Influence of complex slope hydrogeology on landslide susceptibility assessment: the case of the Pays d'Auge (Normandy, France)

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The role of water as a landslide triggering factor is one of the challenges in landslide risk and susceptibility assessment. Indeed, hydrogeologic conditions can greatly influence slope stability conditions.

This is particularly true in the case of the slopes of Normandy that are covered by different types of surficial materials with thickness varying from 1 to 4 meters. One solution to assess water influence on slope stability is to simulate a groundwater level (GWL) in the materials and introduced it into a slope stability model. (Fressard et al., 2016).

Recently, we performed some research based on this approach to analyse slope stability and map landslide susceptibility in the Pays d'Auge (Cance, 2017). Several spatially distributed, physically based models, that account for various levels of GWL in an empirical way and use different slope stability calculation methods, have been tested (Cance, 2017; Mergili et al., 2014; Reid et al., 2015.

Each of the spatialized models shows that the influence of groundwater, as integrated empirically, does not produce the observed instabilities: some areas suffering from slope instabilities appear to be not identified or miss-simulated. Examination of the these poorly simulated areas reveals that, despite a high GWL and very susceptible materials, these areas are subject to a more complex hydrogeology than the one used in the models.

Hence, we decided to build a hydrogeological model to (i) reflect this complexity and (ii) account for several water levels in (1) deeper calcareous materials and (2) shallow surficial materials closer to the ground surface. This conceptual model will be integrated in a hydrogeological model to simulate a more realistic hydrogeology. Using simulation runs with 2D hillslope profiles, we will compare the slope stability under various scenarios with differing hydrogeological models (simple/complex). Finally, we will performed a reflection to regionalize the hydrogeological model and thus map in a more precise way the landslide susceptibility of the slopes.

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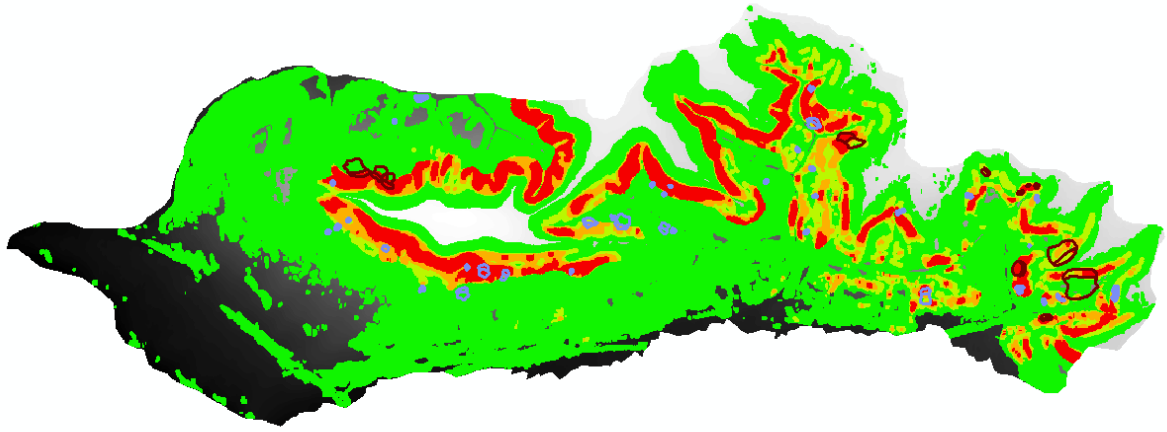

Figure 1. Susceptibility map obtained with ALICE® for shallow landslides (GWL = 0.9) for 'Pont L'Evêque' area (Pays d'Auge, Normandie, France)

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