A preliminary evaluation of the impact of pyroclastic flows using TITAN2D at the Baekdusan volcano according to three different scenarios

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The Baekdusan volcano was formed by three stages of activity: (a) a basalt shield(aging between 2.77 and 0.31Ma), (b) a trachytic comendite stratocone(aging between 1.19 and 0.02 Ma), (c) a trachyte-comenditite ignimbrite deposits(aging between 20 ka up to the present). Volcanic seismicity, ground deformation, and volcanic gas geochemistry yields new evidence for magmatic unrest of the volcano between 2002 and 2006. The monitoring data suggest that the Mt. Baekdusan is a potentially active volcano and close attention is needed. One of the possibly treat of this volcano is the pyroclastic flow volcanic hazard. In order to evaluate the pyroclastic flow emplacement on this hazardous volcano, we use Titan2d code. It is based on a depth-averaged model for an incompressible granular material, governed by Coulomb-type friction interactions. The governing equations are obtained by applying conservation laws to the incompressible continuum, and then taking advantage of the shallowness of the flows to obtain simpler depth-averaged representations. The motion of the material is considered to be gravitationally driven and resisted by both internal and bed friction forces. The resulting hyperbolic system of equations is solved using a finite-volume scheme with a second-order Godunov solver. The DEM file (UTM easting, UTM northing and elevation in meters) must be properly configured to operate with TITAN2D through the use of Grass GIS Software. The other input parameters used are: volume(5-10x107 m3, 1x109 m3, 2x1010 m3) of a vertical cylinder pile(maximum height, major and minor axes), center of initial volume(the location of the initial pile center are the vents of the 1903, 1702, 1668, Millennium eruptions), several orientation angle of the initial pile were selected, internal friction angle(25-30 degree), bed friction angle(16-25 degree).The pyroclastic flow run-out calculated in the field are small(3000 m, 1903 eruption) intermediate(5000 m, 1668-1702 eruptions), large(6-70000 m, Millennium eruption). The initial velocities(m/s) range from 50(1903 eruption) to as high as 300(Millennium eruption). The input parameters have constructed three scenarios(1903, 1702, 1668, Millennium eruptions) following the recent volcanic history of Baekdusan volcano. These eruptions brace all the possibly explosive eruptive scenarios that can occur at Baekdusan volcano in the future. Preliminarily, the 1903 type scenario has been performed, according to the vent location, the flow moves in diverse direction(NE, SE) with a thickness of 3 m, if the vent is center of the caldera the flow fills the caldera with a thickness of 5 m. The modeling of the other two scenario are in progress.

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