GRANULAR SYSTEMS RHEOLOGY AND MECHANICS

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We report the experimental activity carried out on a rotating drum partially filled with grains or glass beads and a model of the grain stream. Experiments give information about rheology through velocity profiles and through the velocity covariance tensor structure. We used a LDV system for measuring the velocity of the grains in several points along three vertical sections. The data were elaborated in order to obtain for all the experiments the velocity and pseudotemperature profiles; for a subset of the experiences an oversized set of data were elaborated to obtain the velocity covariance, that is not collinear with the velocity of deformation tensor. The model is based on several assumptions : frictional component, due to long contacts between particles, is represented by a Coulomb law, assuming that at least for limited values of the mean stress level the global friction angle experiences a strong reduction immediately after shearing start, due to collapse of grain-grain gears; then it tends to increase with decreasing concentration. Anyway the difficulties in measuring volume concentration of the grains with the necessary precision and the substantial impossibility of checking the results, suggest a different closure. The collisional contribution to the global stress is expressed as function of the local concentration, local velocity gradient and of the average contact angle between shearing layers. The kinetic contribution is neglected because of its minor relevance at high concentration.