

## Recognition, classification and synoptical analysis of heat waves to decrease human hazards in northwest Iran

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### Abstract

The heat waves are the main manifestations of contemporary world climate change. They are of great importance in terms of the frequency of occurrence and financial and human loss caused by them. The aim of this study was to identify, classify and analyze synoptic heat waves occurred in the Northwest Iran to verify the effective synoptic systems in the occurrence of the heat waves. In this study, the heat index introduced by the National Center for the United States weather data (NCDC) was used. For this purpose, long term statistics of 23 years of old maximum daily temperature and relative humidity on a daily basis for five hottest months of the year (May to September) of Iran's northwest synoptic stations were collected from National Meteorological Organization. The statistical characteristics of heat waves and synoptic and occurrence of heat waves were evaluated according to the thermal index and classified into five levels of intensity. The analysis of synoptic map also showed that the dominant patterns in the study regions were next to a tropical high pressure, Saudi Arabia and Pakistan. The maps of moisture flux also showed a cyclone movement on the Caspian Sea. The Mediterranean Sea has the most impact on the moisture flux of northwest part of Iran. There is moisture in the event of heat waves on northwest area that exacerbates the risks of heat waves, in terms of human risk.

**Keywords:** decrease in human hazards, heat waves, North West of Iran, synoptic analysis.

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## **Evaluation of society resiliency approach to natural hazards (Case study: Damavand district)**

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### **Abstract**

In recent years, the most researches in the field of hazards have changed their paradigm from losses and damage reduction model to a more comprehensive society resilience model. Accordingly, the views and theories of disaster management and sustainable development are making resilient societies against natural hazards. Resilience is system capacity and their ability to change tolerance, disruption and stability of current relationships between the individuals or variables. This study evaluates Damavand's resilience approach in dealing with natural hazards. The most important of resiliency approaches have been divided into four categories; the first one includes proactive approach, reactive, consistent and wide approach. The second one consist three resiliency approaches as a preparation, performance and ineffectual resiliency. The third one is divided into two approaches are named specific and general resiliency. Finally, the fourth group includes resilience approaches and global equilibrium and resilience and multiple equilibria. Based on these approaches, this study attempted to examine and analyze resilience approach in a case study by survey and questionnaire in the study area. The questionnaires were filled randomly and data were analyzed by statistical methods. In order to determine the resiliency approach in each group, data were analyzed separately for each group. The results indicate that resilience approach of this area in the first group is proactive; in the second one it is resilience as performance; in third group is specific resiliency and finally in fourth one is resiliency approach and global equilibrium.

**Keywords:** global equilibrium, performance, proactive, resiliency, specific.

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## Factors influencing farmers willingness to mitigate greenhouse gases in Bavi township

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### Abstract

Agriculture is a major contribution to production of the greenhouse gases. Therefore, in the agricultural sector, mitigation strategies to reduce the climate change are necessary. Mitigating climate change in agriculture depends on the willingness of farmers. Therefore, to identify the influencing factors on willingness of farmers is important. The purpose of this study was to investigate the factors influencing farmers' willingness to mitigate greenhouse gases. This research in terms of purpose is an applied research and in terms of methodology is survey research. The statistical population of this research is consisted of 3000 farmers of Bavi Township in Khuzestan Province. A sample of 350 persons was selected through random sampling method. The survey instrument was a questionnaire which its validity confirmed by experts. The reliability of the questionnaire has been approved using Cronbach's alpha coefficient ( $\alpha= 0.70-0.90$ ). The results showed that the variables of, knowledge about effects, media trust, knowledge about causes of climate change and social trust could predict 28 percent of variations in farmers' willingness to mitigate climate change. Finally, policy implications are presented based on the results of research.

**Keywords:** Bavi Township, behavioral intention, climate change, willingness to mitigation.

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## **Spatio-temporal evaluation of extreme cold temperatures of Iran under the effects of global warming to reduce risks of hazards**

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### **Abstract**

The territorial changes are of great importance in recent years due to economic and social consequences and financial losses related to their abnormal incidents to decrease the risks. In management system, the prediction and recognition of abnormal risks is considered as the main features of the system. Therefore, the purpose of the present research is to discover the universal thermal effects in emerging Iran cold extremes in the future decades because recognition of these areas and their zoning is considered as an important step to decrease their risks. For this purpose, the data are uploaded on the daily temperature EH5OM model in the Max Plank Society of Germany during a statistical period (2015-2050) under the scenario of AIB with curve degree sorting of 1.75 for Iran realm. The mentioned data are micro scaled with local sorting on the curve  $0.27 \times 0.27$  by REGCM4 model. In order to recognize the cold extreme days, the normalized temperature deviation (NTD) is used. The data are organized based on this index and the extension of the heat governance ( $NTD < 0$ ) and the first 500 days for which the condition  $NTD < -2$  are met. These are considered as the sample population. In this respect, a range with a size  $500 \times 2140$  is established. The results of the study indicate that Iran can be divided into 9 areas in terms of cold extremes by the use of clusters analysis based on self-organizing map (SOM). In the future decades, the cold extremes in the west and high lines (mountains and mountainsides) can be observed more than internal lines and south shores. The minimum and maximum for the cold extreme occurrence can be observed in Kavir-e Namak and the northwest Iran, respectively.

