A new method for mapping the monthly cooling degree days, Iran

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Extended Abstract

Introduction

One of the main problems in the use of atmospheric general circulation models (GCM) for regional assessments is their low spatial resolution that is required to be downscaling by using statistical or dynamical patterns. Therefore, in this study, it is necessary to consider the effects of different ways on the investigated system. The best mean to consider and investigate the effects of greenhouse gases on the atmosphere at regional scale is the use of hybrid models of AOGCM, as one of the indices of climate degree days that its changes play an important role in environmental issues such as energy consumption for heating and cooling in future. Given the fact that Iran has diversity in elevation and climatic conditions and the most important factor in the cooling needs is along with changes in altitude and atmospheric moisture, the climate change is caused by the effects of global warming.

Materials and Methods

In this study, EH5OM database was used to detect the effects of global warming on cooling degree days. This is like the data of general circulation of the atmosphere and ocean models. This has been formed by data of atmospheric and ocean models. The data are implemented from 1960 to 2100, which are the general circulation of the atmosphere data. An international panel of climate change has been implemented by A1B scenario. EH5OM hybrid model is one of the most successful CMIP3 models in simulating climate, in comparison with the models of the twentieth century. EH5OM is one of the hybrid models of atmosphere-ocean ECHAM5 is related to atmospheric models and MPI-OM is related to ocean model. ECHAM has spectral dynamic core; the data of this scenario have been implemented from 1950 to 2100; the data of this scenario, from 2015 to 2050, were used in this study. Given that this research has regional (Iran) dimension, the data in the fourth climatic regional models (RegCM4) are downscaled that

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are best suited for little scaling and regional processes (Roshan et al., 2012; Randall, 2007). Downscaling model of output data are with dimensions of 0.27×0.27 longitude and latitude. This covers about the dimensions of 30×30 km in area of Iran.

After the simulation, the average of daily temperature for a period of 36 years (2015-2050) was derived by the model in a matrix with 2140×13140 arrays. In the matrix the rows represent the days of a year and the columns are the numbers of cells.

Results and Discussion

Table 1 shows EH5OM model scenarios under the conditions of greenhouse gases (carbon dioxide and sulfur atmosphere) as published by the Max Planck Institute. These scenarios were simulated for the period from 2000 to 2100. In fact, in this study we sought to identify change parameters of cooling degree days, according to the scenario of this model. As it is shown in Figure 1, in most of the scenarios greenhouse gas emission has taken an upward turn from the twentieth century and most of them are included in group A scenarios.

These results were performed with the results of analysis; the process of cooling degree days in the previous period, by Masoodian et al. (1393), showed that most of the upward range of cooling needs can be seen in the summer. But it is in agreement with the results of Roshan et al. (2012) who expressed warming regions of Iran in the first half of the year, in the upcoming period, especially in South Bar. This suggests that hot areas of the country will become warmer in spring. With the onset of summer, the number of the regions possessed the trend will be reduced.

Conclusion

In this research, after calculating the threshold of comfort in each station of the country and its compatibility with the surrounding cells, cooling degree days and its changes were calculated. The results of this research show warmer months of March, April and especially May and June in the coming decades in the country compared with other months of the year. In fact, according to the estimate of this scenario and the use of fossil fuels, the biggest challenge in the months of spring is warmer weather and increased demand for energy consumption. This can be a sign of early consumption of energy for cooling in the country in the coming decades.