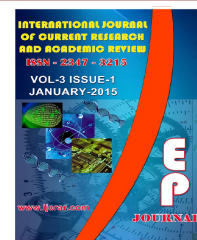




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### Detection of precipitation, temperature rather to mean, and its effect on ponds in Khuzestan province

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#### KEYWORDS

Climate changes,  
Changes coefficient,  
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#### A B S T R A C T

The Khuzestan province is located in southwest with 64055 space square kilometers. In terms of climate, the low area in this province are dry and warm such as Ahvaz, Abadan, Mahshahr; and the areas which have a more altitude, have steppe climate with winter rainfall. Only "Izeh" has a Mediterranean convention humid temperature climate, among the cities in this province. In order to clarify climate change, we calculated changes coefficient and mean in a 30 years period (1980–2010) with investigating precipitation and temperature in five synoptic stations, and then it calculated for 1980, 1990, 2000 and 2010 decades. Then we identify that in all stations especial in last decade (2000–2010), we face to increase in minimum and maximum temperature. In addition, it is significant that there is reduction in all stations.

#### Introduction

The ponds are the God- given gift that 30 percent of plant and animal species live throughout it or depend to it. In this way, they have main role in providing human needs and if we like earth to a human body, ponds are as an earth lungs.

With regard to this matter, that Iran is a dry area, but due to topography and natural conditions, has a several ponds and every pond is unique. Until now, more that 1000 ponds identified in Iran that include wide

range from lochs and swamps of Khazar low areas to natural deltas of Sistan in east, wide salt lakes in central plateau to Mesopotamia deltas above Persian Gulf and Turkmen steppes lakes. While, generally Iran climate is (semi) arid, so these ponds are valuables areas cause to protect local climate. In addition, In fact, keeping from these areas is keeping scarce habitants for scarce species, which is destroying.

In recent years, we face to climate changes in many scientific community and we investigate its effect on environment. Khuzestan province did not have any changes in precipitation and temperature with a space about 64055 square kilometers, which the low altitude areas constitute more parts of this province and the high altitude areas are tiny.

### **Material and Methods**

In order to clarify climate changes in Khuzestan province, we, at first provide minimum and maximum average temperature statistics, its monthly mean and precipitation statistics for synoptic stations (5 stations). Then, available rate divided to 3 decades and we concluded mean and changes coefficient for every decades in order to determine changes rate about decade mean. Then, we investigate the relation between precipitation rate and temperature degree and its effect on fluctuations of ponds annual space.

Table 1 shows average rate and changes coefficient of precipitation and temperature parameters. We determine temperature changes via movement mean paradigm of 5 years.

### **Researches findings and results**

Khuzestan province is one of the country provinces that has a unique ponds and you can see ponds with freshwater and saltwater in it, which everyone have a significant role in the areas where they located in it, and the life of many habitants is depend on it.

Of the most important ponds in this province are “Hooralazim”, “Shadegan”, “Bamdezh”, “Mianganaran” and “Bandon”. Everyone has a high potential to attract and has a high attractiveness for bird – watching in country.

In this research, at first, we identify provinces’ cities, which have pond, or there is pond near them. Then we provide 30-years statistics of minimum average temperature, maximum temperature, and monthly mean-precipitation for synoptic stations in these cities to identify climate changes. Then these rate divided into 3 decades and calculate mean and changes coefficient for every decade to identify decade on average, determine the effects of these changes (precipitation – temperature) to remove and destroy ponds in province. Finally, we investigate human role and non-normative, profit-seeking and hostile behaviors to destroy ponds.

After reaching average and drawing movement average and calculating changes coefficient, the following results obtained:

#### **Abadan station**

This station has a 31-degree latitude and 21 north-minutes and 48-degree longitude and 15east-minutes and its altitude from the sea is 6.6 meters. According to Coupon classification, it has dry and warm weather. According to Table 2, the average of minimum temperature in first decade to period average decreased one percent, and in second decade increase to 13 percent. This increasing continues to last decade and reaches to 1 degree. Minimum temperature average decrease in first decade about 0.4 degrees and in second decade about 0.3, but in third decade, it increases 0.7 degree. In addition, the precipitation had some changes in these three decades: in first decade, it decreases about 5.5 percent, in second decade increases 22 percent, and in third decade decrease 15 percent (Figure 1).