**Keywords:** cold extreme temperature, EH5OM model, Iran, REGCM4 model, SOM clustering.

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## Statistical-synoptic analysis of CO pollutant density according to wind direction and speed and its hazard in Tehran City

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### Abstract

Air pollution is one of the environmental hazards in metropolitans which made the life very expensive and even hazardous during last decades. The main aim of the present study is to determine the synoptic patterns which lead to formation and intensification of stable atmospheric conditions in cold seasons of year. The present study has investigated the thermal and dynamic systems that lead to stable atmospheric conditions in Tehran in the cold season. In this study, statistical, synoptic and Thermo-dynamic methods are used to achieve the objectives. The wind characteristics in all geographical directions (16 directions) were examined in a 10-year period in Tehran City. In order to calculate the correlation between CO and wind speed, Pearson Correlation Method and regression analysis were used in SPSS and MS Excel. The results showed a significant correlation between CO emissions and wind speed in all directions, but by separating all 16 wind directions, the highest correlation (significant at 99% confidence level) between the wind speed at the directions of NW, SSE and W was observed. This means that with increase in the wind speed, the density of CO emissions is reduced (and vice versa). Another result from wind analysis is that there is a direct correlation between NE and ENE directions and CO pollutant which means that with increase in the wind speed in the mentioned directions, the density of CO emissions is also increased as well. Also the results showed that average wind speed in polluted days is 1.3 meter per second which is far less than the average of 2.5 meter per second in the period. For synoptic analysis, 14 severe polluted days in cold seasons were selected during the period of 2002 to 2012. Maps of MSLP, 700 and 500 hpa and vorticity map in Grads software were prepared using ECMWF reanalysis data. The results showed that most of the selected polluted days have followed the same synoptic pattern in which high pressure systems is dominated and Tehran is located in the ridges axis. Due to convergence in upper-air levels, subsidence had occurred near surface levels and the negative vorticity in the region intensified the air pollution. In Thermo-dynamic analysis, by drawing SkewT diagram in Raob software, the type and altitude of the inversion is determined. According to the results, the air pollution severity becomes very hazardous and critical at the times which radiation inversion occurs in altitudes less than 100 meters. Also results showed that in stable atmosphere, wind speed is very low from earth to mid-levels of troposphere.

**Keywords:** CO pollutant, cold season, Hazard, Skew-T, Tehran City, wind.

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## Analysis of extreme rainfall event resulting in the floods on June 28<sup>th</sup> 2015 in Alborz Province

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### Abstract

The flash floods caused by short heavy precipitation are one of the most important natural hazards. The main objective of the study is to provide a synoptic and thermodynamic mechanism analysis of the severe rainfall leading to floods on July 28<sup>th</sup>, 2005, in Alborz province. According to Sijan and Kondor rain-gauge stations as well as Karaj synoptic station, precipitation features and the occurrence of rainfalls in the warm season were determined. Furthermore, anomaly data, geopotential heights, vertical velocity ( $\omega$ ), and vorticity in the days prior to the precipitation at 500 and 850 hpa and sea level were determined and drawn based on GRADS. The instability indices and the Skew-T thermodynamic graph were analyzed based on Tehran synoptic station. The main synoptic features of the rainfall include the cold weather in the upper atmosphere, creation of quasi-stationary trough, and earth surface low-pressure, injection and continuous supply of moisture from Caspian Sea and northwestern streams. The dominant pattern at sea level before and during the precipitation was thermal low pressure in Pakistan. The vertical velocity ( $\omega$ ) at the time of the rainfall strengthened the process and it was observed in more than 500 hPa and 850 hPa. On the day of the precipitation, the amount of positive vorticity reached +9 due to the movement of the upper atmosphere meridional flows. The rainfall with Showalter Index in severe unstable conditions as well as Precipitation Index enjoyed the necessary water vapor for heavy rainfall in the region. High temperature difference between the upper level in atmosphere and ground surface during warm seasons causes heavy precipitation. Hence, such knowledge could be reliable source for flood warnings before the occurrence of the crisis.

**Keywords:** Alborz, flood, instability, severe rainfall event, synoptic.

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