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The effects of segregation on granular flow dynamics

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Geophysical flows such as avalanches, rock slides and debris flows are a major hazard in many mountainous region. Accurate, physically based models are important for the design of defensive structures and hazard zoning. Such flows contains particles of many sizes and the vertical distribution of these particles can significantly influence the dynamics. We introduce a new class of shallow-water granular flow models that includes equations for the vertical distribution of the different particle types. We compare this model with Discrete Element Method simulations and show that they are in excellent agreement with the theory.