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Analysing hydro-mechanical behaviour of reinforced slopes through centrifuge modelling

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Every year, slope instability is causing casualties and damage to properties and the environment. The behaviour of slopes during and after these kind of events is complex and depends on meteorological conditions, slope geometry, hydro-mechanical soil properties, boundary conditions and the initial state of the soils. This study describes the effects of adding reinforcement, consisting of randomly distributed polyolefin monofilament fibres or Ryegrass (Lolium), on the behaviour of medium-fine sand in loose and medium dense conditions. Direct shear tests were performed on sand specimens with different void ratios, water content and fibre or root density, respectively. To simulate the stress state of real scale field situations, centrifuge model tests were conducted on sand specimens with different slope angles, thickness of the reinforced layer, fibre density, void ratio and water content. An increase in peak shear strength is observed in all reinforced cases. Centrifuge tests show that for slopes that are reinforced the period until failure is extended. The location of shear band formation and patch displacement behaviour indicate that the design of slope reinforcement has a significant effect on the failure behaviour. Future research will focus on the effect of plant water uptake on soil cohesion.