the winter climate in China, it found the highest correlation between the oscillation and temperature, which amounted to 0.4, and with rainfall, which amounted to about 0.3 and 0.4 in the southern and central parts of China(Daoyi, G., & Shaowu, W. (2003).

Another study showed that the analysis of the polar oscillation with rains on the eastern side of the Mediterranean tends to decrease, while the southern parts increase rains, and the reason for this is that the northern air masses, when they move towards the south, pass over the warm water for a long distance, so the rain falls heavily on the south. Givati, A., & Rosenfeld, D. (2013). Several studies describe the effect of large-scale phenomena on local climatologic parameters. Turkey winter (December–March) temperature and precipitation variability have a significant relationship with the negative phase of NAO (Kahya2011 .(In Iran and Kuwait, the NAO effect on precipitation variability was not noticeable. The influence of this atmospheric mode on the same field is significantly weak in Oman but generally significant in winter surface air temperature in the western part of Iran (Masih et al. 2010; Marcella and Eltahir 2008 ;Charabi and Al-Hatrushi 2010). Interannual temperature variability in the Middle and Near East is closely related to the patterns associated with the NAO over the past centuries (Mann 2002).

2. Data and Working Methods

In this research, two climatic cycles (1950-1961) (2008-2019) were relied upon to compare the rates of climatic elements and pressure oscillation rates. From the NOAA website, the methods used in the research are statistical-analytical methods in order to study the remote correlation indicators and their effects on the temperature component over Iraq. Moreover, the monthly rates of climatic stations were relied upon, excellently distributed to cover the main regions of Iraq, map (1).

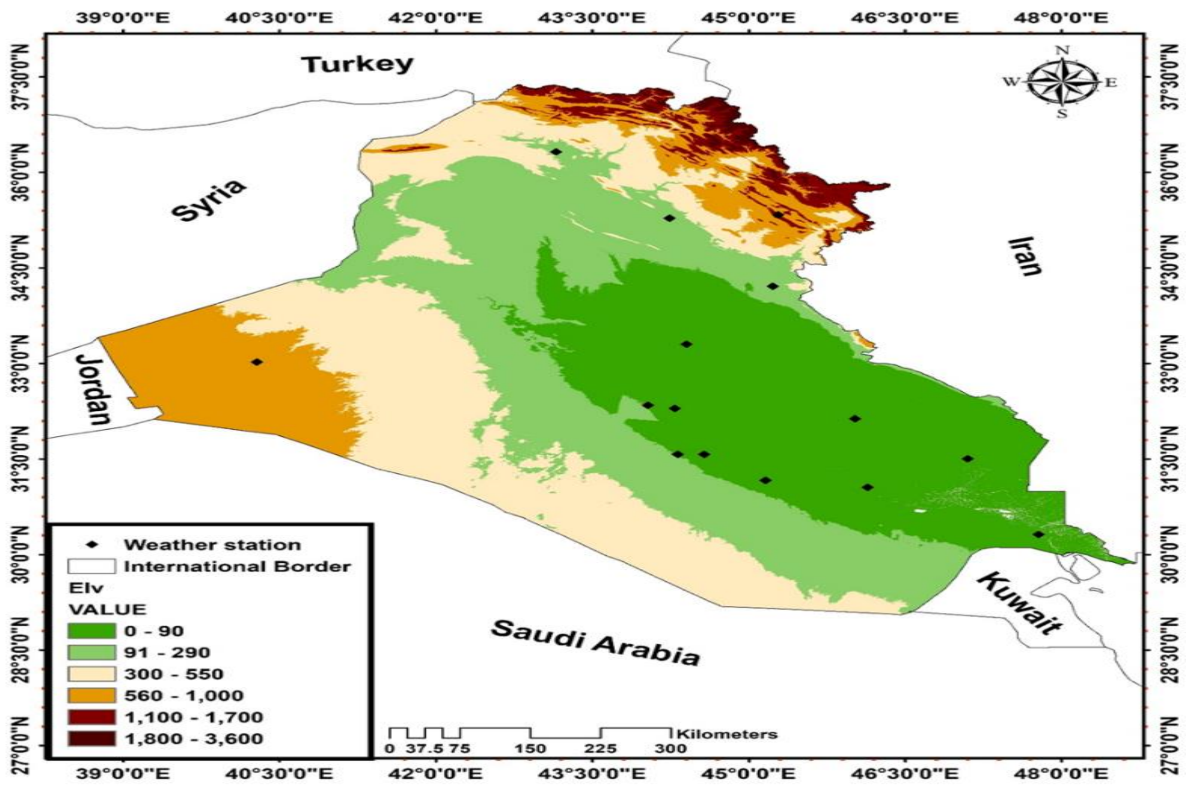

Figure 1. The Map of Iraq elevation and locations of weather stations.

3. Analysis and Results

3.1 The Correlation Between Pressure Oscillations and Temperature

3.1.1 September:

It Became Clear from Table (1) That the Statistical Relationship Between Pressure Oscillations and Temperatures Are as Follows:

3.1.2 Sulaymaniyah

The results of the analysis of the Sulaymaniyah Correlation Station showed that the North Atlantic Oscillation (NAO) amounted to (-0.355) the third, and the effect of the East Atlas/Western Russia frequency (EA-WR) amounted to (-0.145) and the WMOI frequency (449-). (1).

3.1.3 Mosul

The link analysis of the North Atlantic Oscillation Conductor Station (NAO) was about (0.568-, 0.670-) for the first, third/respectively, climate cycle in the link to the Polar Oscillation (AO) by (0.371-, 0.542-) for the first climate cycle, the third/respectively, and the association of the Southern Oscillation (SOI) The link (0.115, 0.477) for the first climate cycle, the third/respectively, and the east Atlantic/Western Russia oscillation link (EA) was about (0.386-, 0.271) for the first climate cycle, the third/respectively, while the east Atlas/Western Russia oscillation (EA-WR) was (0.888- 0.259-) for the first, third/second climate cycle on the bipolar oscillation of the Indian Ocean, with a correlation of about (0.592, 0.189-) for the first, third/respective climate cycle, while the link to the West Mediterranean oscillation (WOMI) (0.761, 0.382) for the first climate cycle, the third/respectively, and finally the oscillation of the North Sea-Caspian Sea was associated (0.831-, 0.643) for the first climate cycle, the third/respectively**Table 1.** *Correlation between Pressure Vibrations and Temperatures for The Month of September for The Main Stations of Iraq*

