Geography and Development
10nd Year - No. 28 - Autumn 2012
Received : 8/6/2011 Accepted : 18/7/2012
PP : 13 - 15

Temporal and Spatial Analysis of Hail in Iran

Dr. Manuchehr Farajzadeh
Associated Professor of Remote Sensing
University of Tarbiat Modares

Taher Mostafapoor
M. Sc of Climatology
University of Tarbiat Modares

Introduction

Hail is one of the most important climatic hazards in the world and Iran. Hail is a phenomena related to thunderstorm which occurrs in unstable atmosphere with high level of moisture. Hail damages human and agricultural products. The damage of hail is serious in comparing with tornadoes and storms. Most of these damages occurrs in agriculture sector and on the crops, so that sometimes all the annual crops are destroyed in a few minutes. Iran has a mountainous condition in Alborz and Zageos area that in association with climatic system creates a suitable area for hail occurrence. In order to prevent the damages of hail, it is necessary to study the frequency and other climatic features. In this study, the temporal and spatial distributions of hail have been investigated in Iran.

Data and Method

The present study has concentrated on the observation data from 67 synoptic stations of a 20-years period (1986-2005), and the spatial distribution has been demonstrated on the country map. In this research, the analyses have been performed by statistical method. At first, the data collected through statistical tests, were examined and then the related data base has been created.the next process was the extract of frequencies for each station, which is performed by SPSS software. After that the calculated frequencies has been entered in to GIS software (ArcGIS) frequency mapshas been prepared and analyzed.

Discussion and Results

The prepared geographical distribution maps indicate the frequency concentration in Iran. Maximum amount of frequency is 4.7 which has been recorded on northern, western and eastern stations of Ilam and other stations are Abali with the average of 4.3 and Maragheh station with an annual mean of 3.2. Regarding the hail seasonal distribution, the highest amount is recorded in spring in which the highest frequency of 1.7 has been recorded for Abali weather station. After spring, the second one is winter which is recorded for Ilam of about 2.5. Autumn and summer have the low frequency so that in most

stations, the hail precipitation in summer is zero and in autumn it reaches to 0.1. The monthly distribution of hail precipitation belongs to March, April and May months.

The highest frequencies of hail occurred in March with 22 cases and April and December with 21 cases which recorded for Ilam and Abali weather stations. Regarding the hourly distribution of hail, the highest amount of hail is recorded between 6 am to 15 pm on Greenwich Time (9:30 am to 18:30 pm for local time). The analysis indicated that distribution of hail occurrence in Iran as a common phenomenon has not been the same for all the regions but it mainly occurres in special regions. It is entirely due to the climatic changes and topography conditions, because the condition for unstable atmospheric systems is suitable for the occurrence of hail. The temporal conditions for occurrence of this phenomenon are on late March and early April. In that time of year, the whole country is influenced by Mediterranean systems moving from west. During this time the temperature difference in plains and mountain regions covered with snow and the topographical condition of main regions which hail is occurred, an increase in temperature can be obsereved. Moreover, the hail occurrence especially at early hours in the afternoon, in which the temperatures difference between the mountain and plain regions is significant is probably one of the reasons of hail occurrence in this time of a day.

Conclusion

The analysis shows that hail is concentrated on east ranges of Zagros extending toward north west of Iran on a direct line to the boarders of Ilam province and also concentrated on the southern parts of central Alborz range, from this point to the southern parts of the country, the hail frequency is decreased and in some stations located in the southern parts of Iran, the hail is almost zero. There are two weather stations in the eastern parts of the country namely Birjand and Torbatheydarye where a higher level of hail is recorded in comparing to the other parts of the country probably due to high altitudes such as Qayenat Mountain ranges and Birjand.

Keywords: Hail - Hailstorm- Thunderstorm- Temporal and spatial distribution- Iran.

References

1- AbdeManafi, Dina (2004). The study of erratic indicators, wind right angle cut and the situation of moisture at the time of hail precipitation, an M.A thesis, Tehran university.
2- Alizadeh, Amin (2006). The principles of applied hydrology, Astane Ghodse Razavi Publications.
3- AminiLeyla et al (2003). The study of synoptic-thermodynamic of hail precipitation in Isfahan province, 11th conference on geophysics of Iran.
4- Charles, A. & Doswell, C,A (1993). Scientific Approaches for very short range forecasting of severe convective storms in the united state of America.
5- Etkin, David & Erik Brun (2001). Canada's Hail Climatology:1977-1993, LCLR Research, No 14.
6- Ezatyan Victoria (2003). Physic processes in increasing the atmosphere disorders, 11th conference of geophysics.

7- Frisby, E.m (1961). Relationship of ground hail damage patterns to features of synoptic map in the upper Great plain of the united state. J.Appl. meteorology. No1.
8- Giaiotti, Dario &etc (2003). The climatology of hail in the plain of Friuli Venezia Giulia , Atmospheric Research ,No 67 -68.
9- Huff, f.a (1964). correlation Between summer hail patterns in Illinois and Associated climatological events, Journal of Applied meteorology, No 3.
10- Kawyani, Mohammadreza&Alijani,Behlool (2006). The principles of Climatology.
11- Qorbani,Azam (2006). the analysis and study of hail phenomenon and cloud classification using GIS and RS in Zayande Rood basin, an M.A thesis, the university of Tarbyat Moalem.
12- Mir Moosavi, SayedHoseyn & Akbarzadeh, Yunes (2009).The study of disorder indicators in forming hail at Tabriza aerology station, FazayeJoghrafyayi, NO9-25, 105, 95.
13- Mir Musavi, SeyedHoseyn & Akbarzade, Yunes (2009). applying poacen and negative functions in evaluating the occurrence possibilities of hail precipitation (case study): East Azerbaijan province, geography and environmental planning (the university of Isfahan scientific magazine) NO 36,73,84.
14- Saanayi, Bahram et al (2003).The study of hail statistic models in Iran, Niwar Journal,48and 49.
15- Seyf, Mehrzad (1996). The study of the distribution of hail precipitation in Iran and its case study, a thesis for getting M.A degree, Tehran university.
16- Sioutas,M. & Flocas, Ha (2004). Hailstorms in northern Greece: synoptic patterns and thermodynamic environment, Applied Climatology, No 75.
17- "The study of avalanche phenomenon, gale and hail in different regions of Iran", third report, volume one, determining the potentials of climate disasters in Iran.
18- Vinet, Freddy (2001). Climatology of hail in France, Atmospheric Research, No 56.
19- Weorer, john & Lindsey, d (2004). Some overlooked severe Thunderstorms Characteristic observed.