

# The Simulation of Climate Change in Semnan Province with Scenarios of Atmospheric General Circulation Model (Hadcm3)

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## 1. Introduction

Climatic change is one of the most important challenges human beings have confronted with in recent centuries due to its severe effects on water resources, agriculture, energy, tourism and even human bioclimatic. Developing strategies, making decisions with awareness about water consumption in different parts in the future, and available water resources management require climatic change information (i.e. precipitation and temperature) which can be directly used with hydrology and climatology models.

In recent years, climate prediction models have been used for numerous purposes such as the generation of climate data using different scenarios related to greenhouse gases in general circulation models. By using these models, the output of general circulation models (GCM) can be examined at micro-scales. One of these models is called LARS-WG, which has received considerable attention from the researchers in Iran or elsewhere.

## 2. Case Study

Using the LAR model, we have collected climate data from among four synoptic stations from their establishment until 2010. Data used in this research including minimum and maximum temperature as well as precipitation were daily recorded. To generate the precipitation values, LAR (a well-known generator model of random data for climatic status) was used. Likewise, the minimum and maximum temperature in every station of Semnan Province was used for both basic and future periods.

In addition,, to investigate the LAR model in simulating, the Ground Truth average bias and absolute error have been calculated for the simulated data and truth in the investigated period:

$$Bias = \frac{1}{n} \sum_{i=1}^n (S_i - O_i)$$

$$MAE = \frac{1}{n} \sum_{i=1}^n |S_i - O_i|$$

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### 3. Conclusion

In these scenarios, there was almost full coverage between the Ground Truth and simulated data. In A1B scenario, more stations bring more assurance in simulating data in winter and spring. The maximum observed and simulated precipitation was calculated by Hadcm3 model scenario in all Semnan stations in March. The minimum precipitation in Shahrood and Biarjmand stations was in July and August, respectively. As for Garmsar and Semnan stations, the minimum precipitation was in September. All stations in January had the least minimum and maximum temperature in January, whereas they had the most minimum and maximum temperature in July.

**Keywords:** Downscaling, Atmospheric general circulation model, Climate change, LARS-WG, Semnan Province.

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