The Numerical Modeling and Simulating of Winds Over Urmia Lake Basin

Shamsipour A.A.*
Assistant Prof., Faculty of Geography, University of Tehran
Najibzadeh F.
M.A. Graduate, Faculty of Geography, University of Tehran
Zarei Chaghabalki Z.
M.A. Graduate, Faculty of Geography, University of Tehran

Received: 18/12/2011 Accepted: 17/02/2013

Extended Abstract

Introduction

During the past years, as a result of various factors, the water level of Urmia (Oroumieh) Lake has dropped andcomplete dryness of the lake may be possible in the coming years. Dryness of the lake with a bed of salt deposits exposures in wind and air can create significant changes in thermal conditions, energy balance and dispersion suspended particles around the lake. Increased frequency of dust events around the lake is complications of climate, which transfers suspended particles and salts to the surrounding area. Using regional-scale climatic modeling, it has been possible to use different scenarios such as dried or filled lake, to be simulated its impact on climate of region. Althoughseveral studies have been done related to Urmia Lake, there are few studies on dried lake and its environmental impact on the surrounding area with climate model. The main aim of this study is to model the local wind behavior over the lake basin and simulates the dominant particulate pollutants dispersion directions.

Methodology

Lake Urmia is a salt lake in northwestern Iran, near Iran's border with Turkey. The lake is between the provinces of East Azerbaijan and West Azerbaijan. It is the largest lake in the Middle East, and the third largest salt water lake on Earth, with a surface area of approximately 5000 to 6000 km², 140 km length, 55 km width, and 5 to 16 m depth.

To develop the research design and explanation theoretical principles library method were

*E-mail: shamsipr@ut.ac.ir Tel: 09126024199

used. This study utilizes three-hourly data of wind direction and velocity from five synoptic stations of Urmia Lake basin and using mesoscale of the air pollution model (TAPM) to estimate the density of suspended particles and its spatial dispersion pattern in the region. The Air Pollution Model (TAPM) is a software package developed by CSIRO to estimate the spread and impact of air pollution. TAPM is a meteorological, prognostic air pollution model, which is dynamic and the limited area model that predicts three-dimensional meteorology and air pollution concentrations. TAPM uses surface dataset such topography, soil texture, surface covering and the surface and upper atmospheric layers

Results and Discussion

Affected by the lake dryness,circadian oscillations of air temperature and relative humidity will increase as altitude of the mixed layer increases.Comparing of temperature between two scenarios of non-dried water and dried lake bed in July, it was observed that dried salt bed has a higher temperature on day, and is cooler in night time. So regarding water presence, heatcapacity is high, whereas in the dryness by lowering heat capacity fluctuations of circadian temperature were increased.The amount of humidity is higher in non-dried lake especially in day time, and during the night corresponding to temperature drop humidity is approximately equal. In late summer, with relatively cool air, temperature drop is considered in both condition, however, the same condition of July is observed.In dried Lake, relative humidity dropped during the day, andis higherduring the night. Rising and falling temperatures canlead to a change in the height of the mixed layer. The prevailing winds directions are west and north, so four days were selected from arid months with frequency of a few hours north and west winds. Lake and its margins emissions were obtained about as 10,624 grams per second, based on Environment organization that was calculated equal to 6 kg per hectare at hour.

According the model outputs, prevailing wind direction is generally north, and just in midnight hours redirect to the East. And among the four days of modeling, 20 July had the lowest velocity, which in midnight is becoming to storm condition. Finally the wind direction in every four days at midnight hours was from the East.

Conclusion

Circadian oscillations of the air temperature and relative humidity and mixed layer height increasing, would be some results of dried Urmia Lake. Air pollution dispersion modeling results indicate that the particle dispersion most likelyoccurs in the North in August and in the South in October. Due to the prevailing wind conditions in summer, salt particles dispersion mostly occurs in the northwest at noon and in the evening. In May, August and September pattern of dispersion particles is changed and predominantly have been observed in the West and Southwest of the Lake.The area includes fertile agricultural lands and orchards, and is more likely be threatened by salt dispersions remained from dried lake.

Keywords: Urmia Lake, Modeling and Numerical Simulation, TAPM, Salt Particles.