Basra		Rutba		Baghdad		Musel		Suleimania			
Sig	R	Sig	R	Sig	R	Sig	R				
0.066	-0.547	0.017	-.672-*	0.028	-.632-*	0.054	-0.568			**NAO**	1961-1950
0.114	-0.480	0.093	-0.506	0.008	-.725-**	0.235	-0.371			**AO**	
0.887	0.046	0.848	-0.062	0.833	-0.068	0.721	0.115			**SOI**	
0.452	-0.240	0.038	-.602-*	0.099	-0.498	0.215	-0.386			**EA**	
0.012	-.697-*	0.001	-.823-**	0.053	-0.569	0.000	-.888-**			**EA-WR**	
0.079	0.525	0.009	.717**	0.077	0.528	0.004	.761**			**WOMI**	
0.067	-0.545	0.002	-.794-**	0.134	-0.459	0.001	-.831-**			**NCP**	
Basra		**Rutba**		**Baghdad**		**Musel**		**Suleimania**			
Sig	R	Sig	R	Sig	R	Sig	R	Sig	R		
0.376	-0.315	0.163	-0.452	0.352	-0.311	0.024	-.670-*	0.349	-0.355	NAO	2019-2008
0.452	-0.269	0.403	-0.281	0.271	-0.364	0.085	-0.542	0.682	0.159	AO	
0.663	-0.158	0.251	0.379	0.472	-0.243	0.138	0.477	0.966	-0.016	SOI	
0.900	0.046	0.438	0.261	0.983	-0.007	0.420	0.271	0.703	0.148	EA	
0.235	-0.413	0.435	0.263	0.002	-.812-**	0.441	-0.259	0.710	-0.145	EA-WR	
0.474	0.257	0.866	0.058	0.476	0.240	0.246	0.382	0.171	-0.499	WOMI	
0.546	0.217	0.190	0.428	0.407	0.278	0.033	.643*	0.378	-0.335	NCP	

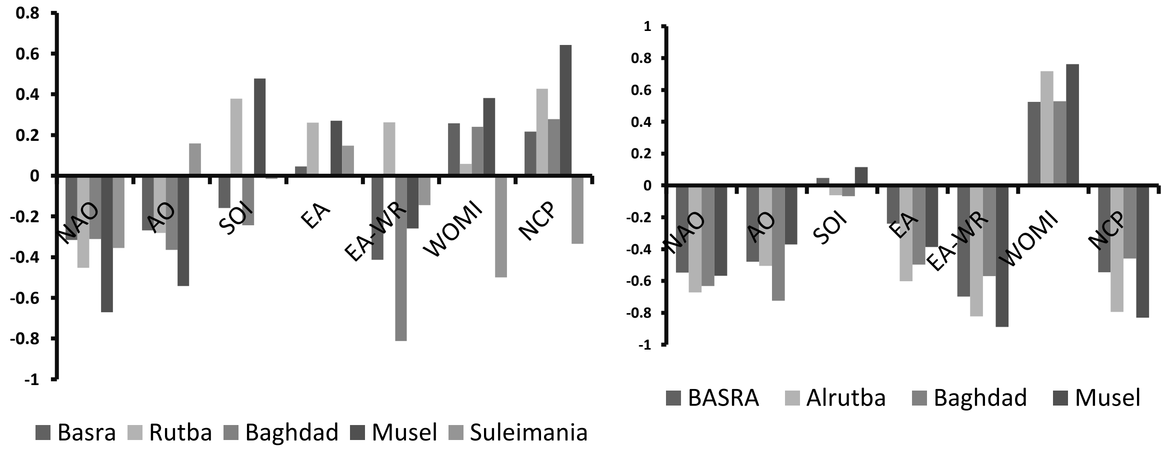

Figure 2. *Correlation between pressure vibrations and temperatures for the month of September for the main stations of Iraq*

3.1.4 Baghdad Station

The results of the analysis of the previous schedule of the Baghdad station showed that the North Atlantic Oscillation (NAO) was associated with temperature during the month of September for the first climate cycle, the third, about (0.632-, 0.670-) respectively, as it is clear that the first cycle recorded a high correlation in reverse and moral, Compared to the second cycle, which was characterized by a very weak correlation, while the Polar Oscillation (AO) the link to the cycles (first, third) was about (0.725-, 0.364-) respectively, it is clear that the first cycle is the highest in terms of correlation compared to the third cycle, The soi frequency link for the first, third cycle was about (0.115, 0.016-) respectively, while the EA link was about (0.498-, 0.07-) respectively, and the EA-WR oscillation was about (0.569-, 0.812-) for the first, third/respectively, climate cycle, while the WOMI oscillation was associated with temperature (0.528, 0.240) for the first climate cycle, the third/respectively, as the values show that the oscillation activates its effect during the first climate cycle unlike other cycles, while the frequency (NCP) reached the link. About (0.458-, 0.278) for the first climate cycle, third/respectively.

3.1.5 Rutba Station

The results of the analysis showed that the North Atlantic Oscillation (NAO) recorded high adverse correlations and statistically indicative conditions of 0.672-0.452 for the first climate cycle, third/respectively, and the correlation between polar oscillation (AO) and heat was 0.506-, 0.281-) For the first, third/respectively, climate cycle, there is a gradient in the link on the wet station of this oscillation and values decreased clearly during the third cycle, while the association of the Southern Oscillation (SOI) was (0.062-, 0.379) for the first, third/respective climate cycle.

The correlation of the oscillation of eastern Russia (EA) was about (0.602-, 0.261) for the first climate cycle, the third/respectively and we conclude that the effect of oscillation when the relationship is more inverse on temperature than the ejection relationship, while the correlation values of the The East Atlas/Western Russia (EA-WR) oscillation of about (0.823-, 0.263) for the first climate cycle, the third/respectively, as it is clear that during the first climate cycle the correlation is very strong as well as decreasing in the third cycle, and the correlation between oscillation Western Mediterranean (WOMI) (0.717, 0.058) for the first climate cycle, third/respectively, analysis shows that most vibrations had a clear effect through the clear association of the first climate cycle unlike the second and third cycles, and the correlation of the North Caspian Oscillation (NCP) to (0.794-, 0.428) of the first climate cycle, the third/respectively.

