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Editorial

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Editorial

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With the impact of climate change and more extreme and intense precipitations, geotechnical engineers are facing increasing challenges to protect our built environment and human wellbeing against rainfall-induced landslides. The scope of this subject is wide, covering the fundamentals of soil–water–atmosphere–vegetation interaction, deterministic and stochastic stability assessment methods, remote-sensing methods and early warning systems. The subject is cross-disciplinary at the interface of soil mechanics, hydrogeology, plant science, climate science and sensing technology. The 5th Italian Workshop on Landslides, with a theme of 'Rainfall-induced landslides: nowcasting for early warning', was held in Naples, Italy, on 28–30 May 2018. In this issue, we are pleased to present eight papers, most of which are contributions from the workshop, to advance the understanding and latest technology in landslide science and practice.

The themed issue has three field studies. Cotecchia *et al.* (2019) develop a physically based model to analyse the activity of a representative deep landslide in a slope formed of clayey turbidites and how it can be connected to the climatic regime of the area of interest (southern Italy). By coupling the finite-element transient seepage analysis with the limit-equilibrium slope stability analysis, the effects of the soil–vegetation–atmosphere interaction on the pore-water pressure regime and stability of the clayey slopes are described. The study also demonstrated how this approach can be used to guide the design of early warning systems. The second paper by Salciarini *et al.* (2019) shows the possible use of a probabilistic physically based stability model to take into account the uncertainty of soil characterisation when assessing slope stability in a study area located in central Italy. Predictions made on different anticipated rainfall scenarios are compared to quantify and identify the variation of the percentage of unstable zones within the study area. Rahardjo and Satyanaga (2019), in the third paper of this issue, describe a system that aimed at planning appropriate preventive measures against shallow landslides in Singapore at different scales. A transient rainfall infiltration and grid-based regional slope stability model is introduced to generate large-scale slope susceptibility maps, from which slopes at critical conditions were selected for instrumentation and monitoring to aid the setup of more-effective early warning systems.

Recognising the needs of considering sustainability in slope engineering, there are three contributions in this issue investigating the effects of plants on slope behaviour, via laboratory and numerical/analytical methods. Yildiz *et al.* (2019a) used an inclinable large-scale direct shear apparatus (ILDSA) to study the effects of plant-induced suction on the shearing properties of unsaturated rooted soil. They assessed and identified the relationships among soil water content, plant-induced suction, root biomass and shear strength parameters. In their companion paper, Yildiz *et al.* (2019b) developed a reliability-based approach to evaluate the stability of infinite unsaturated vegetated slopes based on the laboratory findings from the ILDSA. By considering typical slope geometries from a landslide database, Monte Carlo slope stability analyses were conducted to determine the effect of plants on critical combinations of slope angle and suction stress. Satyanaga and Rahardjo (2019), on the other hand, present a study on the unsaturated properties of soils containing mangrove roots (*Melastoma malabathricum*) and their effects on slope stability. It is interesting to see that the presence of plant roots has modified not only the shearing properties but also the hydraulic properties including the soil-water-retention curve and permeability function. Ignoring these modifications made by the vegetation would lead to significant underestimation of the slope stability.

Reliability-based approach has been an important research area in landslide science. There is a contribution from Sasanian *et al.* (2019), who introduce the geotechnical random field (GRF) algorithm to evaluate reliability of slope stability, considering different geotechnical uncertainty sources, including inherent soil variability, measurement error and transformation uncertainty. Based on finite-difference simulations through the use of available in-situ data of standard and cone penetration test profiles, the paper shows how slope reliability analysis via GRF algorithm can help in providing conservative results in comparison to other stochastic methods in the face of the inherent soil variability.

Apart from the papers reporting the latest understanding of soil slope behaviour, there is one paper from Macciotta (2019) discussing the historical insights and some latest ones into the relationships between weather and rock fall occurrences, based on probabilistic approaches. The paper covers several case histories around the world – paying particular attention to western Canada – and reveals how statistical quantification of weather–rock fall relationships can be potentially used in the field of rock fall hazard management.

In closing, we would like to thank all the authors, the workshop organisers (Professors Luciano Picarelli, Thom Bogaard, Roberto Greco and Gianfranco Urciuoli), the reviewers and our Editorial Advisory Panel members who have contributed greatly to the success of this themed issue. We hope that you enjoy reading the papers and will provide additional discussions and responses for the benefit of advancing the geotechnical knowledge of landslides. We show the ability of geotechnical engineers from different countries to solve complex and challenging slope stability problems, achieving practical solutions based on sound understanding, suitable experience and a reliable database.

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