Using remote sensing data and nonlinear methods for hazard analysis of the Middle East aerosols

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Abstract

Aerosols are among the most important atmospheric pollutants like the microscopic particulate matter (solid and liquid) in the lower parts of the troposphere. From environmental standpoint, this study attempts to investigate the hazards by aerosols distribution and predict the movement mechanism of them with emphasis on the Middle East. The main purpose of this study was to introduce a new method based on remote sensing results and analysis of fractal statistics in addition to investigation on the origin of aerosols, making survey about the movement mechanism and pattern of their distribution in large areas of North Africa and the Middle East. The research results indicate that the pattern of aerosols distribution in Middle East is followed by non-linear patterns with chaotic specifications. To prove this, we used MODIS Images of American space agency [NASA] until the needed photo-maps are containing aerosols optical thickness (AOT), changes in nitrogen dioxide (NO_2) and carbon monoxide (CO). Spatial analysis of data and seasonal - annual comparison of them is represented an exponential relative relationship in aerosols dispersion pattern. Therefore, with use of variance-distance equation, addition to demonstrating the relationship between atmospheric pollutants in Iran, Iraq and Saudi Arabia with climatic changes in North Africa, two climatic regimes of hot and cold were compared according to the energy content and chemical composition of different seasons. In practice, bodies of aerosols and industrial pollutants of the area is functional to seasonal changes and chaotic behavior of them in the cool months is greater than the warm months. Therefore, the environmental hazards of winter regimes are more than that of summer regimes. Also, changes in the fractal dimension (especially at the brown distribution level of optical thickness) alter the possibility to check the remote sensing criteria. This has been provided on the basis of the fractal geometry principles. The new approach is introduced to predict the cumulative behavior and movement pattern of aerosols in Middle East.

Keywords: aerosol, fractal analysis, nonlinear distribution, Middle East.

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Site selection for solid waste landfill in Ardal Region to reduce hazard risks

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Abstract

The waste pollution is sources of many environmental problems. These sources can also contaminate water resource, air and soil. In addition, they can destruct landscapes and pestilential in the regional. Therefore, the placement is a policy for solid waste landfill. In this research, we are going to find suitable placement for landfill in the Ardal region. This region is of great importance for water resources and natural landscape. We used geodatabase such as DEM, river, spring, wells, soil, land use, forest, transfer energy (gas, power electric line), population settlement and geology. In addition, we used AHP and geo-statical methods. The results indicated that distance of population settlements, forest, land-use and water resources are important for election placement of solid waste in Ardal region. In this region, there are five classes for landfill. These classes are very suitable (10.8 km^2), suitable (17.3 km^2), relatively good (4.8 km^2) and unsuitable (1055.3 km^2). Therefore, rural management must consider these conditions for landfill solid waste in Ardal region.

Keywords: Ardal region, land use, location, solid waste.

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Standard precipitation index and TOPSIS ranking method to assess the drought adventure condition in Khouzestan Province

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Abstract

The drought status as a natural hazard is very important problem in different areas. It is necessary to develop plans to deal with drought and risk management. There are lots of indices for drought assessment based on climatic quantities. Simultaneous occurrence of drought indices can be a useful framework for conformity assessment profiles. The aim of this study was to compare two methods, TOPSIS ranking method and Standardized Precipitation Index (SPI) for drought condition in Khouzestan province and their performance in this review. In another part of this study, the sensitivity of TOPSIS method to determine four climatic parameters are affecting climate drought or wet. In this study, it is found that these two methods to determine the intensity and condition of drought are good and have similar performance but for measure the intensity of wet, SPI is not useful. In fact, this method just determined that the target year is wet or not. For example, the lowest value for this index was -3.04 which is related to Abadan station at 2011 and this number indicates severe drought. The highest value was 1.33 which is related to Ahwaz station so it is located in normal (wet) category. TOPSIS ranking method in addition to determine the intensity of the drought can also present the condition of wet years numerically. According to the calculations, 2011 was the driest year among all stations and 1992 was the wettest year among all stations. To determine the sensitivity of TOPSIS method, it was found that the most sensitive parameter among the climatic parameters is related to the number of rainy days and low sensitivity is for relative humidity amongst all the parameters.