3.1.6 Basra Station

The results of the table analysis ()of the correlation between vibrations and temperature at Basra station show that the link of the North Atlantic Oscillation (NAO) amounted to about (0.547-, 0.315-) for the first climate cycle, the third/respectively, and the value of the correlation is not moral despite the strength of the impact of the reverse oscillation At temperature, while the Polar Oscillation (AO) was associated with (0.480-, 0.269-) for the first climate cycle, third/respectively, an average correlation of the first cycle and decreased during the third cycle, while the link to the southern oscillation SOI is about (0.046, 0.158-) for the first, third/consecutive climate cycle, a weak correlation, while the Eastern Russian Oscillation (EA) recorded a correlation of about (0.240-, 0.046) for the first climate cycle, the third/respectively.

The link to the East Atlas/Western Russia Oscillation (EA-WR) was about (0.697-, 0.413-) for the first climate cycle, the third/respectively, a strong reverse correlation of the oscillation effect during the first cycle, as well as differing correlation values for the Western Mediterranean oscillation. WOMI (0.525, 0.257) for the first climate cycle, the third/respectively, the link during the first cycle is strong and influential heading with the direction of temperature recordings at Basra station. 0.217) for the first climate cycle, third/respectively.

3.1.7 October

It became clear from table (2) that the statistical relationship between pressure vibrations and temperatures is as follows:

3.1.8 Suleimania

The results of the analysis of the Sulaimaniyah Link Station showed that the North Atlantic Oscillation (NAO) amounted to (0.201-0.075-) for the second, third consecutive climate cycle, and that the correlation of the Scandinavian oscillation amounted to about (0.622-, 0.596-) of the cycle. The second, third consecutive climate, and the correlation of the Pacific Multi-Contract Oscillation was (0.030-, 0.664-) for the second, third, and the moral correlation of the Bipolar Oscillation of the Indian Ocean was (0.579-0.419) for the second, third consecutive climate cycle. A strong correlation to the West Mediterranean oscillation (0.609) for the third cycle, unlike the second but not moral, was also associated with the North Sea-Caspian oscillation (0.608-0.525-) for the second, third climate cycle, which is a moral relationship to the second and non-moral cycle in the third cycle, Figure.(2)

3.1.9 Mosul

The link to the North Atlantic Oscillation Conduct station (NAO) was about (0.322-, 0.105-) for the first, third/respective climate cycle, while the polar oscillation was 0.074-0.022 for the first, third/respective climate cycle, while the southern oscillation (SOI) was 0.2 20.258-) for the first, third/respectively, and the eastern Russian oscillation (EA) was about (0.217, 0.163) for the first, third/respective climate cycle, while the East Atlas/Western Russia Oscillation (EA-WR) was 0.187-0.084-084 for the climate cycle. The first, the third/respectively, while the link to the WOMI oscillation was (0.177, 0.137-) for the first, third/respective climate cycle, and finally the NCP oscillation was associated (0.506-, 0.120-) for the first climate cycle, the third/respectively.

Table 2. *Correlation Between Pressure Vibrations and Temperatures for The Month of October for The Main Stations of Iraq*

Basra		**Rutba**		**Baghdad**		**Musel**		**Suleimania**			
Sig	R	Sig	R	Sig	R	Sig	R				
0.013	.688*	0.067	-0.545	0.831	-0.069	0.307	-0.322			NAO	1950-1961
0.516	0.208	0.809	-0.078	0.890	0.045	0.820	-0.074			AO	
0.408	-0.264	0.912	-0.036	0.828	-0.070	0.492	-0.220			SOI	
0.070	0.539	0.727	-0.113	0.172	0.422	0.498	0.217			EA	
0.436	0.248	0.085	-0.517	0.523	0.205	0.560	-0.187			EA-WR	
0.236	-0.370	0.344582	0.299	0.4629497	0.235	0.582	0.177			WOMI	
0.084	0.517	0.007	-.727-**	0.317	-0.316	0.093	-0.506			NCP	
Basra		**Rutba**		**Baghdad**		**Musel**		**Suleimania**			
Sig	R	Sig	R	Sig	R	Sig	R	Sig	R		
0.449	0.255	0.401	-0.282	0.371	0.318	0.759	-0.105	0.847	-0.075	NAO	2008-2019
0.838	0.070	0.671	-0.145	0.839	0.074	0.950	-0.022	0.502	0.259	AO	
0.961	-0.017	0.917	-0.036	0.076	-0.584	0.444	-0.258	0.949	0.025	SOI	
0.582	-0.187	0.679	-0.141	0.826	-0.080	0.632	0.163	0.624	0.190	EA	
0.643	0.158	0.314	-0.335	0.302	0.363	0.805	-0.084	0.606	-0.200	EA-WR	
0.248	-0.381	0.402	-0.281	0.527	-0.228	0.687	-0.137	0.082	0.609	WOMI	
0.787	0.092	0.730	-0.118	0.701	-0.139	0.725	-0.120	0.146	-0.525	NCP	

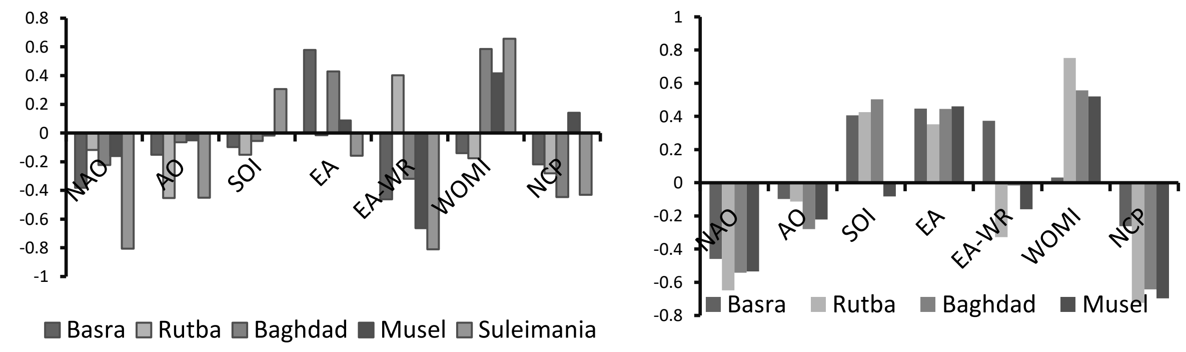

Figure 2. *Correlation between Pressure Vibrations and Temperatures for the Month of October for the Main Stations of Iraq*