#### **Ahvaz station**

Ahvaz is located in 31-degree latitude and 20 minutes, and 48-degree longitude and 40

east-minutes with 22.5 altitudes from the sea level. According to Coupon division, it has warm and dry temperature. Minimum temperature changes decreased about 1 degree in first decade rather to mean. In second decade, it was equal to period mean and do not show any increase or decrease change, but in third decade, it has increase rather to period mean 0.8. In addition, maximum temperatures mean decreased in first decade about 0.2, in second 0.4, but in third decade increased about 0.7. Precipitation increased about 19 percent in first decade and 25 percent in second decade, but it decreased 33.8 percent in third decade (Figure 2).

### **Dezfool station**

Dezfool is located in 32-degree latitude and 24 minutes, and 48-degree longitude and 33 east-minutes with 143 altitudes from the sea level. According to Coupon classification, it has steppe weather with winter precipitation. Minimum average temperature e in first decade of study decrease 1.1 degree. In the second decade, there was an increase equal 0.2 and in the third decade was about 1 decade rather to average. Also maximum temperature condition decreased in the first and second decades about 0.1 and about 0.2 respectively, but the third decade temperature increased 0.3 degree rather to average. Precipitation decrease 1.5 degree in the first decade. In the second decade, it increases 50 percent, but it decrease 43.7 degree in third decade (Figure 3).

### **Masjed Soleiman station**

This station is located in 31-degree latitude and 56 north-minutes, and 49-degree longitude and 17 east- minutes with 320 altitudes from the sea level. According to Coupon classification, it has semi-arid mountains weather. Minimum temperature

changes in the first and second decade had 0.2- percent reduction rather to period average. Nevertheless, in third decade, it shows 0.3 percent increases rather to average. Maximum temperature changes reduced in first and second decade and its amount was 0.4 and 0.2 respectively, but it shows 0.6- percent increase in third decade rather to average. The precipitation increased 27.1 and 51.7 percent in the first and second decade respectively, but it shows 71.7 percent reduction in the third decade rather to average (Figure 4).

### **Ramhormoz station**

This station is located in 31-degree latitude and 16 north-minutes, and 49-degree longitude and 36 east- minutes with 150.5 altitudes from the sea level. Minimum temperature average changes reduced 0.8 rather to average in the first decade, and this reduction reached to 0.15 in the second decade, but it increases 1 degree rather to average. Maximum temperature average decreased in the first and second decade about 0.6 and 0.18 respectively, but in the third decade, it increases 0.7 rather to average.the precipitation condition reduced 28.1 percent in the first decade and it increased 49.3 percent in the second decade and in the third decade it decreased 19.3 percent rather to average (Figure 5).

Generally, annual space fluctuations in the ponds subordinate water inlet amount and evaporation, and its width reach to maximum in spring. So, the relation between precipitation amount and temperature degree effect on them in the different months in a year.

Ponds variations related to changes in water in rivers ends to it; therefore, it has changes and fluctuations due to changes in discharge sources. These changes – that are natural

transformations – created during long years continuously. The second kind is those changes that are due to human interferences. These changes whether are due to performing projects and especial operations in ponds domain or generally are indirect and due to measurements which is done to test basins and utilization from main water sources in “Hour” before reaching to it. It causes to changes in ponds spaces in several years.

According to the World Bank reports, the loss due to pond destructions in country was 350-milliard dollar in 2002. Because the ponds located in lowest points of basins, usually they are under changes and variations. The most significant of these variations, that are threat for ponds, are as follow:

1. Decreasing enter water to ponds from underground and surface resources of basins and plains around ponds especially due to dam projects.
2. Performing great infrastructure and development plans such as petrochemical and refinery in effect range of ponds.
3. Entering biological-chemical – physical pollutants emission from agriculture farms in cities, industries and sediments due to upstream soil erosion in ponds.
4. Irregular hunting and grass feed harvesting and other ponds productions more that renewable power in ponds.
5. Change in lands application in ponds for agricultural affair and so on.
6. Changing climate and drought govern on country that causes to decrease in precipitation and increase temperature.

The above issues are in fact some happened aspects of a series of wise management barriers in ponds that to overcome them, we should consider these barriers. Some main barriers of ponds unstable environment variations are as follow:

1. Management structure available in ponds to support millions hectare ponds in country is incomplete and non-economic.
2. Current rules and regulations did not provide necessary administrative support to protect and preserve ponds.
3. There are false cultural properties such as illegal hunting, pollution of ponds, occupation ponds lands.
4. There is Lack of enough mechanism for corporation intersectional in responsible governmental systems.
5. Very low productivity in agriculture section especially in water consumption efficiency and lack of dynamic economic and with a high added- value in this section.

