1. Why Hazards Science? Definition and Necessity

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Most people are interested to know the effects of hazards on their life, health and environment. We have decided to answer the question "Why Hazards Science?" in each issue of the journal. The necessity of raising this question isn't based on the activity of the present magazine entitled Hazards Science (though the scientific approach we adopt here is a new combined approach), but the numerous and increasing hazards which affect individuals, communities and natural environment.

Any individual and society encounters certain hazards depending on how much they pay attention to research and knowledge, the place and time in which they live, the lifestyle they adopt for living, interactions and relationships they have with other communities and people, and the plan they create for their life (1).

An individual or society that considers themselves independent of science in order to reduce hazard, is always under hazards and helps increasing hazards. Essence of science studies such as geographical science is embedded in this point. Journal of Hazards Science which is the first scientific journal published in this field and has a fundamental-applied nature, deals with the identification of hazards, promoting its scientific nature and presentation of research and experimental achievements based on hazards reduction, for further improvement of human and the environment with a combined approach of human, environment, religious science, technical-engineering, fundamental sciences and even art. For Journal of Hazards Science, anthropocentrism plays a very important role for hazard reduction (this led this publication to be registered in social and behavioral sciences group).

The word "hazard" is synonymous with "risk ratio" and has also been introduced as a synonym with "threat ratio" (2); and "health ratio". Thus, it has a dual nature. On the one hand, it monitors the risk ratio, and on the other hand, the health ratio in society and environment (Fig. 1). Hazards

Science tries to identify the events and activities that reduce the length and width of life of individuals, communities and quality of environment. That is it is helpful. Length of life of individuals and communities, and the environment quality means continuity of life of individuals, communities and the environment over time; width of life means the quality of life of individuals and communities and the environment.

Hazards science is a type of healthy entrepreneurship activity which is both dependent on the type of hazard and on the desired quality for the life of individuals and communities. It is a kind of Ecological entrepreneurship for better life.

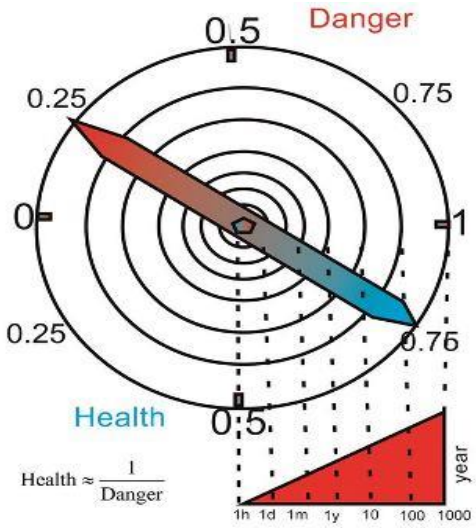

Fig. 1. The dual nature of the hazards science (3)

Hazard science deals with identifying different types of hazard. What is biohazard (4)? How do people avoid suffering property, physical, spiritual, and environmental damages and how to react to the environment, and why the environment should stay healthy?

Hazards science studies the behavior, structure and quality of human environment over a lifetime. Thus, it explores the world and lifestyle. Hazardology emphasizes on maintaining and promoting human and environmental health; for example, how can spatial balance be achieved? Why should media activities be designed to promote the eating habits of

people? Why should consciousness be considered as a basic principle at work? Why should people and authorities be taught not to build their house in hazardous places? Why should not we pollute air and water? Why should people be trained to have lower hazards? Why should we reduce Ahwaz industrial pollution (for example)? How can we manage the hazards and reduce its adverse effects? How can one adapt to Tsunami or Earthquake or Dutch? How do excommunicating behaviors arise? What kind of thought and worldview is necessary to reduce hazards? What changes are necessary to be done in textbooks in this regard? And so on. Hazards science investigates the dimensions of prevention. However, a comprehensive definition of hazard is that we consider it as an event, phenomenon, process, status, situation, activity, thought, worldview and idea which may lead to serious life, material and spiritual losses for individual, population, community and the environment. The Hazards Science analyzes each of the above items. Humanbeing has tolerated huge losses in consequence of the hazards surrounding him. But we should not regret the past, we should learn from it. Of course, damages that have been imposed on individuals and communities due to earthquake, flood, hurricane, tsunami, economic stagnation, drought , war, disease, addiction, unemployment, terrorism, etc. are not trivial; we should not regret, but it is unforgiveable if we don't learn from our experience and don't explore them; this means the necessity to address the Hazards Science.

