ABSTRACT

The effect of loading rate on the asymptotic behaviour of a granular material with permanent particles is investigated using discrete element method. The asymptotic states could uniquely be represented in terms of dimensionless inertial number I. For low inertial numbers (I lower than 0.01 to 0.001), the asymptotic stress ratio is independent of I (and thus of loading rate and of mean stress). This agrees with observation on soils, showing critical state friction angle independent of mean stress. For low inertial numbers, the critical state line as well as the isotropic normal compression line have similar slope in the plane of void ratio vs. mean stress to the isotropic rebound line. This agrees with conclusions of other scientists, who suggest that particle crushing needs to be involved to represent more realistically the volumetric asymptotic response of granular material. It was further shown that the values of critical state friction angle depend on Lode angle, similarly to what is known from experiments.