

Particles motion mechanism of rock-fill dam under initial overtopping condition

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Abstract

Although great efforts have been devoted to revealing the dam-break mechanisms in macroscopic scale, the study of mesoscopic particles motion of rock-fill dam is still not sufficient. This paper presents particles motion mechanism of rock-fill dam under initial overtopping condition based on the coupled Computational Fluid Dynamics and Discrete Element Method (CFD-DEM) analysis. The important fluid-particle interaction forces, as the drag force, the buoyancy force and the virtual mass force, are considered by exchanging interaction forces between the CFD and DEM computations. We study on the initial motion positions and movement modes of the dam particles under different hydraulic head of overtopping. It is found that the higher hydraulic head is, the lower initial motion position of dam particles will be in a certain range. The results of CFD-DEM analysis reflect particles motion mechanism of rock-fill dam well through test model validation.

Keywords: rock-fill dam; particles motion mechanism; hydraulic head of overtopping; coupled CFD-DEM; test model