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Spatial Simulation, Geomorphological Hazards and Limitations of Physical Development of Malekan City

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Abstract

Geomorphology, in some cases, provides a good platform for physical development of cities. However, physical development of cities, sometimes result in unsuitable and hazardous geomorphologic process and form. Therefore, geomorphology of the region is of importance in physical planning and urban development. In this study, based on historical trends of expanding the boundaries of the Malekan city (located in eastern Azerbaijan province), the pattern for future growth of the city was simulated, using Markov Chains–Cellular Automata hybrid model. Then, limitations and geomorphological hazards ahead in relation with the continuation of the current growth pattern are investigated. Most important materials used in this research include: topographic maps, geological map, GIS and RS software, ASTER, SPOT, and Landsat satellite imagery. Monitoring urban expansion from 1985 indicates that the spatial growth pattern of the city has been towards the barren lands and lagoon area in recent years. By developing past growth patterns and taking into account the transition probabilities and the neighborhood rules, development trend of the city mainly will be towards lagoon and hillslope units. Geomorphology of the study area will impose limitations and hazards to his parts. In this context, most important problems relating to the physical development of Malekan city include: lodgment of some parts of the city on the steep, dealing with hillslope landform with low strength lithology, high levels of water table in lagoon area, and flooding probability in some parts of the city.

Key words: cellular automata, geomorphology, Malekan city, natural hazards, physical development.

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Application of Protection Motivation Fear Appeals Theory in Promoting Safety Culture against Earthquake

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Abstract

Lack of enough awareness about the right ways of finding shelter, principles of building construction, structural and non-structural retrofitting, lack of enough information about the active faults and earthquakes knowledge are among those issues which impose financial and non-financial expenses on a country after an earthquake. Making an attitude correction and forming new beliefs and behaviors in public opinion may considerably decrease earthquake loss and damages and enhance the state safety against earthquake. In this regard, using methods of communication and persuasion leads to new beliefs and consequently attitude change. A common method of persuasion and making attitude change in people is to create fear in them so that the fear conducts them from a passive stance towards action and new behavior. This paper deals with Ahar-Varzaghan earthquake as a fear-inducing message for Tabriz -a city near the epicenter of the earthquake- civilians and the limit of their attitude and behavior change, after receiving this alerting message, was evaluated. The research method of this paper is survey and the data was gathered by questionnaires, distributed randomly among 385 Tabriz civilians.

Keywords: attitude change, communicative-persuasive theories, fear appeal, improved safety against earthquake.

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Risk Assessment of Engineered Nanoparticles (ENPs)

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Abstract

Although the applications of nanotechnology have been widely studied, the risk measurement and assessment of nanoparticles effect on biological systems and ecosystems has not been clearly demonstrated. The small size and specific properties of nanoparticles makes them a carrier for toxic chemical pollutants. Several studies show the nanoparticles and nanotubes can release in the environment and cause harmful effects on human. In addition, nanoparticles can attach to colloid particles and affect their bioavailability and uptake to cells and microorganisms. Concerns about the side effects of nanoparticles on human, environment and ecosystem are increasing due to the appearance of unique properties of nanoparticles and increased exposure of human to them. The aim of nanotoxicology, a new branch in toxicology researches, is to evaluate the risk of products prepared by nanotechnology. Nanoparticles can enter organisms through water, soil and air. In this study the probable risks associated with nanoparticles on human and environment is demonstrated.

Keywords: engineered nanoparticles, environment, human health, nanotechnology, risk.

