Influence of georeference for saturated excess overland flow modelling using 3D volumetric soft geo-objects

Abstract:

Existing 2D data structures are often insufficient for analysing the dynamism of saturation excess overland flow (SEOF) within a basin. Moreover, all stream networks and soil surface structures in GIS must be preserved within appropriate projection plane fitting techniques known as georeferencing. Inclusion of 3D volumetric structure of the current soft geo-objects simulation model would offer a substantial effort towards representing 3D soft geo-objects of SEOF dynamically within a basin by visualising saturated flow and overland flow volume. This research attempts to visualise the influence of a georeference system towards the dynamism of overland flow coverage and total overland flow volume generated from the SEOF process using VSG data structure. The data structure is driven by Green-Ampt methods and the Topographic Wetness Index (TWI). VSGs are analysed by focusing on spatial object preservation techniques of the conformal-based Malaysian Rectified Skew Orthomorphic (MRSO) and the equidistant-based Cassini-Soldner projection plane under the existing geodetic Malaysian Revised Triangulation 1948 (MRT48) and the newly implemented Geocentric Datum for Malaysia (GDM2000) datum. The simulated result visualises deformation of SEOF coverage under different georeference systems via its projection planes, which delineate dissimilar computation of SEOF areas and overland flow volumes. The integration of Georeference, 3D GIS and the saturation excess mechanism provides unifying evidence towards successful landslide and flood disaster management through envisioning the streamflow generating process (mainly SEOF) in a 3D environment.