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Physical and numerical modelling of reinforced slopes

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Slope instabilities have each year an catastrophic impact on people and their surroundings. Due to the complexity of these slopes e.g. reinforcement, slope angle, pore water pressures and the coupled hydro-mechanical soil characteristics the combination of physical and numerical modelling forms a good tool to examine this problem. This study describes the hydro-mechanical effects of reinforcements on medium-fine sand slopes in loose conditions. Different types of grasses and randomly distributed polyolefin monofilament fibres were used as a reinforcement. Reinforced sand specimens with various void ratios and fibre- and root densities were tested with the triaxial shear test apparatus. Under all reinforced circumstances an increase in peak shear strength is observed. To simulate the stress state of real scale situations, centrifuge model tests were conducted on sand specimens with different fibre- and root densities at different locations along the slope. The hydrological parameters were measured with miniature tensiometers during the centrifuge tests. It is observed that for reinforced slopes tested in the centrifuge the failure period is extended. The location and density of the reinforcement play a key role in slope behaviour indicated by the location of the shear band and the movement in point displacement. The outcomes of the physical tests will be used as a basis for the numerical modelling of reinforced slopes. Future research will focus on the further development of the numerical model.