3.1.10 Baghdad Station

It was found from an analysis of an earlier table that the North Atlantic Oscillation (NAO) was associated with temperature during September for the first, third climate cycle, about (0.069-, 0.318), respectively, while the polar oscillation (AO) reached the link to the first and third cycles (0.045, 0.074) Respectively, the soi frequency link for the first, third cycle was about (0.070-, 0.584-) for the first, third/ /respectively) cycle, while the correlation for the oscillation (EA) was about (0.422, 0.080-) for the cycle (first, third) /on Respectively, the EA-WR oscillation is about (0.205,0.363) for the first, third/respective climate cycle, and the bipolar oscillation of the Indian Ocean has been associated with (0.120-, 0.679) of the climate cycle, second, third/respectively, while the oscillation WOMI was associated with temperature (0.235, 0.228-) for the first, second, third/respective climate cycle, while the NCP oscillation was about (0.316-, 0.139-) for the first climate cycle, third/respectively.

3.1.11 Rutba Station

The results of the correlation analysis showed that the North Atlantic Oscillation (NAO) recorded adversely high correlations and statistically significant correlations of 0.545-0.282-) for the first, third/respective climate cycle, and the association between polar oscillation (AO) and heat The 0.078-0.145 for the first climate cycle, the third/respectively, while the southern oscillation association (SOI) was (0.036-, 0.036-) for the first, third/respective climate cycle.

The link to the Eastern Russia Oscillation (EA) was 0.113-0.141-) for the first, third/respective climate cycle, and the correlation values of the East Atlantic/Western Russia oscillation (EA-WR) varied to about (0.517-, 0.335-) for the first climate cycle, third/respectively, The link between the Western Mediterranean Oscillation (WOMI) was (0.299, 0.281-) for the first, third/respective climate cycle, and the link to the North Caspian Oscillation (NCP) was about (0.727-0.118-) for the first, third/respective climate cycle.

3.1.12 Basra Station

The correlation between vibrations and temperature at the Basra North Atlantic Oscillation Station (NAO) was about (0.688, 0.255) for the first, third/respective climate cycle, while the Polar Oscillation (AO) was associated with (0.208, 0.070) for the first, third/third climate cycle. The soi was at 0.264-0.017 for the first, third/respective climate cycle, a weak correlation, while the Eastern Russian Oscillation (EA) recorded a correlation of about (0.539, 0.187-) for the first, third/respective climate cycle.

The link to the East Atlas/Western Russia Oscillation (EA-WR) was 0.248, 0.158 for the first climate cycle, third/respectively, and the link between the Western Mediterranean

Oscillation (WOMI) was 0.37. 0.381-) for the first, third/respective climate cycle, and the link to the North Caspian Oscillation (NCP) was about (0.517, 0.092) for the first climate cycle, the third/respectively.

3.1.13 November

It became clear from table (3) that the statistical relationship between pressure vibrations and temperatures is as follows:

3.1.14 Suleimania

The results of the analysis of the North Atlantic Oscillation Correlation (NAO) were found to be 0.690-0.805 for the second, third consecutive climate cycle, while the polar oscillation was 0.450-0.451 for the second and third consecutive climate cycle. WOMI (0.657) was strongly linked to the third cycle, unlike the second but not moral, and the link to the North Sea-Caspian Oscillation (NCP) was 0.364-0.430 for the second, third/respective climate cycle, figure 3.

3.1.15 Mosul

The link of the North Atlantic Oscillation Conduct station (NAO) was about (0.536-, 0.161-) for the first climate cycle, the third/respectively, while the Polar Oscillation AO by an amount (0.221-, 0.161-) for the first climate cycle, the third/respectively, and the southern oscillation (SOI) link was (0.0.) 082-0.018-) for the first, third/respectively, and the eastern Russian oscillation (EA) was about (0.461, 0.088) for the first, third/respectively, climate cycle, while the East Atlas/Western Russia Oscillation (EA-WR) was (0.160-, 0.662-) for the cycle. The first climate, the third/respectively, while the link to the West Mediterranean oscillation was WOMI by (0.521, 0.416) for the first, second, third/respective climate cycle, and finally the oscillation of the North Sea-Caspian Sea NCP was related (0.697-, 0.141) for the first climate cycle, the third/respectively.

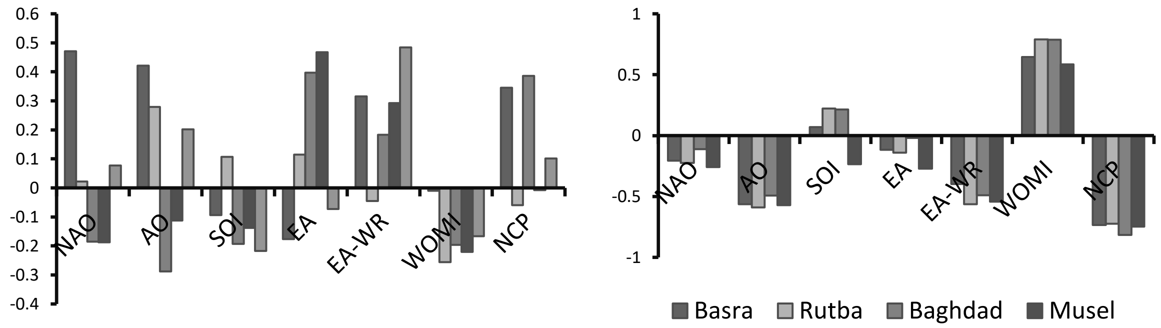

Figure 3. *Correlation between Pressure Vibrations and Temperatures for The Month of - November for The Main Stations of Iraq*

3.1.16 Baghdad

We conclude from an analysis of the table referred to earlier that the results of the link to the Baghdad North Atlantic Oscillation Station (NAO) were associated with temperature during November, about (0.542-, 0.223-) for the (first, third) cycle/respectively, while the polar oscillation (AO) was about (0.280-, 0.064.) for the first, third/respectively cycle, and the association for the SOI oscillation amounted to about (0.503, 0.054-) for the cycle (first, third) /respectively, while the correlation of the oscillation (EA) was about (0.445, 0.429) for the cycle. First, third/respectively, and for the EA-WR oscillation towards (0.017-, 0.320-) for the first climate cycle, third/respectively, while the oscillation (WOMI) reached its association with temperature (0) .557, 0.585) for the first, second, third/respective climate cycle, while the NCP oscillation was about (0.624-, 0.447-) for the third/consecutive first climate cycle

