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Landslide hazard assessment by a probabilistic model in the Mendoza river valley, Argentina.

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A landslide hazard zonation of the Mendoza river valley, Argentina, was elaborated at regional scale using a probabilistic model based on *Favorability functions* related to likehood theory expressing the final hazard by the certainly factor. This kind of assessment is significant for this arid mountain region where landslides are very common affecting an international road, an international railway, and villages. Three hundred landslides, at least 1,000 m long, have been identified in the elaborated inventory map covering 12.46 km^2 (0.78% of total study area).

Initially, spatial analysis was carried out overlaying digital thematic maps of main conditioning factors with the landslide inventory map. Nevertheless, significance of these parameters for slope instability was previously analysed for their final inclusion into the model. Most suitable parameters were lithology, slope grade, and elevations. Granites and porphyric-rhyolitic volcanites showed a high correlation with landslide distribution; while slope instability increases with slope grade. Slope failures also increase with elevation as response to greater precipitations (rainfall and snow fall). But they predominate between 3000 - 4000 m a.s.l. where preglacial environment exists and dissapear practically at higher elevations as glacial environment is developed.

Moreover, other parameters were not significant for predict hillslope instability. Favorability to find a landslide indecreases with distance to regional faults, resulting negative certainly factors just on or near regional faults. Hence, we dismissed any relation between mapped faults and landslides may be as a consequence of lacking mapping of the faults or not all mapped faults are Quaternary active.

Also, we concluded that inclusion of certain parameter may induce prediction error. Extense areas comprising different mountain ranges show variation in certain parameters behaviour. In our case, main directions of landslide movement are different for Cordillera Frontal and Precordillera geological provinces with dissimilar mountains range trend. So, if slope aspect parameter was included for hazard assessment, results would be uncertain since model is not able to distinguish more susceptibility hillslope orientations in each geological province. Moreover, model prediction did not enhance when this parameter was considered.

The final landslide hazard map was classified in 200 categories of equal areas and was spatially and temporally validaded. The validation accumulative curves showed that 45% of events shorther than 1000 m were located in 30% of areas classified by the model with higher hazard category; while 45% of events occurred from 1963 to 2000, comprises 30% of area classified as most hazardous by the model.

Finally, the obtained map was compared with a previous landslide hazard zonation elaborated by a geomorphological approach. Present hazard map shows several advances such as: a- better predictive accuracy, b- results given by quantitative terms, and c- possibity of indenpendent analysis of parameters to realise which are the main landslide conditioning factors in this region.