Investigation of impact of land-cover change on climate factors on surrounding areas of Urmia Lake

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Extended Abstract

Introduction

Many factors controlling atmospheric parameters, includes lake and seas, mountains, urban areas and etc. One of this factors is land cover. If the land cover is changing, then the nature of climate will change. One of the important part of land cove are aquatic bodies. Lakes are considered as natural controls on temperature, rainfall and moisture regime in interior continents. Due to climatic changes such as reduced rainfall, increased temperature and also uncontrolled use of surface water resources in watershed areas, distinguished changes are exposed. Monitoring such changes and consequences should be considered as an important issue in the national and regional development and natural resource management. Any change in hydro climatic conditions of lakes such as increase or decrease of their levels is reflected into climatic conditions of lake surroundings. Future more lakes or other aquatic bodies need a minimum amount of fresh water inflow, called environmental flows, to meet specific ecosystem requirements.

Among the most obvious examples of changes in the land cover, is the change in water level of the Urmia Lake and ultimately drying water of the lake in recent years. Urmia Lake with its previous lake area of approximately 5000–6000km 2, had a crucial socio- economic and ecological role in the Northwestern part of Iran. During the past decades, Lake Urmia has been strained by a number of concurrent anthropogenic and natural causes. The aim of current study are numerical simulation of the role of Urmia Lake in climatic elements in surrounding areas of this lake. For this aim the TAPM mode was used.

Urmia lake basin is located in northwest of Iran limited in 44°07´ E to 47° 53´ E longitude and 35° 40´N to 38° 30´N latitude with total area of about 52,679km2.Urmia lake is the largest lake in Iran and one of the world's salt-saturated lakes that has significant role in moderating the climate of a vast area containing East and west Azerbaijan provinces. According to 39-year period of daily precipitation data (1973 to 2011) the annual mean precipitation over the basin is 352 mm.

Materials and Methods

For analysis of climatic role of Urmia lake in Northwestern Iran the synoptic data in station of Urmia and Bonab Cities in respectively in west and east of lake were analyzed. For simulation of the role of Urmia Lake in climatic elements (min, max and mean temperature, monthly precipitation and relative humidity) in surrounding areas the TAPM mode was used. Then by using TAPM model outputs and observed data performance of the model validation. TAPM model is a model for air pollution simulation that made by CSIRO in format comprehensive software. This software had been used and recommended by more than 190 users in 25 countries in different parts of world. In this research for purposes of simulation and evaluation the monthly data of two years; 2003 and 2006 were used. For computing the occurred changes and as such as estimating the errors the observed and simulated data were compared with together. For analyzing the role of Urmia Lake in climatic elements in surrounding areas, two scenarios were considered. First: Existence of the lake at it's the maximum extent; two: Aquatic body of Urmia lake removed and substituted by an area having coverage of gravel and sand with a texture of loam.

Discussion and Results

Before using climate simulation models, it is necessary to assess the ability of the model for the desired target. In the other word all the simulation models need to validation. In this study for

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calculate error of model RMSE have been used. Overall the performance of TAPM model for simulate of monthly precipitation was not good but for yearly precipitation was good. For other elements, the best performance was for maximum temperature and humidity. The results of the drying Aquatic body of Urmia Lake show that precipitation in Urmia station will reduce about 28% during the year. The highest reduction occurs in winter rainfall about 8/42 mm per year. Future more precipitation in Bonab station will reduce about 21% during the year. The mean temperature in west and east of lake in cold periods of year will decreased about 1 ° C and in warm periods of year will increased about 0/6 ° C. the most increase in men temperature will be in July and August (about +0/7 C°) and most decrease will be in in December and January (about 1/5 C°). The minimum temperature in surrounding area of lake in cold periods of year will decreased about 2 ° C and in warm periods of year will not change. The most decrease will be in in December (-2/4 C°) and January (-2 C°). The role shrivel Lake Urmia on the maximum temperature in the cold period of the year decreased 0/5 °C in the western part of the lake (Urmia) and 0/3 °C east coast areas; therefore a reduction in the maximum temperature in cold period is 0/6 °C. In the warm period of the year the maximum temperature increase of 1.1 ° C. Other element that maybe changed by changing the surface, is the moisture content in the region. The mean relative humidity in west and east of lake in the year will decreased about 8%; that's decrease in relative humidity in eastern part of the Lake (Bonab 9%) are more than western part of Lake (Urmia 7%) and also the reduce in relative humidity in the warm period is more intense than during the cold period.

Conclusions

The results of this study indicate that the Urmia Lake has a fundamental role in climate nature of North West of Iran. If trend of drying the Urmia Lake until up to completely dry of water body, the nature of climate in the north west of Iran will change. Accordingly in effect of the shrivel Lake Urmia have significant effect in annual mean, minimum and maximum temperatures, precipitation and relative humidity. Due to above mentioned results in climatic elements differences the continental conditions in study area will increase dramatically. Additionally the performance of TAPM model for simulate of climate elements was somewhat good.

Keywords: Urmia Lake, Climate Elements, Numerical Simulation, TAPM Model, Northwest of Iran.

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