Table 3. *Correlation between pressure vibrations and temperatures for the month of November for the main stations of Iraq*

Basra		Rutba		Baghdad		Musel		Suleimania		
Sig	R	Sig	R	Sig	R	Sig	R			
0.132	-0.460	0.022	-.649-*	0.068	-0.542	0.073	-0.535			NAO
0.761	-0.098	0.726	-0.113	0.377	-0.280	0.489	-0.221			AO
0.189	0.407	0.168	0.425	0.095	0.503	0.801	-0.082			SOI
0.145	0.447	0.260	0.353	0.147	0.445	0.131	0.461			EA
0.23	0.374	0.299	-0.327	0.957	-0.017	0.619	-0.160			EA-WR
0.922	0.032	0.005	.753**	0.060	0.557	0.083	0.521			WOMI
0.41	-0.262	0.007	-.723-**	0.024	-.642-*	0.012	-.697-*			NCP

Basra		Rutba		Baghdad		Musel		Suleimania		
Sig	R	Sig	R	Sig	R	Sig	R	Sig	R	
0.276	-0.382	0.729	-0.118	0.510	-0.223	0.636	-0.161	0.009	-.805-**	NAO
0.677	-0.151	0.163	-0.452	0.851	-0.064	0.882	-0.051	0.223	-0.451	AO
0.787	-0.098	0.655	-0.152	0.870	-0.056	0.958	-0.018	0.421	0.307	SOI
0.080	0.579	0.966	-0.015	0.188	0.429	0.797	0.088	0.682	-0.159	EA
0.177	-0.463	0.220	0.402	0.337	-0.320	0.026	-.662-*	0.008	-.811-**	EA-WR
0.699	-0.140	0.604	-0.176	0.059	0.585	0.204	0.416	0.054	0.657	WOMI
0.546	-0.218	0.401	-0.282	0.168	-0.447	0.680	0.141	0.248	-0.430	NCP

3.1.17 Rutba Station

The results of the correlation analysis showed that the North Atlantic Oscillation (NAO) recorded adversely high correlations and statistically significant evidence of 0.649-0.118-0.118 for the first climate cycle, third/respectively, and the correlation between polar oscillation (AO) and heat was 0.113-0.452-) for the first climate cycle, third/respectively.

3.1.18 Basra Station

The correlation between vibrations and temperature at the Basra North Atlantic Oscillation Station (NAO) was about (0.460-, 0.382-) for the first, second, third/respective climate cycle, while the Polar Oscillation (AO) was associated with (0.0.0). 098-0.542-, 0.151-) for the first, second, third/respective climate cycle, while the Eastern Russian Oscillation (EA) recorded a correlation of about (0.447, 0.579) for the first, third/respective climate cycle.

3.1.19 December

It became clear from table 4 that the statistical relationship between pressure vibrations and temperatures is: It turns out that the results of the analysis of the link relationship of the Southern Oscillation SOI amounted to (0.684, 0.217-) for the second, third/respective climate cycle, while the East Atlantic-Western Russian Oscillation (EA-WR) was 0.68 9.484) For the second, third/respective climate cycle, here the most influential vibrations were relied upon from their recording of correlation values, while vibrations whose correlation relationships are weak are excluded from the analysis because the basic objectives of the analysis are to identify and identify the most powerful vibrations in terms of correlation.

3.1.20 Mosul

The AO link was 0.572-0.112 for the first, third/respective climate cycle, and the Southern Oscillation (SOI) was 0.234-0.138 for the first climate cycle, third/respectively, when the oscillation East Atlantic-Western Russia (EA-WR) reached (0.544-, 0.292) for the first climate cycle, third/respectively, and last for the impact of the North Sea-Caspian Oscillation (NCP) at 0.747-0.008-) for the first climate cycle, third/respectively.

3.1.21 Baghdad

The Polar Oscillation AO was associated (0.494-0.288-) for the first climate cycle iii/respectively, while the southern oscillation SOI proved to have a heat effect of (0.213, 0.193) for the first climate cycle, iii/e, while other vibrations also proved weak and did not show their climatic effects based on statistical results.

3.1.22 Rutba Station

The results for link analysis (AO) showed that adversely high correlations and statistically significant correlations were shown at (0.589-0.279) for the first, third/respective climate cycle, and a oscillation (SOI) of 0.222, 0.107 for the first, third/respective climate cycle, and a oscillation (EA-WR) of 0.5.6. 5-0.045-) for the first, third/respective climate cycle, and the WOMI oscillation association was 0.789, 0.036-, 0.256-) for the first, third/respective climate cycle, and in the latter the impact of the NCP oscillation was about (0.723-, 0.059) for the cycle. First climate, third/respectively.

3.1.23 Basra Station

The AO was associated with (0.565-0.421) for the first climate cycle, the third/respectively. The WOMI oscillation was 0.644, 0.010-) for the first, third/respective climate cycle, and the NCP oscillation was the oscillation correlation (0.734-, 0.345) for the first, second, third/respective climate cycle.

3.1.24 January

It became clear from table (4) that the statistical relationship between pressure vibrations and temperatures was as follows:

3.1.25 Solomonian Station

The results of the table analysis showed that the AO correlation was (0.583-, 0.160) for the second climate cycle, the third/respectively, and the soi link was about (0.198, 0.638-) for the second climate cycle, third/respectively, while the EA-10 oscillation WR) was 0.587-0.742 for the second, third/respective climate cycle, and the PDO oscillation association was 0.557, 0.369 for the second, third/respective climate cycle, while pna's correlation increased to (0.572, 0.160-) for the climatic cycle. Second, third/respectively, the WOMI correlation for the third cycle increased by (0.838) as well as the result of an association (NCP) of (0.778-0.308-) for the second, third/respective climate cycle.

