利用統計方法開發台灣地震誘發山崩之近即時預報模型

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摘要

地震誘發山崩是構造活動山區的主要災害之一，快速評估山崩的即時預報（近即時評估）模型對於減災和管理至關重要。本研究的目的是利用羅吉斯回歸開發近即時預報模型，使用 1999 年 Mw7.6 集集地震引發的山崩目錄，以 40 m 的空間解析度訓練模型，使用多階段框架來選擇主要變量來開發最佳模型，結果表明，該模型包含三個關鍵因子，最大地面加速度(PGA)、地形粗糙度和岩性，及兩個基本組合變量 PGA*slope 和 PGA*roughness，以增強地面震動和地形之間的相互作用。將模型套入 1998 年 Mw5.7 瑞里地震，選擇閾值 0.1 的潛感值來定義預測的山崩，預測的平均準確度在 0.95 以上，該模型的開發可以通過輸入即時 PGA 有效地預估地震可能引發的山崩，並根據台灣潛在的山崩分佈進行緊急應對。

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Development of a statistics-based nowcasting model for earthquake-triggered landslides in Taiwan

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ABSTRACT

Earthquake-triggered landslides are one of the major hazards in tectonically active mountain belts, and a nowcasting (near-real-time assessment) model for rapid assessment of coseismic landsliding is crucial for hazard mitigation and management. The purpose of this study is to develop a nowcasting model by using a logistic regression model. We use an inventory of earthquake-triggered landslides from the 1999 M_w7.6 Chi-Chi earthquake to train the model at a spatial resolution of 40 m. We use a multi-stage framework to choose dominant variables for developing an optimal model. Our result shows that the model contains three key variables, peak ground acceleration (PGA), topographic roughness, and lithology, and two essential combined variables, PGA*slope, and PGA*roughness, to enhance the interaction between ground shaking and topography. By using the landslide inventory of the 1998 *M*w5.7 Jueili earthquake, the probability threshold of 0.1 is chosen to define predicted landslides, and the balanced accuracy is above 0.95 in the prediction. The development of this model can effectively estimate possible earthquake-triggered landslides with the input of real-time PGA values, and facilitate a rapid response in emergencies based on the potential landslide distributions in Taiwan.