Using a landslide inventory from online news to evaluate the performance of warning models for rainfall-induced landslides in Italy

Gaetano Pecoraro and Michele Calvello
University of Salerno, Department of Civil Engineering, Mercato San Severino, Italy (gpecoraro@unisa.it)

In Italy rainfall-induced landslides pose a significant and widespread hazard, resulting in a large number of casualties and enormous economic damages. Mitigation of such a diffuse risk cannot be attained with structural measures only. With respect to the risk to life, early warning systems represent a viable and useful tool for landslide risk mitigation over wide areas. Inventories of rainfall-induced landslides are critical to support investigations of where and when landslides have happened and may occur in the future, i.e. to establish reliable correlations between rainfall characteristics and landslide occurrences. In this work a parametric study has been conducted to evaluate the performance of correlation models between rainfall and landslides over the Italian territory using the "FraneItalia" database, an inventory of landslides retrieved from online Italian journalistic news. The information reported for each record of this database always include: the site of occurrence of the landslides, the date of occurrence, the source of the news. Multiple landslides occurring in the same date, within the same province or region, are inventoried together in one single record of the database, in this case also reporting the number of landslides of the event. Each record the database may also include, if the related information is available: hour of occurrence; typology, volume and material of the landslide; activity phase; effects on people, structures, infrastructures, cars or other elements. The database currently contains six complete years of data (2010-2015), including more than 4000 landslide reports, most of them triggered by rainfall. For the aim of this study, different rainfall-landslides correlation models have been tested by analysing the reported landslides, within all the 144 zones identified by the national civil protection for weather-related warnings in Italy, in relation to satellite-based precipitations estimates from the Global Precipitation Measurement (GPM) NASA mission. This remote sensing database contains gridded precipitation and precipitation-error estimates, with a half-hour temporal resolution and a 0.10-degree spatial resolution, covering most of the earth starting from 2014. It is well known that satellite estimates of rainfall have some limitations in resolving specific rainfall features (e.g., shallow orographic events and short-duration, high-intensity events), yet the temporal and spatial accuracy of the GPM data may be considered adequate in relation to the scale of the analysis and the size of the warning zones used for this study. The results of the parametric analysis conducted herein, although providing some indications on the most relevant rainfall conditions leading to widespread landsliding over a warning zone, must be considered preliminary as they show a very heterogeneous behaviour of the employed rainfall-based warning models over the Italian territory. Nevertheless, they clearly show the strong potential of the continuous multi-year landslide records available from the "FraneItalia" database as an important source of information to evaluate the performance of warning models at regional scale throughout Italy.