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逻辑回归模型在玉树地震滑坡危险性评价中的应用与检验

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LOGISTIC REGRESSION MODEL AND ITS VALIDATION FOR HAZARD MAPPING OF LANDSLIDES TRIGGERED YUSHU EARTHQUAKE

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全文: PDF (7372 KB) HTML (KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要 2010年4月14日07时49分(北京时间),青海省玉树县发生了Ms7.1级大地震。作者基于高分辨率遥感影像解译与现场调查验证的方法,圈定了2036处本次地震诱发滑坡。这些滑坡受地震地表破裂控制强烈,规模相对较小,常常密集成片分布。滑坡类型多样,以崩塌型滑坡为主,还包括滑动型、流滑型、碎屑流型、复合型等类型的滑坡。本文基于地理信息系统(GIS)与遥感(RS)技术,应用逻辑回归模型开展玉树地震滑坡危险性评价,并对结果合理性进行检验。应用GIS技术建立玉树地震滑坡灾害及相关滑坡影响因子空间数据库,选择高程、斜坡坡度、斜坡坡向、斜坡曲率、与水系距离、坡位、断裂、地层岩性、归一化植被指数(NDVI)、公路、同震地表破裂、地震动峰值加速度(PGA)共12个因子作为玉树地震滑坡影响因子,在GIS平台下将这些因子专题图层栅格化。应用逻辑回归模型得到每个因子分级的回归系数,然后建立滑坡危险性指数分布图。利用玉树地震滑坡空间分布图对滑坡危险性指数图进行检验,正确率达到83.21%。滑坡危险性分级结果表明,在占研究区总面积4.97%的"很高危险度"的较小范围内,实际发育滑坡数量为766个,占总滑坡面积的比例高达37.62%,表明地震滑坡危险性评价结果良好。不同危险性级别的滑坡点密度统计结果表明,滑坡点密度随着危险性级别的升高而非常迅速的升高。

关键词： 玉树地震滑坡 逻辑回归模型 危险性评价

Abstract： At 07: 49(Beijing time)on April 14, 2010,a catastrophic earthquake with *Ms 7.1* struck Yushu County,Qinghai Province,China.2036 landslides were interpreted from aerial photographs and remote sensing images,verified by selected field checking.The spatial distribution of the landslides was evidently strongly controlled by the locations of the main surface fault ruptures.The landslides commonly occurred close together.Most of the landslides were small.The landslides were of various types.They were mainly shallow,disrupted landslides,but also included rock falls,deep-seated landslides,liquefied landslides, and compound landslides.The aim of this study was to apply and validate logistic regression model for the Yushu earthquake triggered landslide hazard mapping.The Geographic Information Systems(GIS) and Remote Sensing(RS) technologies were used.A spatial database was developed and analyzed using GIS technology.It includes the landslides and associated controlling parameters which may have influence on the occurrence of landslides..The twelve factors that influence landslide occurrence were created in raster data format base on GIS platform.They include elevation,slope angle,slope aspect,slope curvature,slope position,drainages,lithology,faults,roads,normalized difference vegetation index(NDVI),co-seismic main surface fault-ruptures, and peak ground acceleration(PGA).the coefficients of the evaluation variables were estimated using logistic regression model and were used to calculate the landslide hazard index for the entire study area within a GIS environment.The validation result showed a success rate of 83.21% between the hazard map and the locations of Yushu earthquake triggered landslides.The landslide hazard assessment rank result showed that the"very high hazard"level covers about 4.97% of the total study area but has a number of 766 landslides (37.62% of the total landslides number),which representing good quality of the landslide hazard map.The sequence of the landslide number density percentage descends expeditiously accompany with the hazard level decreasing.