Some reasons to destroy ponds in this province are in Table 3.

### **Conclusion and Suggestions**

After investigation of precipitation and temperature statics in 5 synoptic stations, we reach to following conclusions:

1. Temperature minimum in mentioned stations in two first decades had a increase and decrease fluctuations, but in all stations in third decade (2000- 2010), there is an increase in minimum temperature.
2. There was not any regularity in maximum temperature, and we observed fluctuations in two first decades in all stations. However,

we observed increase in third decade in all stations.

3. Precipitation condition decreases in all stations especially in third decade. In some stations, this reduction is significantly. We can also observe that there are changes in temperatures and precipitation amount in province, but the ponds destruction trend in province is not generally due to these changes, because we can observe that un-scientific human interferences had the most shares in destruction trend clearly. Therefore, ponds management and reaching it to ecological condition is necessary. Therefore, those measurements recommend improving ponds condition in province faster than climate changes. Some of these measurements are as follow:

1. Set new rules and regulations and create coordination between related organs to protect province ponds.
2. Build educational and research facilities and centers for province ponds: currently most of province ponds do not have research centers.
3. Investigate and improve quality and quantity of province ponds water: that is one of the most important parameters to revival ponds. Ponds systems destruction via water discharge, resources and dams can affect on ponds water quantity, sometimes more that precipitation component. Water quantity follows some parameters such as salty, nutrient and toxin.

4. Decreasing effluent enter of province factories to ponds: that so affected to save ponds. Whatever, now we see in province, is discharging kinds of effluent to ponds.

5. Protect from plant cover in province ponds: that have a significant role to preserve water quality. In addition, it can protect biological variation of province ponds as a wildlife habitat.

6. Hunting control: this matter is so important and vital especially during production periods such as generation.

7. Protect ponds bed condition: sudden deliver water from different resources may cause to destroy some mollusk species in ponds bed. In addition, we should prevent from sediment and dredging in ponds, because both factors affect on biological variation.

8. Protect natural shores and benches in province ponds: because these places is as important as a place to generation and rest of some species and any changes in them cause to destroy this pond performance.

9. Revive destruction ponds and ponds species.

If drying in province ponds and their destruction continue, it can cause to irreparable losses to environment and could have adverse effect on human healthy via spreading fine- dust.

**Table.1** Average, precipitation, and temperature changes coefficient in Khuzestan province stations

<b>Ramehrmez</b>	<b>Masjed Soleiman</b>	<b>Dezfool</b>	<b>Ahvaz</b>	<b>Abadan</b>	
19.47	19.08	15.9	18.6	18.37	Period average
4.9	3.2	1.6	4.8	4.9	Period changes coefficient
18.6	18.86	14.86	17.68	17.36	Average decade 1
2.2	22.8	2.7	2.9	2.2	Changes coefficient decade 1
19.32	18.97	16.15	18.64	18.5	Average decade 2
4.5	3.7	3.8	3.8	3.1	Changes coefficient decade 2
20.42	19.39	16.87	19.41	19.19	Average decade 3
1.4	2.2	3.1	2.7	2.6	Changes coefficient decade 3
32.7	31.45	32.44	33.18	33.35	Period average
2.8	3	2.1	2.4	2.7	Period changes coefficient
32.03	31.03	32.21	32.97	32.96	Average decade 1
1.7	2.5	1.7	1.3	1.6	Changes coefficient decade 1
32.52	31.21	32.35	32.72	33	Average decade 2
3	3.2	2.1	2.8	3	Changes coefficient decade 2
33.48	32.6	32.73	33.79	34.03	Average decade 3
1.5	2	2	2.4	1.8	Changes coefficient decade 3
315.42	439.15	397.16	229.19	159.09	Period

					average
23.8	32	29.7	38	37.3	Period changes coefficient
287.7	466.26	395.57	248.2	153.59	Average decade 1
12.4	32.8	23	24.7	37.9	Changes coefficient decade 1
364.58	490.93	466.97	253.99	181.14	Average decade 2
27	27.9	31.6	44.1	35.1	Changes coefficient decade 2
295.94	367.43	353.34	195.23	144.06	Average decade 3

