Shear band forming with respect to spatial heterogeneity evolution – PARTICLES 2017

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ABSTRACT

Shear band is one of the significant issues both for natural hazards and civil engineering[1]. For granular materials, multiple methods have been applied to investigate the phenomenological features and physical mechanisms of the shear band. The spatial heterogeneity of the frictional granular system is highly exhibited when shear band occurs. According to some researches [2,3], the heterogenous phenomenon usually develops before the shear band. In this paper, we put emphasis on the evolution of the heterogeneity from a spatial point of view during the formation of the shear band. For this purpose, 2D DEM simulations using YADE code are conducted for a dense specimen, which performs an evident shear band during the biaxial loading process. The evolution of spatial distribution of different indicators are shown and analysed, including the shear strain, the sliding index, the local void ratio and the redundancy ratio. Localized patterns of these indicators illustrate the similarity during the biaxial loading. The Moran's Index shows the heterogeneity is generated at the very early stage. In addition, the meso-structures (force chains and loops) as well as their evolutions are explored, which demonstrate the correlation between the local mechanical behaviours and the topology evolution index.

Key words: granular materials; shear band; DEM; meso structures; heterogeneity;

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