3.1.26 Mosul

Most vibrations reached a strong moral correlation on the Mosul station during the first climate cycle, reaching a oscillation (NAO) (0.621-) and a oscillation (AO) towards (0.628-) EA-WR towards (0.592-) and oscillation (AO) towards (0.628-) EA-WR towards (0.592-) and oscillation SCN by (0.541-) and PDO oscillation (0.511) and PNA oscillation (0.693) and NCP oscillation was associated (0.731-) and in the second climate cycle the frequency correlation decreased and the strong correlation was limited to oscillation (NAO, AO,EA,EA-WR,NCP) about (0.714, 0.538-, 0.516, 0.628-, 0.450-) respectively while the relationship between pressure vibrations during the third climate cycle was very weak.

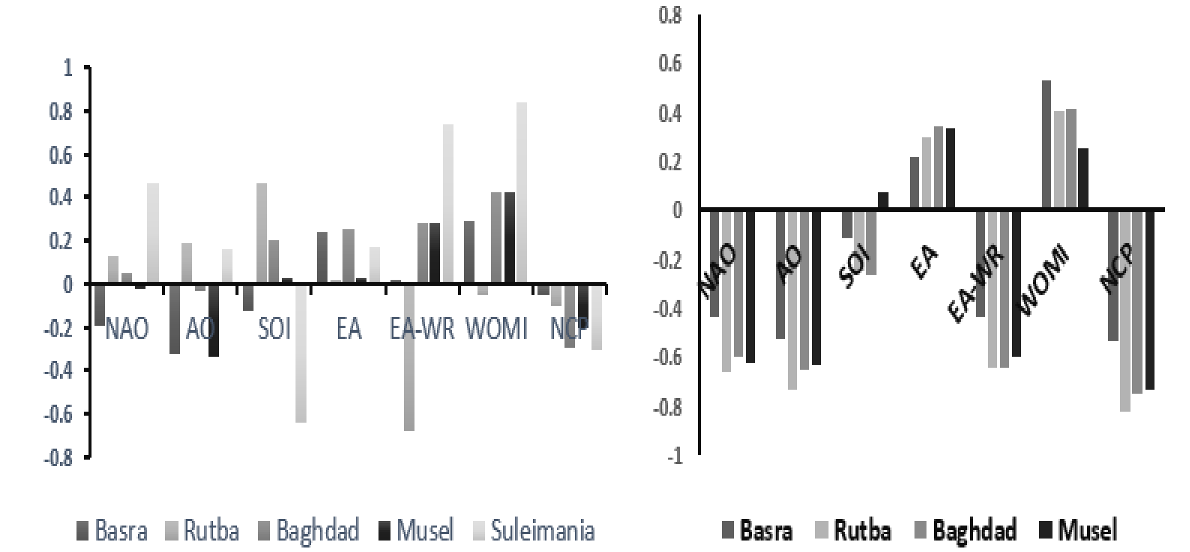

Figure 4. *Correlation between Pressure Vibrations and Temperatures for The Month of December for The Main Stations of Iraq*

3.1.27 Baghdad

An oscillation association (NAO, AO, EA-WR, PDO, PNA, ONI, NCP) with temperature element was about (0.598-, 0.621, 0.748-) for the first climate cycle/respectively, While the oscillation (AO, EA, EA-WR, NCP) was limited to about (0.693-, 0.618, 0.549, 0.808-) for the second/respective climate cycle, correlation values decreased and became very weak for the third climate cycle form (4).

Table 4. *Correlation between Pressure Vibrations and Temperatures for The Month of December for the Main Stations of Iraq*

Basra		Rutba		Baghdad		Musel		Suleimania		
Sig	R	Sig	R	Sig	R	Sig	R			
0.523	-0.205	0.484	-0.224	0.730	-0.112	0.416	-0.259			**NAO**
0.055	-0.565	0.044	-.589-*	0.102	-0.494	0.052	-0.572			**AO**
0.830	0.069	0.487	0.222	0.505	0.213	0.464	-0.234			**SOI**
0.719	-0.116	0.664	-0.140	0.948	-0.021	0.394	-0.271			**EA**
0.199	-0.399	0.055	-0.565	0.105	-0.491	0.067	-0.544			**EA-WR**
0.024	.644*	0.002	.789**	0.002	.788**	0.045	.586*			**WOMI**
0.007	-.734-**	0.008	-.723-**	0.001	-.816-**	0.005	-.747-**			**NCP**
Basra		**Rutba**		**Baghdad**		**Musel**		**Suleimania**		
Sig	R	Sig	R	Sig	R	Sig	R	Sig	R	
0.143	0.471	0.949	0.022	0.609	-0.185	0.579	-0.188	0.845	0.077	**NAO**
0.197	0.421	0.406	0.279	0.420	-0.288	0.743	-0.112	0.602	0.202	**AO**
0.782	-0.094	0.755	0.107	0.593	-0.193	0.686	-0.138	0.575	-0.217	**SOI**
0.605	-0.176	0.736	0.115	0.256	0.397	0.146	0.468	0.853	-0.073	**EA**
0.344	0.316	0.895	-0.045	0.613	0.183	0.383	0.292	0.187	0.484	**EA-WR**
0.976	-0.010	0.447	-0.256	0.588	-0.196	0.514	-0.221	0.667	-0.167	**WOMI**
0.298	0.345	0.863	-0.059	0.270	0.386	0.982	-0.008	0.796	0.101	**NCP**

Table 5. *Correlation between Pressure Vibrations and Temperatures for The Month Of January for The Main Stations of Iraq*

Basra		Rutba		Baghdad		Musel				
Sig	R	Sig	R	Sig	R	Sig	R			
0.154	-0.438	0.020	-.658-*	0.040	-.598-*	0.031	-.621-*			**NAO**
0.078	-0.527	0.007	-.731-**	0.021	-.653-*	0.029	-.628-*			**AO**
0.721	-0.115	0.434	-0.250	0.400	-0.268	0.817	0.075			**SOI**
0.488	0.222	0.337	0.304	0.277	0.341	0.286	0.336			**EA**
0.161	-0.432	0.025	-.641-*	0.025	-.639-*	0.043	-.592-*			**EA-WR**
0.074	0.534	0.194	0.403	0.176	0.418	0.421	0.257			**WOMI**
0.072	-0.536	0.001	-.822-**	0.005	-.748-**	0.007	-.731-**			**NCP**
Basra		**Rutba**		**Baghdad**		**Musel**		**Suleimania**		
Sig	R	Sig	R	Sig	R	Sig	R	Sig	R	
0.574	-0.191	0.698	0.132	0.902	0.045	0.946	-0.023	0.212	0.460	NAO
0.326	-0.327	0.567	0.194	0.936	-0.029	0.313	-0.336	0.681	0.160	AO
0.713	-0.125	0.154	0.460	0.577	0.201	0.936	0.028	0.064	-0.638	SOI
0.468	0.245	0.961	0.017	0.477	0.255	0.932	0.029	0.665	0.169	EA
0.987	0.006	0.022	-.677-*	0.436	0.278	0.406	0.279	0.022	.742*	EA-WR
0.389	0.289	0.886	-0.049	0.216	0.429	0.188	0.429	0.005	.838**	WOMI
0.880	-0.052	0.758	-0.105	0.411	-0.293	0.541	-0.207	0.421	-0.308	NCP

