On the Dynamic Behaviour of Soils within the Framework of Elasto-Plasticty

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ABSTRACT: Phenomena related to porous media dynamics, such as wave propagation and liquefaction, are encountered in many engineering applications, especially, in geomechanics and earthquake engineering. Drawing our attention to fluid-saturated granular materials with a heterogeneous microstructure, the modelling is carried out within a continuum-mechanical framework by exploiting the well-established macroscopic Theory of Porous Media (TPM) together with thermodynamically consistent constitutive equations. In this regard, the solid skeleton is described within the framework of elasto-plasticity. The underlying equations are discretised and implemented into the coupled finite-element porous-media solver PANDAS. A general interface to the well-established Abaqus finite-element package allows for a straight-forward usage of PANDAS material models within Abaqus, thereby exploiting the advantages of Abaqus, such as the graphical user interface, the contact algorithms and the possibility to deal with large problems through parallelisation. Moreover, the coupling introduces a convenient environment to define new material models through PANDAS. In conclusion, the interface allows to define complex intial-boundary-value problems through Abaqus, but involve state-of-the-art material models of PANDAS. The underlying interface will be used to analyse the wave propagation, which is caused by transient loading condition as they occur, for instance, during earthquakes or the pile driving during deep foundations, within in fluid-saturated soil.