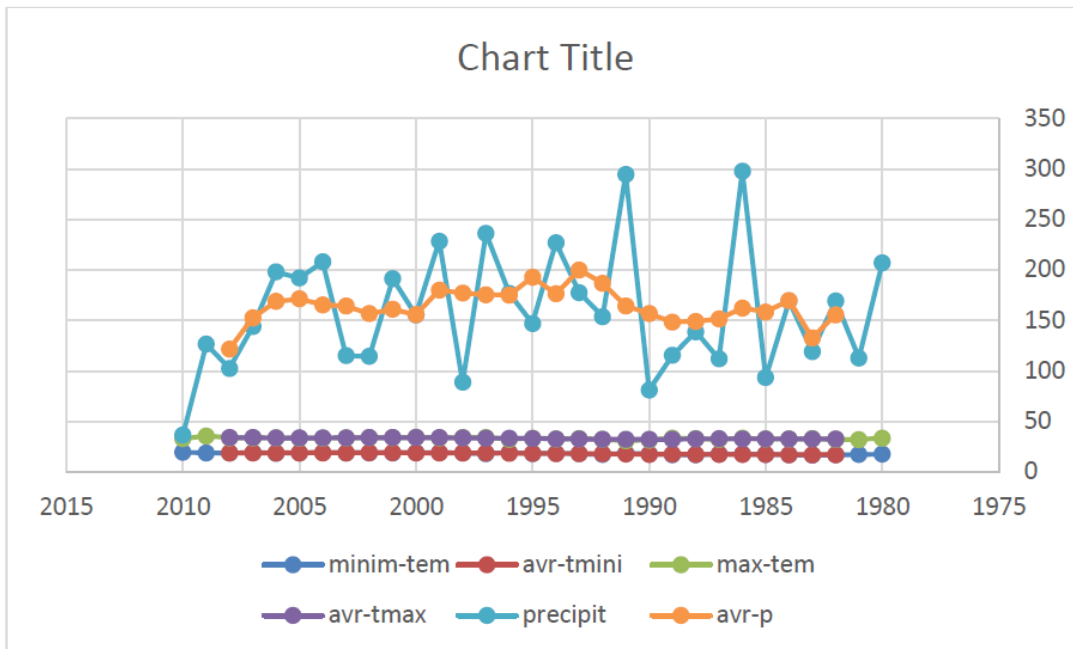
**Table.2** Precipitation and temperature changes amount in three decades in Khuzestan province stations

		<b>Abadan</b>	<b>Ahvaz</b>	<b>Dezfool</b>	<b>Masjed Soleiman</b>	<b>Ramermez</b>
minimum Temperature changes average	First decade rather to average period		8	1.1-	0.2	0.8
	The second decade rather to average period	0.5	0.8	0.1	-0.1	-0.1
	The third decade rather to average period	1.2	0.01	0.8	0.3	0.9
maximum Temperature changes average	First decade rather to average period	-0.05	0.0 6	-0.1	-0.4	-0.6
	The second decade rather to average period	-0.0 1	-0.1	-0.4	-0.2	-0.1
	The third decade rather to average period	10.2	0.9	-0.02	0.6	0.7
precipitation changes average	First decade rather to average period	-0.14	38	-41.1	27.11	-28.1
	The second decade rather to average period	27.4	43.7	20.6	51.78	49.3
	- The third decade rather to average period	-119.4	-175.6	5.03	-71.7	-19.2