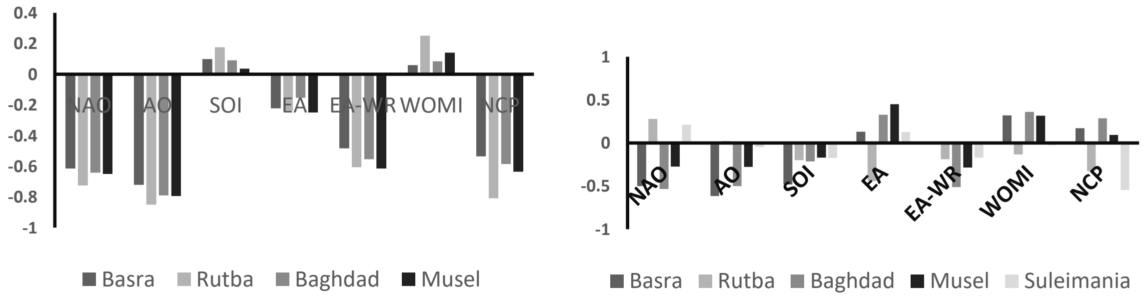

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Figure 5. *Correlation between Pressure Vibrations and Temperatures for the Month of January for the Main Stations of Iraq.*

3.1.28 Rutba

The correlation for oscillation (NAO, AO, EA-WR,NCP) was about (0.822-, 0.641-, 0.731-, 0.658-) for the first climate cycle/respectively, while the number of vibrations with strong correlation also decreased and was limited to (AO) EA-WR, PDO, PNA,NCP) (0.752-, 0.603, 0.554-, 0.647-) for the second/respective climate cycle, while the relationship was weak for most oscillations for the third climate cycle and was limited to oscillation (EA-WR) towards (0.677-).

3.1.29 Basra

The strongest vibrations were found to be related (AO, PNA, AMO, WOMI, NCP) and the link (0.536-, 0.534, 0.502, 0.656, 0.527-) for the first climate cycle/respectively, in The number of vibrations for the second climate cycle (AO, AO, EA, PNA, NCP) increased to (0.719-, 0.620, 0.749-, 0.773-, 0.549-) for the second climate cycle/respectively, and no strong and moral correlation oscillation was recorded for the third climate cycle.

3.1.30 February

It became clear from table (6) that the statistical relationship between pressure vibrations and temperatures is as follows:

3.1.31 Solomonian Station

EA-WR, PDO, NCP was associated with about (0.600-, 0.533, 0.517-) for the second/respective climatic cycle, and pearson's strong association in the third climate cycle of the NCP was limited to (0.546-) and intangible.

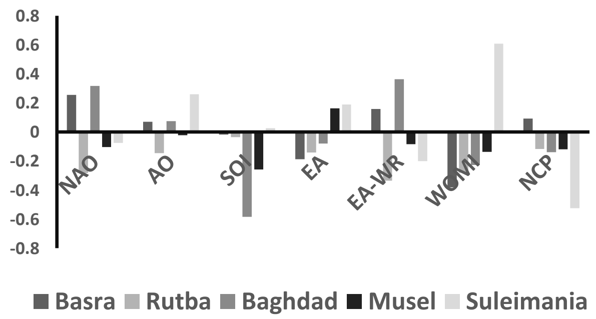
3.1.32 Musel Station

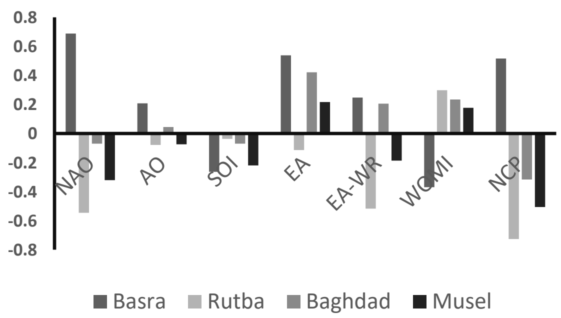
The correlation relationships of a oscillation (NAO, AO, EA-WR, NCP) were found to be (0.636-, 0.614-0.794-, 0.650-) for the first climate cycle/respectively, and the EA frequency link was 0.448 for the third/respective climate cycle.

3.1.33 Baghdad Station

The oscillation link (NAO, AO, EA-WR, NCP) was (0.585-, 0.555-, 0.790-, 0.641-) for the first climate cycle/respectively, and the oscillation (EA-WR, PDO, NCP) reached (00) 569.569- 0.528, 0.490- For the second/respective climate cycle, the correlation for a oscillation (NAO, AO, EA-WR, ONI) was about (0.513, 0.510-, 0.502-, 0.532-) for the third/respectively climatic cycle figure.

Basra		Rutba		Baghdad		Musel		Suleimania		
Sig	R	Sig	R	Sig	R	Sig	R			
0.033	-.615-*	0.008	-.725-**	0.025	-.641-*	0.022	-.650-*			NAO
0.008	-.722-**	0.000	-.850-**	0.002	-.790-**	0.002	-.794-**			AO
0.762	0.098	0.585	0.176	0.778	0.091	0.911	0.036			SOI
0.487	-0.223	0.457	-0.238	0.636	-0.153	0.436	-0.249			EA
0.111	-0.483	0.036	-.607-*	0.061	-0.555	0.034	-.614-*			EA-WR
0.853	0.060	0.432	0.251	0.793	0.085	0.662	0.141			WOMI
0.073	-0.534808	0.001	-.808-**	0.046	-.585-*	0.026	-.636-*			NCP
Basra		**Rutba**		**Baghdad**		**Musel**		**Suleimania**		
Sig	R	Sig	R	Sig	R	Sig	R	Sig	R	
0.139	-0.502	0.406	0.279	0.092	-0.532	0.413	-0.275	0.580	0.214	NAO
0.058	-0.615	0.944	0.024	0.116	-0.502	0.406	-0.279	0.902	-0.048	AO
0.160	-0.481	0.553	-0.201	0.524	-0.216	0.618	-0.170	0.652	-0.175	SOI
0.723	0.129	0.176	-0.440	0.323	0.329	0.166	0.448	0.743	0.128	EA
0.046	-.640-*	0.580	-0.188	0.109	-0.510	0.394	-0.286	0.663	-0.169	EA-WR
0.365	0.321	0.696	-0.133	0.276	0.360	0.340	0.318	0.946	-0.026	WOMI
0.633	0.173	0.331	-0.324	0.396	0.285	0.781	0.095	0.128	-0.546	NCP





