71st MSS-Seminar

Wednesday, May. 13th, 15:30

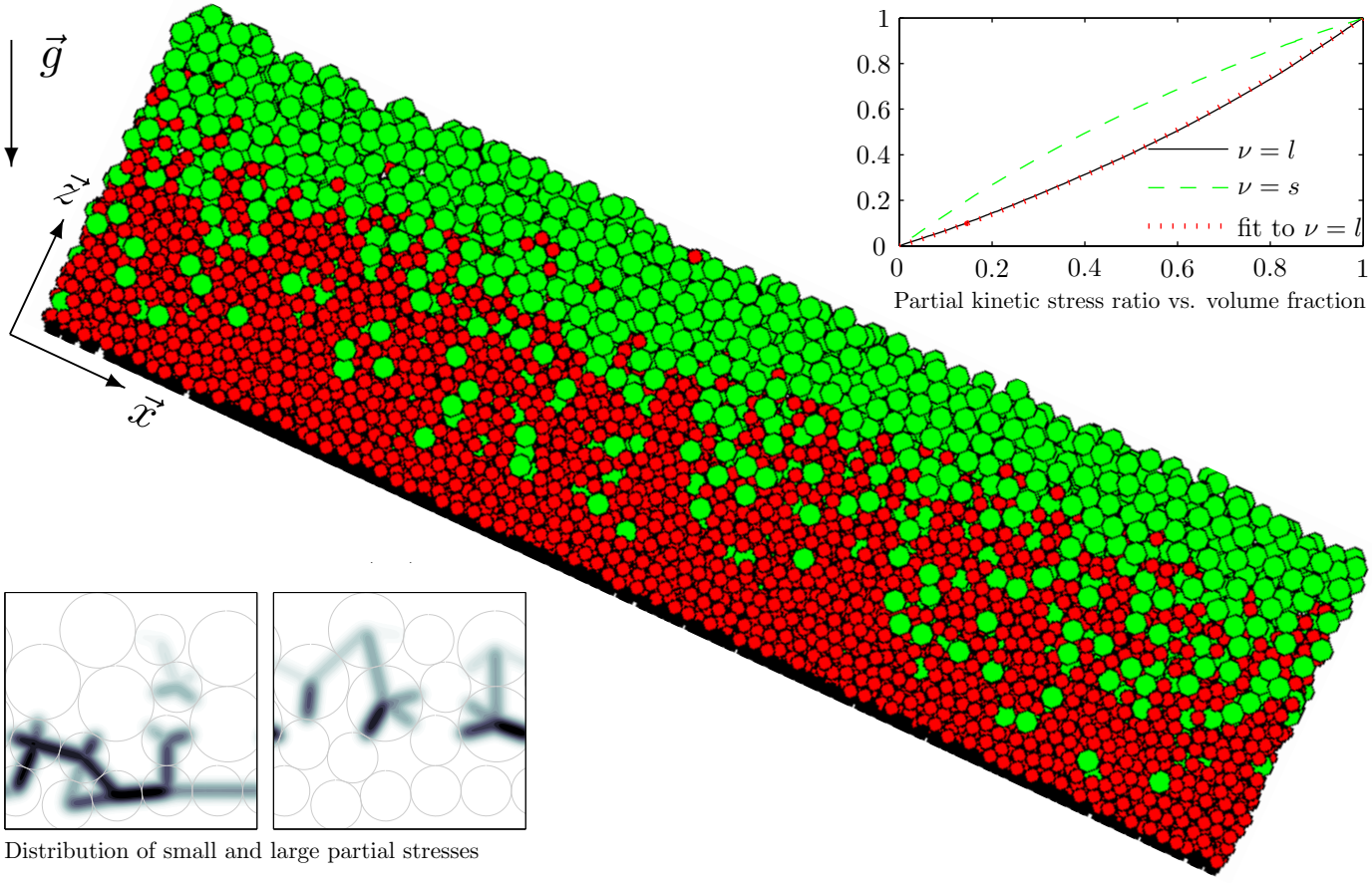
Nägelsbachstr. 49b

MSS

From discrete particles to continuum fields in granular mixtures

Thomas Weinhart

University of Twente



Partial kinetic stress ratio vs. volume fraction

Distribution of small and large partial stresses

We present a novel way to extract continuum fields from discrete particle systems that is applicable to multi-component granular mixtures as well as boundaries and interfaces. The mass and momentum balance equations for mixed flows are expressed in terms of the partial densities, velocities, stresses and interaction terms for each constituent. Expressions for these variables in terms of the microscopic quantities are derived by coarse-graining the balance equations, and thus satisfy them exactly. A simple physical argument is used to assign the interaction forces to the constituents.

Discrete particle simulations of dense granular flows over a rough inclined plane are presented to illustrate the strengths of the new boundary/mixture treatment. We apply the formulation to bidispersed mixtures differing in density and size to confirm the assumptions of shear-induced segregation: the larger/denser constituent supports a fraction of the local kinetic stress that is higher than their volume fraction.