11th. World Congress on Computational Mechanics (WCCM XI)
5th. European Conference on Computational Mechanics (ECCM V)
6th. European Conference on Computational Fluid Dynamics (ECFD VI)
July 20 - 25, 2014, Barcelona, Spain

Simulation of Cyclic Isotropic Compression Tests with the Material Point Method and the Subloading Cam Clay Model

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Key Words: *Subloading Cam Clay, Dynamic Problems, MPM, Isotropic Compression tests.*

Material Point Method (MPM) has gained space in dynamics problems. In geotechnical engineering this problems appear in areas like foundations of machines, earthquakes, wave attack protection, construction of sand compaction piles and others [1].

In dynamical simulations occurs loading and unloading. A proper constitutive model must be able to consider the irreversible deformations that can appear in cyclic loading. In this paper, the SubCam model proposed by [2] is implemented in a code of MPM.

This model introduces the concept of subloading surface as presented by [3] to the well-known Modified Cam Clay model (MCC). Consequently, a smooth transition between the elastic and elasto-plastic behaviour of the soil is obtained. The model introduces only one more parameter than the MCC. This new parameter measures the velocity of degradation of the densification effect of overconsolidated soils. Therefore, more realistic results can be obtained with little increment of effort.

The fundamental differences in the implementation of the model compared to the MCC are presented. Although the SubCam model can better reproduce the behaviour of the soil and it is easier to implement. Cyclic isotropic and oedometric compression tests are simulated as benchmarks to evaluate the implementation of the model. Also, the response of the model to different values of the new parameter is evaluated.

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