Using SDSM Model to Downscaling Precipitation and Temperature GCM Data: Case Study for Station Climate Predictions over Iran

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Introduction

Iran is located in the south-west of Asia and is in the arid belt of the world and about 60% of the extent of the country is mountainous and the remaining part (1/3) is desert and arid land.

climate of the country can be divided into three main categories: -Warm temperate, rainy with dry summer in a narrow strip in the north, -Dry, hot desert in the central plateau, -Dry, hot steppe covering the rest of the country. Then, it could be so difficult to predict climate change over whole of the country.

In this case, using new methods for solving weather equations and having climate prediction because of its long term temporal has so many important roles for massive management. In climate change studies, the global circulation models (GCMs) are usually used to simulate the past and future global climate. Unfortunately, despite the advancement in GCM research and modern computing technology, the most recent generation of general circulation models still have serious problems due to their low spatial resolutions (with the field variables being represented on grid points 300 km apart).

So, because of its serious limitation and resolution, using them in long term forecast can't predict actual weather in station scale or small scale and it is important to assess the accuracy and uncertainty of GCMs in various climatic and geographical regions.

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Methodology

To employ output of Global Climate Models and accesses to good resolution, "Downscaling Methods" are used that are divided in two dynamical and statistical groups and some when syncretistic of them. A thorough evaluation of the current generation of GCMs has only started recently and the evaluation of a rich spectrum of indices on extremes is new.

In this, calibrating downscaled data is very important as a main parameter to reach best resolution and for analyzing long term forecast. Two different approaches to downscaling have been employed. It has adopted a methodology that exploits mean inter station correlations to correct the statistics of grid-box means. The method, closely related to block-kriging, is demonstrated to remove the sample size sensitivity of statistics in daily grid-point precipitation.

It has adopted a direct downscaling by distance and direction weighted average of point observations. At this filed, SDSM is a Statistical down scaling model that distributed both of these aggregation techniques to the consortium. Several data of selected stations have been started applying to a dataset and coding study area. These datasets will provide a valuable reference for model evaluation simulate predictor variables across selected region.

The SDSM model run on selected period and reached amount of precipitation, minimum and Maximum of temperature and their standard deviations. By using statistical methods we could evaluate SDSM outputs to reach the best conclusion and selecting best data. With acceptable results, we could use them for climate prediction over region.

Materials

In this paper, at the first we tried to select 41 synoptic stations that have 41 years climate data (1961-2001). These stations distributed to whole country with several climates.

These data applied our observation dada. At this method we used third version of the coupled global Hadley Centre Climate Model (HadCM3) Outputs as predictor of method and A2 scenario that is one of the most probable emission scenarios.

Then we down scaled them by using SDSM model version4.2 that could downscale general circulation models to station scales.

Then by using statistical methods and reaching differential coefficients could analyses downscaled data by

base data and present suitable correlation of them.

Results and Discussion

Results was shown, there is no significant deference with 0.5 critical errors and correlation of data and accepted at 0.01 significant levels. And there is a good accepted correlation between modeled data and observing minimum and maximum temperature and precipitation data.

Conclusion

So, using Downscaled data is acceptable with suitable efficiency to correct future data at station scale. This study should help to fill in the knowledge gap in GCM downscaling research of climate and add an important

Key words: Global Circulation Model (GCM), Downscale, Climate scenario, Climate Models