Assessment of the Precipitation and Temperature Changes over South East Iran Using Downscaling Of General Circulation Models Outputs

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Received: 16 June 2015 Accepted: 1 January 2016

Extended Abstract

Introduction

Numerous studies have demonstrated the relationship between the amount of CO_2 in the atmosphere and climate change. In this respect, developed countries have an undeniable role and cause serious damage to earth environment throughout the world. IPCC' forth evaluation report implies that adding greenhouse gases to the atmosphere during recent decades prevents the heat rays to emit which, in turn, cause atmospheric temperature to increase. During the past centuries, the temperature has increased by 3 to 6 Degrees Centigrade, with a rapid speed in the recent decades. It is believed that if greenhouse gases continue to increase at the present rate, an average increase in temperature, from 1^c to3.5^c, is expected by the year 2100. Therefore, it is necessary to study and evaluate climate changes in the future decades so as to plan a proper environmental program corresponding to future climate conditions, consequently reduce its unfavorable effects. With the uncertainty in Atmospheric Circulation Models being taken into account, the present study investigates the temperature and precipitation changes in Southeastern Iran during the following periods: 2011-30, 2044-65, and 2080-99.

Material and Methods

We have used two datum groups, namely, observed data and model data. These are including maximum and minimum temperature, precipitation and solar radiation. The period, 1983-2007, was chosen as the observed period; data from weather synoptic stations were gathered. The required data for General Circulation Models including IPCM4, NCCCM3, HADCH3, and INCM3 with three scenarios of A1B, A2, B1 were gathered from the two Reference Networks,

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Canada Climate Change Reference and data bank of LARS-WG5.1. The most upgraded version of LARS-WG5.1 was used to evaluate climate change in Eastern South of Iran. This version observes the forth report on IPCC. Therefore, it uses the outputs of 15 General Circulation Models with A1B, A2, and B1 Scenarios. Four climate models with three shared Scenarios were used in this study.

Time series of the observed data from synoptic stations in Eastern South of Iran were compared with those of IPCM4, NCCCM3, HADCH3, and INCM3 in similar periods with A1B, A2, and B1 scenarioes. To do so, first, average time series of each station were computed using temperature and precipitation data from synoptic stations; then, monthly thermal data and those of GCM fall values during the study period were received from CCCSN (Canada). Finally, the mentioned data were compared with the average temperature and precipitation during the study period. To investigate the uncertainty resulted from employing various GCM models, weighting method of averages of the observed temperature and precipitation was used.

Results and Discussions

General circulation models don't have equal results in estimating long-term temperature and precipitation. This indicates the existing uncertainty in their outputs. Analysis by T-test and Chi square statics results for all stations, revealed no significant difference between the modeled and observed values at $P < 0.05$.

In general, the results show that LARS-WG Model is capable of modeling the climate in previous periods of the studied stations. The average precipitation and temperature of the stations were compared using LARS-WG Model. The results revealed an increasing trend in the temperature of all the studied regional stations in future. The 90 year thermal increases in the following stations are 0.44-3.53 in Bam, 0.52-3.30 in Bandar Abbas, 0 .39-2.64 in Chabahar, 0.85-3.41 in Iranshahr, 0.38-2.27 in Jusk, 0.76-3.82 in Kerman, 0.55-3.47 in Zabol, and 0.54-3.57 in Zahedan. The above values are in Degree Centigrade.

The most distinctive feature of modeling, in regard to precipitation, is lack of harmony in its increase or decrease trends in future. In other words, it cannot be concluded that precipitation, like temperature, has an increasing trend; rather it has fluctuations. As the modeled values revealed, precipitation increases in all the stations during spring. Although it is relatively more in such dry stations as Bam, Kerman, Zahedan, Zabol, and Iranshahr, this, in turn, causes spring floods.

Conclusion

This study investigated the effects of climate change on the two weather parameters, temperature and precipitation. This was carried by the data gathered by Atmospheric General Circulation from the synoptic stations located in Eastern South of Iran. The obtained results showed that LAR-WG Model is capable of modeling precipitation and temperature values. According to the results, it was indicated that NCCCM3, HADCH3, IPSLM4, and INCM3 models have a good performance in simulation of precipitation. Regarding temperature, HADCH3 Model proved a good capability in most months. The obtained weights having been applied on model values, an increasing temperature trend was indicated in all the stations. Furthermore, it was also indicated that thermal increasing amount in coastal stations is higher

than that of dry ones. The highest increase in temperature belongs to Kerman, Zahedan, Bam, Zabol, and Iranshahr, in order. Accordingly, all coastal stations would experience a thermal increase less than 3^c, while the value for dry stations would exceed 3^c. It seems that temperature follows a steady increasing trend, whereas precipitation in various stations is fluctuating during different seasons.

Keywords: climate change, downscaling, general circulation model, southeast Iran.