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Landslides in the mountain region of Rio de Janeiro: A semi-automatic proposal for the definition of rainfall thresholds through the intensity-duration relationship

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In 2011 Brazil experienced the worst disaster in the country's history. Due to intense precipitation and related ground effect, 918 dead and thousands homeless ere reported in the mountainous region of Rio de Janeiro State. This area suffers constantly with high volumes of rain and episodes of landslides. After these experience, especially in the municipalities of Nova Friburgo, Petrópolis and Teresópolis, we propose a set of new empirical rainfall thresholds, which can be used for a warning system at the municipality scale. We used MaCumBa (Massive CUMulative Brisk Analyser) software to identify rainfall intensity-duration thresholds capable of triggering landslides in the analyzed municipalities. More than 3000 landslides and rain data were computed: 10 years were used for calibration and one year is used to validate the results. It was possible to establish reliable rainfall thresholds for three alert levels: moderate, high and very high. Such thresholds may be used for early warning and the results may be replicated to other Brazilian municipalities with different data sets.