Geophysical Research Abstracts, Vol. 9, 11075, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-11075

Experimental investigation on the turbulent structures involved in particle motion

J. Le Louvetel-Poilly, F. Bigillon and J.Y. Champagne

Laboratoire de mécanique des fluides et d'acoustique, UMR 5509, INSA-Lyon, F-69621, France,

; (julie.le-louvetel-poilly@insa-lyon.fr / Fax: +33 472438718 / Phone: +33 472438070)

Experiments in an open-channel flow have been performed to study the interaction between turbulent structures of the wall and particles motion. Particle Image Velocimetry technique was used to measure simultaneously both the turbulent characteristics of the flow and the particle motion. Thus, from these measurements it was possible to go into more details on the turbulent structures, in particular ejections and sweeps, involved in particle motion. The particles used in these experiments are ceramic beads 0.329 mm of diameter with a density 3800kg/m3. Five hydraulic conditions have been tested with Reynolds numbers varying from 3,000 to 30,000.

Results concerning the turbulence of the flow and the beads motion are analyzed together. They show that the moving beads are located preferentially into sweeps and ejections, with a Reynolds stress about 2 to 6 times stronger than the mean Reynolds stress. Particularly we observed that 60 to 80% of the beads fall into ejections and sweeps; as illustrated with the figure 1. The results also show that there is a great correlation between the vertical motion of the beads and their surrounding turbulent structure indicating that ceramic beads move along with the turbulent structures.