**Table.3** Main factors to destroy ponds

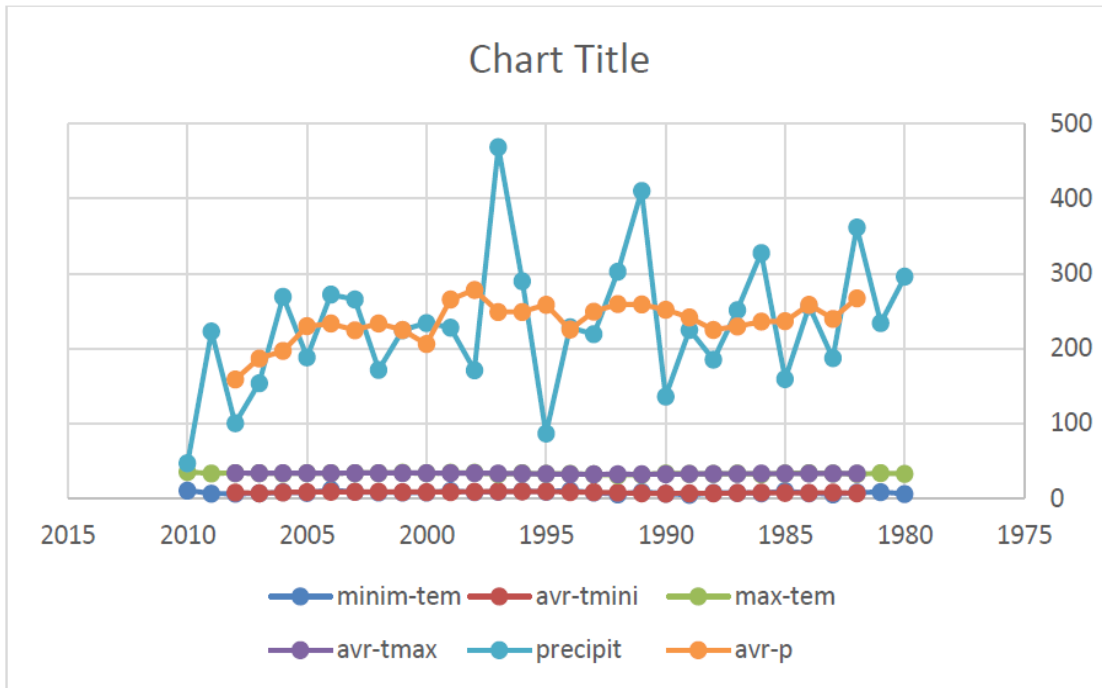
Main threats	Main reasons to destroy ponds	
Human measurements	Drainage Dredging and canal in water flow Filling sediment Building dams Plowing for production crop Changing water consuming in order to other consumptions Climate change ( increasing sea water level – acidification of sea water )	Mining Water and air pollutants Triggering poison chemical material Grazing Cutting trees Embankments Building Drainage and surface waters Creating changes in nutrients surfaces
Natural threats	Erosion Earth summit Increase in sea water	Drought Wind-round and other kinds of storms Climate change