Key words： Yushu earthquake triggered landslides Logistic regression model Hazard evaluation

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[1]   许冲, 徐锡伟,戴福初,等.2010年4月14日玉树地震滑坡空间分布与控制变量分析[J].工程地质学报, 2011, 19 (4): 505~510. 浏览

      Xu Chong,Xu Xiwei,Dai Fuchu,et al.Analysis of spatial distribution and controlling parameters of landslides triggered by the April 14, 2010
      Yushu earthquake.Journal of Engineering Geology, 2011, 19 (4): 505~510. 浏览

[2]   USGS,Magnitude 6.9-southern Qinghai,China, 2010 April 13 23: 49: 38
      UTC.2010,http: //earthquake.usgs.gov/earthquakes/eqinthenews/2010/us2010vacp/.

[3]   殷跃平, 张永双,马寅生,等.青海玉树Ms7.1级地震地质灾害主要特征[J].工程地质学报, 2010, 18 (3): 289~296.

      Yin Yueping,Zhang Yongshuang,Ma Yinsheng,et al.Research on major characteristics of geohazards induced by the Yushu Ms7.1
      earthquake.Journal of Engineering Geology, 2010, 18 (3): 289~296.

[4]   殷跃平, 田廷山,李文渊,等.青海玉树地震地质灾害调查 .2010,http: //www.gcdz.org/CN/article/downloadArticleFile.do? attachType=PDF&id=855

[5]   Yin Yueping,Tian Tingshan,Li Wenyuan,et al.Investigation on Yushu Earthquake Triggered Geological
      Hazards.2010,http: //www.gcdz.org/CN/article/downloadArticleFile.do? attachType=PDF&id=8550.

[6]   赵家绪, 李玉军,张力征,等.青海玉树"4•14"地震灾区地质灾害应急排查报告 .2010.

[7]   Zhao Jiaxu,Li Yujun,Zhang Lizheng,et al.Report of Emergency Investigation on"4•14"Yushu Earthquake Triggered Geological Hazards.20

[8]   Pradhan B,Talib JA,Lee S.Application of remote sensing data in determining regional landslide hazard analysis by using logistic regression
      model and GIS.27th Asian Conference on Remote Sensing(ACRS2006), 2006. cross ref

[9]   Pradhan B,Lee S.Landslide susceptibility assessment and factor effect analysis: backpropagation artificial neural networks and their
      comparison with frequency ratio and bivariate logistic regression modelling.Environmental Modelling and Software, 2010, 25 (6): 747~75
      cross ref

[10] Chen ZH,Wang JF.Landslide hazard mapping using logistic regression model in Mackenzie valley,Canada.Natural Hazards, 2007, 42 (1):
      75~89. cross ref

[11] Yilmaz Ⅰ.Landslide susceptibility mapping using frequency ratio,logistic regression,artificial neural networks and their comparison: A cas
      study from Kat landslides(Tokat—Turkey).Computers and Geosciences, 2009, 35 (6): 1125~1138. cross ref

[12] Greco R,Sorriso-Valvo M,Catalano E.Logistic Regression analysis in the evaluation of mass movements susceptibility: The Aspromonte ca
      study,Calabria,Italy.Engineering Geology, 2007, 89 (1-2): 47~66. cross ref

[13] Thapa PB,Esaki T.GIS-based quantitative landslide hazard prediction modelling in natural hillslope,Agra Khola watershed,central
      Nepal.Bulletin of the Department of Geology, 2007, 10 : 63~70.

[14] Dai FC,Lee CF,Li J,Xu ZW.Assessment of landslide susceptibility on the natural terrain of Lantau island,Hong Kong.Environmental Geology
      2001, 40 (3): 381~391. cross ref

[15] Dai FC,Lee CF.Landslide characteristics and slope instability modeling using GIS,Lantau island,Hong Kong.Geomorphology, 2002, 42 (3-4)
      213~228. cross ref

[16] 胡德勇, 李京,陈云浩,等.GIS支持下滑坡灾害空间预测方法研究.遥感学报[J], 2007, 11 (6): 852~859.

