

Abstract

A discrete element modeling of granular material was carried out using a 3D spherical discrete model with a rolling resistance, in order to take into account the roughness of grains. The numerical model of Labenne sand was generated, and the desired porosity was obtained by a radius expansion method. Using numerical triaxial tests the micro-mechanical properties of the numerical material were calibrated in order to match the macroscopic response of the real material. Numerical simulations were carried out under the same conditions as the physical experiments (porosity, boundary conditions and loading). The pre-peak, peak and post-peak behavior of the numerical material was studied. The calibration procedure revealed that the peak stress of the sand sample does not only depend on local friction parameters but also on the rolling resistance. The larger the value of the applied rolling resistance, the higher the resulting stress peak. Furthermore, the deformational response depends strongly on local friction. The numerical results are quantitatively in agreement with the laboratory test results