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Comparing methods to assess the potential variations in frequency of rainfall-induced landslides in the Nocera area (Southern Italy) under the effect of climate changes

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According with the Intergovernmental Panel on Climate Change (IPCC), the effects of the Climate Changes (CC) on weather-induced natural hazards are becoming a relevant topic at different levels involving Administrators, communities and researchers.
In this perspective, if climate projections at high resolution developed in the last years allow to detect clear indications about the potential future trend of the main atmospheric forcing, the translation of such projections in variations of natural hazards is more challenging due to different types of uncertainties which arise and are be properly considered by impact users.
In this sense, a very exhaustive hotspot for investigations and applications developed in the last years by the REMHI Division of CMCC within different research projects (e.g. SAFELAND, INTACT, GEMINA) is represented by the rainfall-induced landslides (RILs) affecting the pyroclastic slopes of the Campania Region in South-Western Italy. Over the past years, such slopes were frequently theater of RILs resulting in casualties and damages to infrastructures and buildings and that were emphasized by the high exposure and demographic pressure of the territory.
Among the different geomorphological contexts of the Campania Region, this study focuses on the slopes forming the Lattari Mts, around the Nocera Inferiore municipality. Since 1960, such area was affected by several events of RILs (1960, 1972, 1997 and 2005), occurred in the wettest period of the year (November-March) and entailing casualties and services interruptions/disruptions especially on the Naples-Salerno highway.
In order to investigate the various levels of uncertainties which should be considered, different simulation chains have been developed and tested. They differ for:
(i) climate models (e.g. the model at very high resolution developed for Italy by CMCC or ensemble simulations with the models of the Euro-CORDEX initiative);
(ii) impact tools (empirical, e.g., rainfall thresholds and statistical methods, or physically-based, e.g., thermo-hydraulic approach able to adequately take into account soil-atmosphere interaction dynamics);
(iii) approaches for coupling the previous ones (e.g., adopting or not bias correction approaches to adjust the systematic bias in climate projections; adopting of probabilistic methods to post-process results through synthetic indices accounting for uncertainties).
The work displays and properly discusses the main findings achieved stressing strengths and weaknesses of the different simulation chains considered. Under these premises, the working methodology and the proposed theoretical framework can be generalized, in a consistent way, also on other geo-hydrological hazards characterized by similar features.