



User-oriented indices for rainfall-related hydrogeological hazards prediction at regional scale: validation in Central Italy

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Italy is one of the countries most exposed to hydrogeological risk in Europe. From the hydrological point of view, alluvial phenomena and rainfall-induced landslides have a common origin, since both of them are caused by intense surface runoff causing slope instability or water overflow in the drainage network. In particular, the territory of central Italy has a complex orography, where heterogeneous basins with different areas co-exist. Vast basins such as that of the Tiber, are found in geographical areas contiguous to minor hydrographic basins, which are mainly located along the eastern slope of the Apennines. Due to this complexity of the landscape, the territorial response to precipitation can be different and alluvial phenomena can be the result of different processes, with the precipitation as a common denominator. Floods or flash floods, but also rainfall-triggered landslides represent the main effects at the ground, due to intense or persistent rains. In general, river floods are considered more predictable than flash floods, since the latter are linked to very localized rain events, concentrated over a short period of time. The predictability of landslides is associated with attentive monitoring, based on the definition of rainfall thresholds. In this work, the hydrological model developed by Cetemps (CHyM) is applied for the simulation and detection of areas subjected to hydrological stress of a large geographical domain, which includes all of Central Italy, during diverse severe weather event impacting Central Italy in the recent years. We propose the validation of three different stress indices on a geographical area of about 65 500 km², including basins of very different sizes and characterized by heterogeneous substrates. The main purpose is to present a unique tool for the forecast on a regional scale of hydrogeological stresses induced by precipitation. The identification of stress conditions is given through the use of indices, able to detect areas affected by floods, flash floods and landslides, also providing a key to discriminate and classify these three different phenomena.