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A comparative study on optical techniques for the estimation of granular flow velocities

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Abstract

The evaluation of particle velocities in fluidized beds has improved the understanding of ongoing micro and macro processes significantly. Several measurement techniques are available in order to estimate single particle velocities as well as granular flow velocities in terms of velocity fields. All of those techniques feature individual advantages and shortcomings, which have been reviewed at various occasions, in particular by Werther (1999), Horio et al. (2003) or recently by Sutkar et al. (2013). Often, the reviewers presented facility specific findings, which are not to be generalized.

Therefore, our study focuses on the comparison of four different measurement techniques, namely fiber optical probe (FOP), laser Doppler velocimetry (LDV), particle image velocimetry (PIV) and particle tracking velocimetry (PTV), which have been applied under identical conditions at one and the same flat fluidized bed facility. Consequently, results obtained with the different techniques feature identical system characteristics and can be compared to derive general conclusions.

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