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# A continuum approach for the pyroclastic flow deposit

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The final deposit of a pyroclastic flow is the resulting difference balance between the particle deposition and erosion. A relation for the particle deposition velocity ($v_d$) is proposed, which accounts for the hindered settling velocity, the particle concentration and a threshold related to the minimum fluidization velocity. The erosion velocity ($v_e$) is assumed proportional to the shear stress and the shear velocity. A net deposition velocity is defined as $v_n = v_d - v_e$ and is used as boundary condition at the ground level for the vertical velocity. The above analytical approach is included in the full Navier-Stokes equation system coupled with the convection-diffusion equation, which is used to describe the bulk evolution of the flow.

The equations are solved by the use of the finite element method and the model is applied to the a Montserrat volcano eruption showing a deposit thickness of 2-4 cm at a distance of 4 km away from the vent, this result is in agreement with the field measurements (0-10 cm). Additionally, other dynamical parameters are obtained, showing a mean speed of the flow front of 60 m/s, a temperature of 500 $^0K$ at the arrival to the coast and a overpresssure of about 100 KPa all of them showing good agreement with the field estimates.