3.1.34 RUTBA Station

Results showed a oscillation (NAO, AO, EA-WR, NCP) (0.808-, 0.607-, 0.850-, 0.725-) of the climatic cycle First/respectively, the Oscillation (AO, EA- WR) was (0.502-, 0.508-

for the second/respective climate cycle, and the EA oscillation correlation was about (0.444-) for the third/respective climate cycle.

3.1.35 Basra Station

Results for the pulse (NAO, AO, NCP) (0.534-, 0.722-, 0.615-) for the first climate cycle /respectively, and the oscillation (NAO, PDO) was (0.615-) for the first climate cycle/respectively, and the oscillation (NAO, PDO) was (0.615- 661, 0.528-) for the second/respective climate cycle, and the correlation of the oscillation (NAO, AO, EA-WR, ONI) was about (0.600, 0.640-, 0.615-, 0.502-) for the third climate cycle/respectively.

4. Conclusions

The results of this study provide an interesting perspective on the factors that influence changes in variables in Iraq:

1- The prevailing patterns of temperature in Iraq are characterized by a clear pattern, It is noted that it is related to the patterns of long-distance correlation, but it is affected by some local influences, including the different terrain in Iraq.
2- It seems that the correlation is strong during the first climatic cycle with NAO, AO, EA-WR, WOMI, and NCP index for the month of May, while during the second climatic cycle it was limited to NAO, AO, with an insignificant statistical relationship.
3- It turns out that the correlation is strong between the variables studied during the first climatic cycle, while the correlation weakens in the second climatic cycle. It can be inferred that Iraq is greatly affected by global climatic changes, and there is a trend of an increase in temperature rates, especially during the winter and autumn months, despite their being affected by patterns of remote connection.
4- The results showed that Atlantic and Arctic oscillation, as well as the local oscillations, have the most influence on the temperature rates over Iraq.
5- The atmospheric condition accompanying the correlation relations shows that there is a relationship between the oscillations and the temperatures accompanying the pressure organization, and it turns out that the effects of NAO during the winter months are more pronounced compared to other oscillations.
6- Most of the oscillations showed varying effects with temperature, and it is not possible to infer that the effect is subject to the oscillation without referring to the extensions of pressure systems and their effects in the local conditions over Iraq.

References

Bhutiyani, M. R., Kale, V. S., & Pawar, N. J. (2010). Climate change and the precipitation variations in the northwestern Himalaya: 1866–2006. International Journal of Climatology: A Journal of the Royal Meteorological Society, 30(4), 535-548.

Charabi, Y., & Al-Hatrushi, S. (2010). Synoptic aspects of winter rainfall variability in Oman. Atmospheric Research, 95(4), 470-486.

Daoyi, G., & Shaowu, W. (2003). Influence of Arctic Oscillation on winter climate over China. Journal of Geographical Sciences, 13(2), 208-216.

Ghavidel Rahimi Yousef, Farajzadeh Asl Manouchehr, Hatami Zarneh Daryosh (2016). Analysis Of The Relationship Between North Sea-Caspian Teleconnection Pattern And Minimum Temperatures In Iran. GEOGRAPHIC SPACE, 15(52), 137-159.

Givati, A., & Rosenfeld, D. (2013). The Arctic Oscillation, climate change and the effects on precipitation in Israel. Atmospheric research, 132, 114-124.

Hatzaki, M., Flocas, H. A., Maheras, P., Asimakopoulos, D. N., & Giannakopoulos, C. (2006). Study of future climatic variations of a teleconnection pattern affecting Eastern Mediterranean. Global Nest J, 8(3), 195-203.

Kahya, E. (2011). The Impacts of NAO on the Hydrology of the Eastern Mediterranean. In Hydrological, Socioeconomic and Ecological Impacts of the North Atlantic Oscillation in the Mediterranean Region (pp. 57-71). Springer, Dordrecht.

Karamouz M.,Ramezani,F,Razavi,s,2007,Forsting the long-term of rainefall through metrological sigals: Applition of Artifical Neural Networks , Sevensth International Congress on Civil Engineering ,thran ,p11.

Kutiel, H., Maheras, P., Türkeş, M., & Paz, S. (2002). North Sea–Caspian Pattern (NCP)–an upper level atmospheric teleconnection affecting the eastern Mediterranean–implications on the regional climate. Theoretical and Applied Climatology, 72(3), 173-192.

López-Moreno, J. I., Vicente-Serrano, S. M., Morán-Tejeda, E., Lorenzo-Lacruz, J., Kenawy, A., & Beniston, M. (2011). Effects of the North Atlantic Oscillation (NAO) on combined temperature and precipitation winter modes in the Mediterranean mountains: Observed relationships and projections for the 21st century. Global and Planetary Change, 77(1-2), 62-76.

Mann, M. E. (2002). Large-scale climate variability and connections with the Middle East in past centuries. Climatic Change, 55(3), 287-314.

Marcella, M. P., & Eltahir, E. A. (2008). The hydroclimatology of Kuwait: explaining the variability of rainfall at seasonal and interannual time scales. Journal of hydrometeorology, 9(5), 1095-1105.

Masih, I., Uhlenbrook, S., Maskey, S., & Smakhtin, V. (2011). Streamflow trends and climate linkages in the Zagros Mountains, Iran. Climatic Change, 104(2), 317-338.

Räsänen, T. A., & Kummu, M. (2013). Spatiotemporal influences of ENSO on precipitation and flood pulse in the Mekong River Basin. Journal of Hydrology, 476, 154-168.