**Figure.1** Minimum and maximum temperature changes, precipitation, and movement average in Abadan station

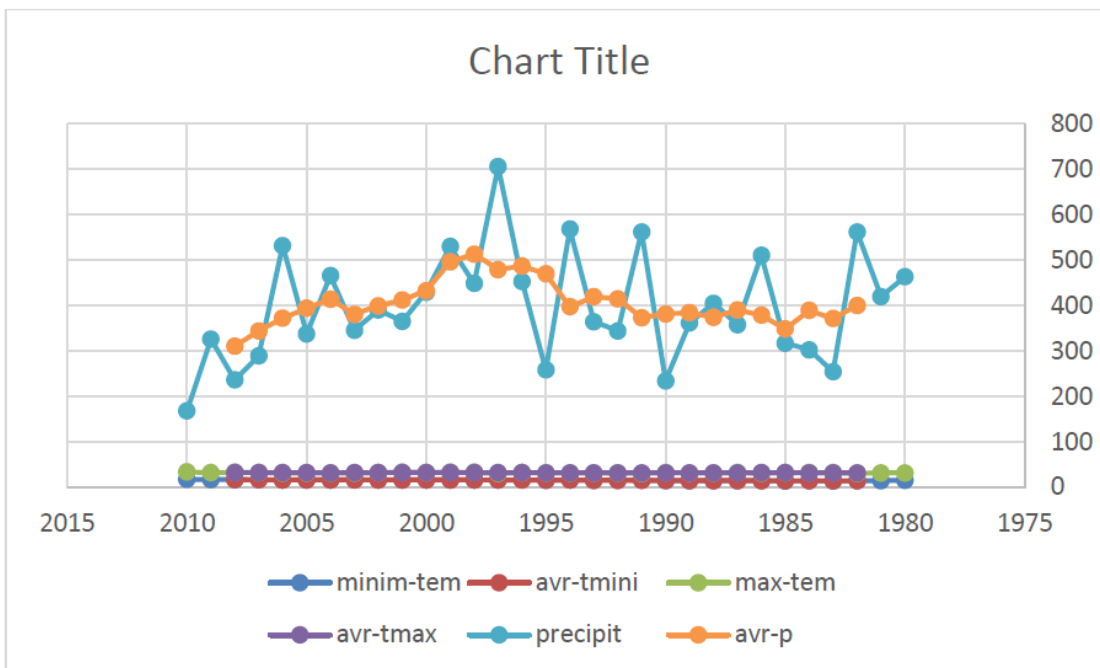




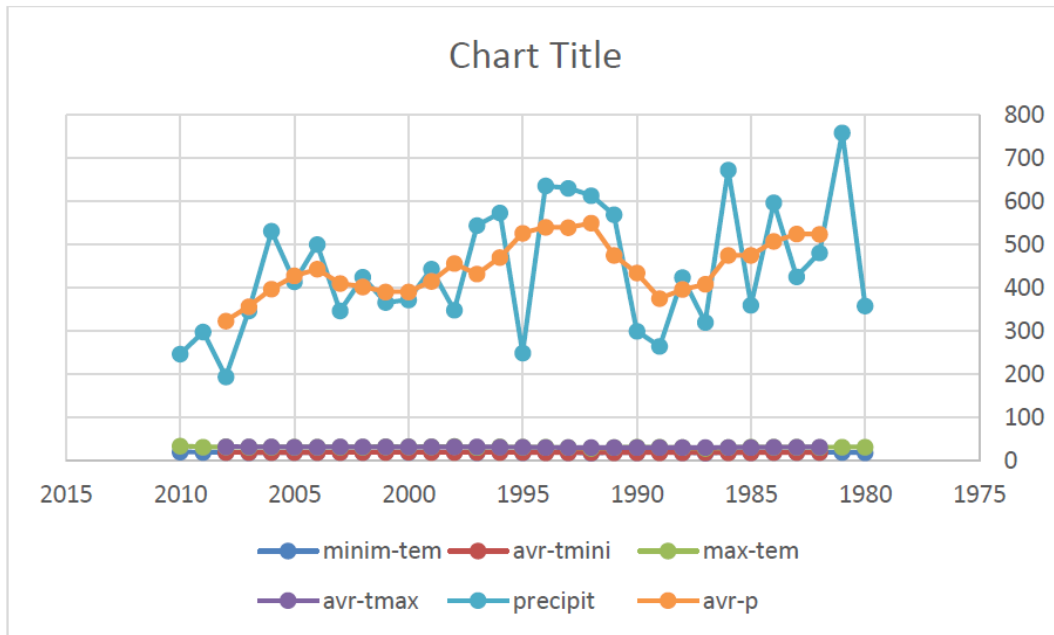
**Figure.2** Minimum and maximum temperature changes, precipitation, and movement average in Ahvaz station



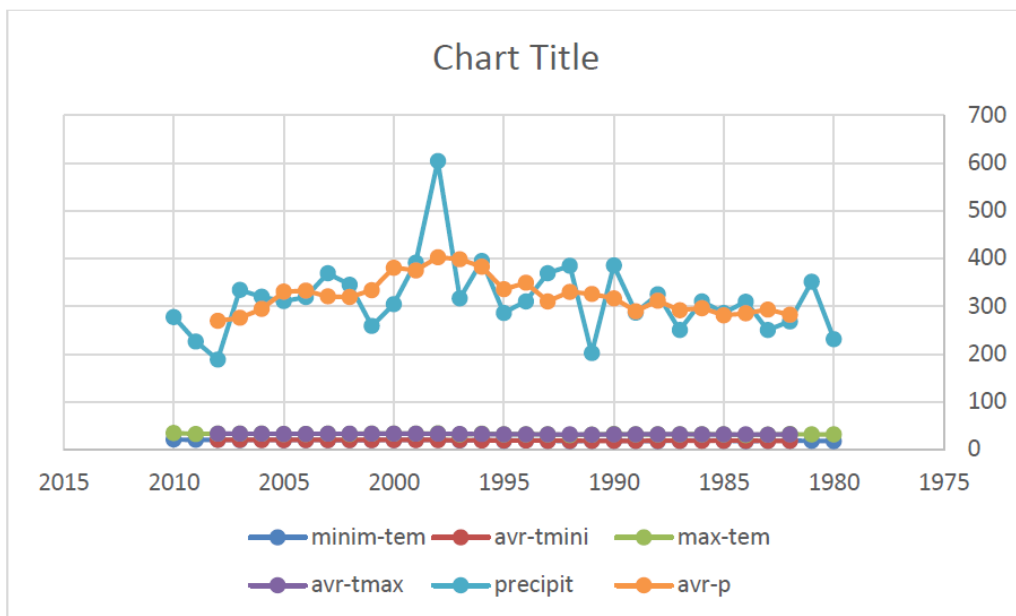
**Figure.3** Minimum and maximum temperature changes, precipitation, and movement average in Dezfool station



**Figure.4** Minimum and maximum temperature changes, precipitation, and movement average in Masjed Soleiman station



**Figure.5** Minimum and maximum temperature changes, precipitation, and movement average in Ramhormoz station



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