



## **Closure relations for bidispersed shallow granular flows – towards understanding segregation in geophysical flows**

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The flow behaviour of shallow granular chute flows for uniform particles is well-described by the  $h_{stop}$ -rheology [Y. Forterre, O. Pouliquen, J. Fluid Mech. 486, 21–50 (2003)]. Geophysical flows, however, are often composed of highly non-uniform particles that differ in particle (size, shape, composition) or contact properties (friction, dissipation, cohesion). The flow behaviour of such mixtures can be strongly influenced by segregation effects.

Here, we study the influence of particle size segregation on the flow behaviour of bidispersed flows using the discrete particle method. We consider mixtures where both large and small particles have the same contact properties (such as friction and restitution). We derive closure relations for the granular shallow layer equations, and study their dependence on the segregation profile and the dispersity. We further account for the dynamics of the flows by measuring their segregation Peclet numbers. The resulting model will allow us to make better predictions for large-scale geophysical flows.