

Abstract:

This work presents a well-balanced numerical scheme for the one-dimensional Savage-Hutter (S-H) granular model. This model resembles the one-dimensional shallow water equations and shares several properties such as hyperbolicity, characteristic fields etc. Moreover, the steady states at rest are the same when the earth pressure coefficient equals one. Therefore, the idea to construct the well-balanced numerical scheme for shallow water equations plays a vital role in constructing that for S-H model.

First, we construct a Godunov-type finite volume numerical scheme for the shallow water equations with bottom topography. That numerical scheme addresses important issues related to the well-balanced (i.e. preserving the steady states at rest) and positive preserving properties, as well as its capability to handle wet-dry transitions. Then, we apply the derived scheme to S-H granular model by using the semi-implicit method for the treatment of the friction term.