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Zoning of mass movements risks using information value model, surface density and LNRF in the Zohreh Watershed

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Abstract

Iran because of its natural characteristics and morphology has been exposed to many natural hazards. Mass movements and slope instability are major dangers to human activity that often leads to loss of economic resources and damage to property. These issues need mass movement hazard zonation as the first step in environmental management to explain this phenomenon. The purpose of this study is to make a zonation of mass movement hazard in Zohreh watershed, Fars Province. At first, we have prepared the factor affecting the mass movements. These factors are lithology, slope, elevation, current use of the land, rainfall, temperature, slope, distance from roads, distance from fault, and distance from the river. Then, using aerial photo interpretation and field work, all the mistakes in the field, were identified on the maps. The integration of independent and dependent variables of mass movements and the weighting factor classes in each class have been executed based on the models of intelligence value, density and LNRF. Finally, hazard map has been created for a mass movement to integrate the various layers of weightlessness on different models. The results show that the information value method in terms of compliance with high-risk zones of the mass movements as well as the ability to separate classes of risk is better than the other two methods.

Keywords: information value model, LNRF model, mass movements, surface density model, Zohreh Watershed, zoning.

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Synoptic analysis of destructive thermodynamic thunderstorms in Ahvaz

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Abstract

Thunderstorms are destructive climatic phenomena that recognition of their mechanism, genesis and development could be especially very helpful to reduce their losses. In this study, we have examined thunderstorms with rainfall exceeding 10 mm in a 14-year period (2000- 2013) in the Ahwaz region. We have also made early identification of the code for this event to extract 10 mm of rain and daily data of sea level pressure from NCEP/NCAR reanalysis data in 32 days. Finally, using Principal Component Analysis (PCA) and cluster analysis, we have classified circulation patterns of sea level as an effective factor in rain thunderstorms. The study showed that the Ahwaz region thunderstorm is following general pattern. In the first pattern, in the SLP, Sudan low pressure systems with trough at 1012 millibar with the passage over the Red Sea and the Persian Gulf made hot and humid air by advection on the study area at 850 and 500 millibar level. Ahwaz region is located in front of the trough at 1500 geopotential heights and 5760 geopotential meter respectively. In the precipitation of this pattern, instabilities have continued to 500 millibar level. In the second pattern, the anticyclone tongue (flank) at 1016 millibar is spread from the East with the passage over Oman Sea and the Persian Gulf. This situation is led to moisture advection on study area at 850 millibar level in front of the trough with geopotential height of 1500 to 1510 meter. Both the precipitation pattern, main source of moisture is provided by the warm seas in the South and the major factor of uplifting is also provided by the western trough.

Keywords: Ahvaz, Principal Component Analysis (PCA), synoptic analysis, thunderstorms.

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Management of news coverage of weather-related risks in Iranian TV

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Abstract

The present study attempts to shed lights on the way "climate-related usual and disastrous events" are forecasted by Iran Meteorological Organization and how they are covered by IRIB. This research is carried out through a "content analysis" of news items broadcast various provincial newscasts as well as Channel One newscast at 21:00 and IRINN newscast at 13:00 during the years of 2014, 2015 and 2016. The results of each newscast have been compared. For practical aims, as survey was conducted and the views of meteorological experts as well as news editors-in-chief with regard to the way weather-related news events are managed were gathered consequently. The findings indicated that the rhetoric and terminology used in almost half of the weather reports on dangerous and disastrous events were not "sensitizing and warning". About 22 percent of critical events were not forecasted in the Meteorological Organization's announcement and 33 percent of weather reports were not consistent with the organization's forecast announcements. In 92.5 percent of weather reports, no experts and employers-at-risk were interviewed for training implications. The forecasts of 58.5 percent of dangers were reflected as usual weather events with low priority at the end of newscasts and with the same amount of time (55 percent of weather reports on usual events and 47 on critical events lasted from one to two minutes). Literature review shows that no other study has been carried out on the subject about IRIB. Therefore, the present work is a new and innovative research.

Keywords: crisis management, forecasting crisis, IRIB, meteorological risks, news coverage, weather reports.

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