Discrete Numerical Modelling of Particle Sediment Transport on Inclined Landforms

R. Bravo*, P. Ortiz* and J.L. Pérez-Aparicio†

* University of Granada. Esc. Ing. Caminos.
Campus de Fuentenueva 18071. Granada. Spain.
E-mail: rbravo@ugr.es, portiz@ugr.es

† Dep. of Continuum Mechanics and theory of Structures.
Universitat Politécnica de Valéncia 46022. Valencia. Spain.
E-mail: jopeap@upvnet.upv.es

ABSTRACT

This work studies the initiation of motion of an arrangement of sediment ellipsoidal particles located on an inclined landform under the action of laminar and turbulent flows. The numerical approach based on the Discrete Element Method (DEM) computes the motion of each individual particle and the interaction with the surrounding particles. Therefore it simulates the initiation of motion as a consequence of the multiple particle interactions of particles in contact with the flow.

The aim of this work is establishing a relationship between the Reynolds number Re* of the flow and the non-dimensional critical shear stress τ^* (Shields diagram) that defines the initiation of motion of the particle and therefore the initial conditions for the beginning of the erosion. Previous attempts to model the initiation of motion have been developed for spherical particles, see [1] and therefore do not fully simulate the variety of shapes included in the main experimental contribution of Shields. Several inclined landforms composed by ellipsoidal particles with random orientations are simulated and the relation Re^*- τ^* is computed according to a criterion of incipient transport.

The results shown in this work numerically extend the diagram of Shields to geometries that have not still been tested.

REFERENCES

[1] R. Bravo, P. Ortiz and J.L. Pérez-Aparicio, "Incipient sediment transport for non–cohesive landforms by the discrete element method (DEM)", *Applied Mathematical Modelling*, **38**, 1326-1337 (2014).