

Modelling of Climatic Parameters in Province of Southern Khorasan

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Extended Abstract

Introduction

Climate change has played an important role in all aspects of human life. Therefore, climate predictions in atmospheric general circulation models (GCM) will have particular importance. In this study, downscaling by A1B scenarios, IPCM4 and BCM2 of atmosphere general circulation models in LARS-WG model are used for analysis of climate change impacts on maximum and minimum temperature, solar radiation and precipitation. The data have been gathered from 7 Synoptic stations in province of Southern Khorasan. For this purpose, assessment process of simulation and observation data are conducted by three steps, including calibration, validation and modelling. To evaluate the agreement between the observed and simulated data, two indexes were used; Root Mean Square Error (RMSE) and Coefficient of Determination (CD). The results of analysis in Makesens, Sin's Estimator and Mann-Kendall showed that minimum temperature, maximum temperature and evapotranspiration in all stations will be increased in years of 2011-2060. The results have shown that rainfall in all stations (except Ghaen station) will be decreased and solar radiation in all stations (except Ghaen and Ferdous station) will also be increased. Increasing trend in temperature in Birjand and Ghaen station will be lower and in Tabas Station will be higher. It may be appeared that weak changes in climatic parameters in some stations are related to specific geographical conditions and topography of this region.

Climate change in the past and today would change the pattern of human life and it seems that humans and their activities are causing the global climate change. Uncontrolled growth of

population, transportation and other human activities, particularly pollution resulted from industries lead to major changes in climate. After the industrial revolution changes in global climate such as increases in extreme climatic events have appeared due to the excessive use of fossil fuels and land use change. At present, this variability has become a major concern of climatologists and weathermen. Therefore, attention to researcher long term forecast about climate parameters for change value help decrease the effects of ill climate change. Atmospheric general circulation models to assess future climate is one of the common methods. Meanwhile, LARS-WG model as one of the general circulation models of the atmosphere is important for future climate change and has led to some efforts by many scholars. The high accuracy of climate data modelling in different climatic stations has been confirmed by many researchers.

Methodology

In this study at first, daily statistics including minimum temperature, maximum temperature, rainfall and radiation related to 7 Synoptic stations in province of Southern Khorasan were obtained from meteorological organization of Iran (Table: 1).

Table 1: Geographical characteristics of the sample stations

Stations	LON	LAT	EIE
Birjand	59 12	32 52	1491
Boshruyeh	57 27	33 54	885
Ferdous	58 10	34 10	1293
Ghaen	55 05	33 47	845
Khour	58 28	32 56	1117
Nehbandan	58 48	36 16	1213
Tabas	56 55	33 36	711

In Second step, some weather data have been produced by using parameters listed in Lars models. Two BCM2 IPCM4 models for each synoptic station in South Khorasan are used in this study to arrive target modeling data under scenario A1B. After entering data into the model Lars-wg and getting the trends in the observed time series data, we have attempted to reproduce the data at the stations during 2011- 2060.. Finally, the simulated data are compared with observed data using statistical analysis and graphing. They have also examined the ability of the model to simulate meteorological data in stations. The Root Mean Square Error (RMSE) and coefficient of determination (CD) have also been applied. If the RMSE values are closer to zero, this indicates the observed and simulated values are closer to each other and to be more precise answers in each step.

Results and Discussion

The results of the research showed that BCM2-A1B models in Birjand, Boshruyeh, Ferdous, Nehbandan and Tabas and IPCM4-A1B models in Ghaen, have the lowest simulated values. Distribution of annual minimum temperature simulated for the period 2011-2060 shows that the

minimum temperature in southern Khorasan province is 0.02 per year and the coefficient of determination of 0.09 is increasing and that the minimum temperature during the five decades can be changed between 11.4 to 12.9 degrees. The simulations conducted by LARS-WG models over the next fifty years will change in the average of minimum temperature among the Synoptic stations of provinces, from 7.5 degrees in Ghaen to 17 degrees in Tabas. The average of maximum temperature will also change from 23 degrees in Ghaen to 30 degrees in Tabas. In province of South Khorasan, the average of minimum temperature is 12 degrees and the average of maximum temperature is 26.6 degrees. Increasing trend of temperature in Birjand and Ghaen stations will be lower and in Tabas Station higher. Obviously, due to the lower temperature, the cities of Ghaen and Birjand will experience more precipitation. Nehbandan, Tabas and Khor will have the highest mean radiation in cities and Birjand will receive the lowest evapotranspiration and radiation and Tabas the highest rates of evapotranspiration.

Conclusion

From the results this can be concluded that BCM2-A1B models in Birjand Boshruyeh, Ferdous, Nehbandan and Tabas and IPCM4-A1B models in Ghaen have the lowest differences imulated values with observed values. Results of LARS model simulations for the next fifty years showed an average low temperature in Ghaen and Birjand cities. The Birjand has the lowest rates of evapotranspiration and Tabas the highest temperature and the least amount of precipitation. Ghaen had not seen much rain, but relative to other stations it will have weak increasing trend. The results of analysis of Makesens, Sin's Estimator and Mann-Kendall showed that in the years from 2011 to 2060 we will experience an increase in the minimum temperature, maximum temperature and evapotranspiration in all the stations and also a decrease in all (except Ghaen station). It will also observe an increasing trend in radiation in all stations except for Ghaen and Ferdous.

Keywords: *Climate Change, General Circulation Model, Lars-WG, Province of Southern Khorasan, Trend.*