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Environmental Sustainability in Geo-Systems, with Analysis based on Satellite Data and Hazard-based Approach (Case Study: Urmia Lake System)

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Abstract

Identifying the change trends in forms of land surface is one of the main topics in geomorphic system. In this view, we try to assess the stability level of geo systems, boundary changes, instability and prediction of surface forms and processes response. This paper tries to conduct a comparative analysis on the geomorphic equilibrium paradigms, critical thresholds, environmental and natural hazards and environmental disaster based on system geomorphology view. To that end, each element was first studied separately and then together in terms of concept in between. In the present study, the condition of Urmia Lake system was studied, using statistical analysis and remote sensing techniques such as principal component analysis, false band combination and reviewing the profiles reflect changes in lake water during 1987 (equilibrium of Urmia Lake System qualification), 1998, 2007(critical threshold qualification) and 2011(destruction and death of ecosystem). The results showed that each geo-system, at different stage of environmental change, is affected by human applications. So trends of geo-systems changes can be assessed and managed by identification of equilibrium (stable elements of geo-system), threshold (boundary changes of geo-systems), environmental hazards (incompatibility of geo-system elements) and geo-system disasters. In this approach, geo-systems persistence will be affected by the above mentioned stages and it's necessary to evaluate each effective index of these steps by various techniques such as remote sensing and field studies. The results of satellite image analysis also show clear changes between years 2011 and 2007 comparing 1987 and 1988. The results of using images methods show the changes trend within these years clearly and can serve as a useful tool to better understanding of occurred changes in these environments.

Keyword: critical thresholds, environmental hazards, geomorphic equilibrium, geomorphic systems, remote sensing.

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Vulnerability Assessment of Marab Karstic Aquifers Pollution Using RISKE Model and Analysis of Time Series

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Abstract

Vulnerability and contamination risk assessment is of great importance in karst aquifer management. Because of vastness of karst in Zagros, natural conditions and human activity within the region of aquifer, pollution emission has become one of the most important challenges in front of Zagros aquifers. The purpose of this study is to assess Marab aquifer vulnerability, using RISKE model and, defining 5 parameters of rock (R), infiltration (I), soil (S), karst development (K), epikarst (E) to evaluate the vulnerability of karst surfaces. The internal network development of Marab karst aquifer was evaluated using single-variable autocorrelation statistical methods. Ultimately, analyzing the results of these two methods, we assessed the vulnerability of the aquifer. The results of RISK model indicated three zones of vulnerability. The medium, small and large layers were 57.5, 37.7 and 4.8 percent of the region respectively. The vastness of vulnerability layers suggest average level of vulnerability of Marab against pollution emission. The most vulnerable areas are located within sinkholes and poljes. The results of autocorrelation function suggested a multiple hydrodynamic behavior and two base and fast flow for Marab aquifer. Therefore, we concluded that due to the fast flow in the aquifer and geomorphological development of karst surface, it is possible that contamination spread through the aquifer.

Keywords: autocorrelation, contamination, Marab aquifer, RISK model, vulnerability.

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Prediction and Detection of *Earthquake Ionospheric Anomalies* in Total Electron Content of the GIM based on Wavelet Transform Technique and Hazards Reduction (the M 7.7 Saravan Earthquake of April 16, 2013)

