Simulating the Trend of Temperature and Precipitation Change in Stations Selected in the Great Karun Basin

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Introduction

The Increase in greenhouse gases in recent decades has caused an increasing in the earth's temperature. As recent scenarios of the state board of climate change have predicted global average temperature increase to 0/76 ° C in the last century x up to 6/4°C until 2100 are expected (IPCC, 2001) This phenomenon is called "climate change". Climate change can be very effective on water resources system. In this sense, climate change is considered as one of the major challenges human beings face in future decades.

In this study, using the atmospheric general circulation model (GCM) (General Circulation Model) under the scenario of greenhouse gases (SRES), changes in rainfall and temperature in the period 2010-2039 for stations of Ahvaz, Dezful and Khorramabad as selected stations of great Karun basin are simulated. The required data including average monthly temperature and total rainfall in mentioned time period are obtained from two models of HadCM3 & CSIRO and models of Atmospheric general circulation model scenario of a A2 & B1 and can be used from proportional method of basic and future periods. The results suggest an increase in temperature and a decrease in precipitation in the mentioned time period (2010-2039).

Materials and Methods

Considering different heights and natural variation of Karun basin, it is seems normal to find diverse climates in this basin. To evaluate the accuracy of the data and the period of data suitable for this study, three main stations were selected in this basin, among them, Khorramabad station was considered as the mountain part, Dezful station as the middle, and Ahwaz station as the southern part.

Simating climate variables at the post periods by models HadCm3& CSIRO

Temperature and precipitation are main and basic elements of each climate and are among the main indicators climate Zoning are method of simulating local climate variations in a specific region is to evaluate time periods in a long time statistical period(lager then a few hundred years. Due to lack of long term observations in most parts of the world, the alternative way is using simulation of (AOGCM). These models are based on laws of physics which are presented by mathematical relations. These relations are solved in a three dimensional network at the Earth's surface. For simulating the climate of the Earth, main climate phenomena (Atmosphere, Kryosphere, Biosphere and Hydrosphere) are simulated in separate sub-models. Till now; many models of atmosphere general circulation have been presented by different research centers. In all of them, eight climate variables including precipitation, mean sea level pressure, solar radiation, mean temperature, dew point temperature, minimum temperature, maximum

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air temperature and wind speed at 10m altitude from earth surface until years 2100 are simulated under different scenarios. In this study, the outcome of two models Had CM3& CSIRO Under scenarios of A2 & B1 refereed to Fourth assessment report IPCC(AR4) are used.

Small-scale data

Considering the low acuity of places of atmospheric general circulation, using them in local scale is not possible. So, it is necessary to correct them. These corrections are done by decreasing statistical climate precipitation data by Alkuma and colleagues which is based on correction made by difference between man annual observed and simulated data.

$T'_{GCM=}T_{GCM}-(\overline{T}_{GCM}-\overline{T}_{CRU})$

$P'_{GCM=}P_{GCM}\times(\overline{P}_{CRU}/\overline{P}_{GCM})$

T'_{GCM}, is corrected temp. P'_{GCM} Is corrected precipitation for a specific month.

T_{GCM}, is not corrected simulated temp. P_{GCM} , is not corrected precipitation.

$\overline{T}_{GCM}$, is mean simulated annual temp. $\overline{P}_{GCM}$, is mean simulated annual precipitation for base 30 years period in model GCM. Also $\overline{T}_{CRU}$ is mean observed annual temp $\overline{P}_{CRU}$ is mean observed annual precipitation for the above mentioned (30 years) period?

The studies show that mean monthly temperature in model Hadcm3& CSIRO Under scenario of A2 in Karun basin has increased up to 1/7 & 2/2° C and under scenario B1 2° C & 1/8° C, respectively compared to observatory period. Also, mean monthly rainfall is decreased in Karun Basin in models Hadcm3 & CSIRO and under scenario A2 down to 0.9 & 0.4 percent & under scenario B1 down to 2.7 & 4.6 percent, respectively, compared to the observatory period.

Results

This study show that mean monthly temperature will increase and mean monthly precipitation will decrease in Karun basin in 30 years from now. Studies show that most increase in mean monthly precipitation in model CSIRO under scenarios A2& B1 in November which is 5.2 & 5.8 percent and in model Hadcm3 under scenarios A2& B1 is 15.5& 12.2 monthly precipitation for model CSIRO under scenarios A2& B1 is in march which is 0.4& 4.6 percent and for model Hadcm3 under scenarios A2& B1 in February is 0.9& 2.7 percent respectively.

Conclusion

In this paper have tried to present a method for revealing climate change in past periods in local small scale and its relation to greenhouse gases considering climate processes in a specific region. Generally, the results show an increase in temperature and precipitation. Considering the fact that Karun basin is one of the most important basins in our country, and water shortage and drought crisis have been more frequent in this area and have caused regional and national significant problems, and decreased the quality of water resources.

It is worthy to get ready and prepared to defend against probable changes. Also, it seems necessary for the qualified responsible authorities to take proper measures against these changes. The results indicate that the effects of greenhouse gases are more obvious in the final years of the mentioned time period. So, we need to worry more.

Keywords: global warming, climate change, simulation, Atmosphere general circulation, great Karun Basin