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Velocity Structure and Spatio-temporal Evolution in the Head Turbidity Currents based on Ultrasound Doppler Velocity Profiling

Shun Nomura (1,2), De Cesare Giovanni (1), Yasushi Takeda (3), Taiki Yoshida (4), Yuji Tasaka (4), and Hide Sakaguchi (2)

(1) EPFL, Lausanne, Switzerland (shun.nomura@epfl.ch), (2) Jamstec, Yokohama, Japan (nomura.shun@jamstec.go.jp, (3) ETH, Zurich, Switzerland (yasushi.takeda@hest.ethz.ch), (4) Hokkaido University, Sapporo, Japan (tasaka@eng.hokudai.ac.jp)

Particle laden flow or turbidity current along the sea floor are important as a sediment conveyer and a formation factor of the submarine topography in the geological field. Especially, in the head of the flow, the kinematic energy is frequently exchanged through the boundary of the ambient water and the seabed floor, and it dominants the substantial dynamics of turbidity currents. An understanding of its turbulence structure helps to predict the sediment transport and layer development processes. To comprehend its dynamics precisely, flume test were conducted with continuously fed fluid quartz flour mixture supply. The flow velocities were measured at two different angles by the ultrasound Doppler velocity profiler UVP and both velocity components, in flow direction and on the vertical axis, were extracted. The fundamental velocity structure corresponds to the theories found in literature. Its spatio-temporal evolution was examined from the velocity distribution profiles along the downstream directions. Additionally, developing processes of head structures were also discussed through hydraulic statistic values such as mean velocity, Reynolds stress, and turbulent kinematic energy.