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Three-dimensional particle tracking velocimetry applied to granular flows down rotating chutes HERMAN CLERCX, SUSHIL SHIRSATH, JOHAN PADDING, HANS KUIPERS, Eindhoven University of Technology — We report on the cross-validation of 3D particle tracking velocimetry (3D-PTV) with other measurement techniques, such as particle image velocimetry (PIV), electronic ultrasonic sensor measurements for bed height and the discrete element model (DEM), for gaining more insight into the behavior of granular flows down inclined rotating chutes. In particular we aim at gaining access to Lagrangian displacement data of surface particles in granular flows and to obtain independent measurements of both the surface velocity and the bed height in the chute. The 3D-PTV method is based on imaging and tracking colored tracer particles that are introduced in the granular material, which are viewed from three directions. The three cameras collect consecutive frames a known Δt apart and the PTV algorithm for locating and tracking particles is used to determine particle trajectories and velocities. The PTV and PIV results are in good mutual agreement with regard to the streamwise and spanwise surface velocity. The particle bed height obtained from 3D-PTV was compared with data from an ultrasonic bed-height sensor and it is found to be in good mutual agreement, as was the case for the comparison between the experimental findings from 3D-PTV and simulations by DEM.

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