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A real time WebGIS landslide warning system based on a regional set of spatially variable rainfall thresholds

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In the Tuscany region (ab. 23,000 km2, Central Italy) rainfall is the major cause of landsliding.
To set up a regional warning system for the occurrence of landslides, the region was partitioned into 25 alert zones. For each of them an independent set of empirical Intensity – Duration rainfall thresholds was defined analyzing the rainfall measurements connected to the triggering of 2132 past landslide events. Rainfall data were retrieved from a regional network which consists of 332 automated rain-gauges. The thresholds were defined with a semiautomatic statistical procedure and they were calibrated using also the rainfall events that did not result in landslides. The validation procedure stressed that this approach minimizes the false alarms, allowing an effective use for civil protection purposes.
A warning system was set up using the data from the regional rain-gauge network. Each rain gauge provides hourly rainfall measurements and the data are stored on a protected FTP site managed by the Region authority. A specific procedure was programmed in the PHP language in order to continously access the FTP site: data are checked and if new data are present, they are downloaded, stored on a MySQL database and used to build and update in near real time the rainfall path of each rain-gauge.
A WebGIS system based on the OpenLayers technology allows the real time monitoring of all the rain-gauges measurements, which are constantly compared with the rainfall thresholds. With an intuitive color mapping, the WebGIS interface provides an overview of the alert level associated to every rain gauge (based on the overcoming of the rainfall thresholds). Clicking over a rain gauge link, its rainfall path can be visualized and compared with the respective thresholds. On a distinct module, the WebGIS adds to the past measures also spatially distributed rainfall forecasts; at present this module is employed on a test-phase for the prediction of landslides occurrence.