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Abstract

Earthquakes show unknown nonlinear behavior and given the magnitude of the earthquake, we would encounter certain changes in lithosphere, atmosphere and ionosphere. The ionospheric parameters have been found to be sorely susceptible to major earthquakes. In addition to the ionospheric variations generated by solar activity, there are remarkable temporary changes in the ionosphere that are generated by prompt changes in geomagnetic activity. Therefore, recognizing the ionospheric anomaly variations generated by seismic activity or geomagnetic activity is hard, exclusively when there is interposition from little geomagnetic storms. Processing the time series of total electron content (TEC), in order to ionospheric anomalies detection is a significant subject. Two wavelet methods were used to nonlinear and non-stationary time series of the TEC: the analytic wavelet transform (AWT) to detect variation in the TEC, and cross wavelet transform method (XWT) to analyze the mutual relationship between the variability of the ionospheric anomalies and the geophysical indices around the epicenter of the earthquake in the time-frequency domain. The Saravan (28.107˚N, 62.053˚E) earthquake happened on 16 April 2013 during the period of high solar activity in the 24th solar cycle. In this study, we utilized the CODE GIMs from 1 March 2013 to 31 April 2013 for the Saravan earthquake. Under quiet geomagnetic condition, the earthquake was considered the only reason of these changes and within 10 to 15 days before the earthquake and 7 days afterward, severe changes were observed. There was a *powerful nonlinear context* in the TEC data, generated by abnormal solar irradiance during the studied period. It is essential to eliminate the solar activity and geomagnetic activity traces from the ionospheric TEC to elude for representing error in the TEC time series. To recognize if the ionospheric perturbation detected by the AWT is connected to geomagnetic activity, we carried out the XWT for the TEC and AP time series from 1 March to 31 April 2013. It specifies that there is one common high energy region extract within the two time series. The common high energy region related to 17 March 2013. Accordingly, this increment was more probably caused by the geomagnetic storm effects. Within the dynamic range of earthquake, no energetic common point was observed which showed that geomagnetic activity had no role in ionospheric anomalies and another factor, very probably the earthquake was the root of the mentioned anomalies. Therefore, in order to reduce hazard, given TEC time series, the time and frequency of the earthquake could be predicated and defined by evaluating ionospheric parameters.

Keywords: geomagnetic index, hazard reduction, ionosphere, Saravan earthquake, total electron content, wavelet transform.

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Concept of Time and Forecasting Techniques of Natural Hazards

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Abstract

Although the history of hazard recognition goes back to years ago, and even some techniques were invented to predict it, hazard studies are new in the current knowledge. The concept of hazard and risk will be defined when the events show two special properties: First, they happen unexpectedly, and second, their occurrence cause harm to us. The general state of the earth should be considered among the warm periods and the cold periods are nothing beyond a cryogenic shock, i.e. over the past 750,000 years of Earth's history, a total of 630,000 Years and 120,000 years were warm and cold periods respectively. One of the ways of predicting events is using statistical techniques. In these techniques special default have been made, according to which the types and patterns of analysis will be different. By proving this assumption, studying the relation of one or several features of agent variable, the pattern of hazardous event can be analyzed. This article which comes from University of Isfahan deals with an event in quaternary called ice choir glacial in one of the mountain valleys Tian Shan to assess the sides, using turning point test statistical method. Results show that the way in which these events happen, make them to be considered as hazards or risks. The concept of Frequency- magnitude in geomorphology are kind of conditional forecasts which may help us to manage the probability of exposure to such events.

Keyword: catastrophe, frequency – magnitude, natural hazards, time, turning point test.

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Feasibility Study of Earthquake Prediction through a Study of b-Value Precursor (Case study: Silakhor Earthquake, Iran)

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Abstract

The purpose of the present study is to compare the changes in b-value parameter using frequency-magnitude distribution for the data before and after the Silakhor earthquake by Gutenberg-Richter relation. The variations of b-values are investigated using Broadband Iranian National Seismic Network Center (BIN). Besides, spatial and time variations of the parameters were analyzed. The spatial variation of b-value parameter in the epicentral area showed anomalies before the event. Therefore, some important information was estimated about the changes in stress by reducing b-value in the region. On the other hand, anomalies were seen in b-value parameter in aftershocks sequences, representing a reduction in stress in the region. Generally, the results of this study indicate that the b-value parameter had a decreasing trend prior to the March 31, 2006 event in Silakhor, and an increasing trend after that. The increase and decrease of this parameter is associated with the increase and decrease of stress in active faults and a change in slip rate in the region. These anomalies in b-value parameters in the region suggest that b-value changes can be offered as a precursor for estimating the time and location of earthquakes along segments of the faults in the region. Therefore, proper data recording in different regions and permanent monitoring of this parameter can be an important step toward the long-term or medium-term prediction, and especially toward the identification of the approximate location of future events in the active seismic zones.

Keywords: b-Value parameter, earthquake, earthquake prediction, Iran, precursors, Silakhor.

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