      Hu Deyong,Li Jing,Chen Yunhao,et al. GIS-based landslide spatial prediction methods,a case study in Cameron Highland,Malaysia.Journa
      Remote Sensing, 2007, 11 (6): 852~859.

[17] 李雪平, 唐辉明.基于GIS的分组数据Logistic模型在斜坡稳定性评价中的应用.吉林大学学报(地球科学版)[J], 2005, 35 (3): 361~365. cross ref

      Li Xueping,Tang Huiming.Application of Gis based grouped data logistic model in evaluation of slope stability.Journal of Jilin University(Ea
      Science Edition), 2005, 35 (3): 361~365.

[18] 李雪平, 唐辉明.贝叶斯信息标准在滑坡因子敏感性分析中的应用[J].岩土力学, 2006, 27 (8): 1393~1397. MagSci

      Li Xueping,Tang Huiming.Application of Bayesian information criterion to sensitivity analysis of landslide factor.Rock and Soil Mechanics,
      2006, 27 (8): 1393~1397.

[19] 许冲, 徐锡伟,于贵华.玉树地震滑坡分布调查及其特征与形成机制[J].地震地质, 2012, 34 (1):47~62.

      Xu Chong,Xu Xiwei,Yu Guihua.Study on the characteristics,mechanism,and spatial distribution of Yushu earthquake triggered
      landslides.Seismology and Geology, 2012, 34 (1):47~62.

[20] 许冲, 戴福初,姚鑫,等.GIS支持下基于层次分析法的汶川地震区滑坡易发性评价[J].岩石力学与工程学报, 2009, 28 (S2): 3978~3985.

      Xu Chong,Dai Fuchu,Yao Xin,et al.GIS-based landslide susceptibility assessment using analytical hierarchy process in Wenchuan earthqu
      region.Chinese Journal of Rock Mechanics and Engineering, 2009, 28 (S2): 3978~3985.

[21] 许冲, 戴福初,姚鑫,等.基于GIS与确定性系数分析方法的汶川地震滑坡易发性评价[J].工程地质学报, 2010, 18 (1): 15~26. 浏览

Xu Chong,Dai Fuchu,Yao Xin,et al.Study on Wenchuan earthquake-induced landslide susceptibility evaluation based on Gis platform and certainty factor analysis method.Journal of Engineering Geology, 2010, 18 (1): 15~26. 浏览

[22] Xu XW,Yu GH,Sun XZ.Yushu earthquake slip: Implication of great earthquake migration along boundary fault system of Bayan Har block,Tibetan Plateau.American Geophysical Union,Fall Meeting 2010, 2010,abstract #T22A-04. crossref

[23] Pan J,Li H,Xu Z,Li N,Wu F,Guo R,Zhang W.Surface rupture characteristics and rupture mechanics of the Yushu earthquake(Ms7.1), 14/04/2010.American Geophysical Union,Fall Meeting 2010, 2010,abstract #T54B-08.

[24] 张军龙, 陈长云,胡朝忠,等.玉树 *Ms*7.1地震地表破裂带及其同震位移分布[J].地震, 2010, 30 (3): 1~12.

Zhang Junlong,Chen Changyun,Hu Chaozhong,et al. Surface rupture and coseismic displacement of the Yushu Ms7.1 earthquake,China.Earthquake, 2010, 30 (3): 1~12.

[25] Weiss AD.Topographic position and landforms analysis.2006. http: //www.jennessent.com/downloads/tpi-poster-tnc_18x22.p.

[1]   李雪平,李云安,汪洋,李恒 · 基于GIS与数值模拟的三峡水库库首区诱发地震危险性评价   [J]. 工程地质学报, 2010, 18(3): 345-350.

[2]   王群敏, 梁收运, 周自强, 蔡汉成. 多级模糊综合的小城镇地质灾害危险性评价[J]. 工程地质学报, 2010, (): 422-427.