Performance of hydro-acoustic sediment flux profiling in highly turbulent particle flows

Laboratory :	LEGI (Lab. Ecoulements Géophysiques et Industriels), Grenoble, France
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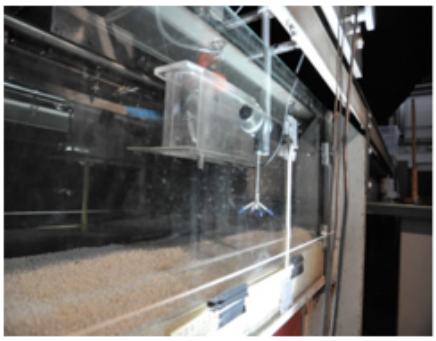
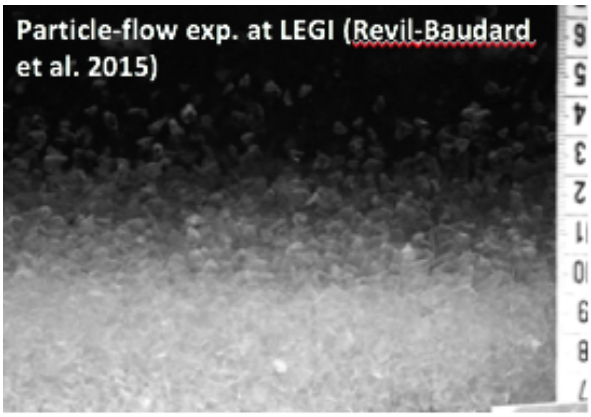
Period :	5 months internship between Feb. and September 2018
Profile:	Master level courses in underwater acoustics / fluid mechanics and / or sediment transport with strong interests in laboratory experiments, data collection, processing, analysis & interpretation. Interest in a PhD project appreciated
Skills:	Matlab / Python / labview. Advanced spoken and writen English skills
Project:	ANR Astrid MESURE, European Hydralab+ project

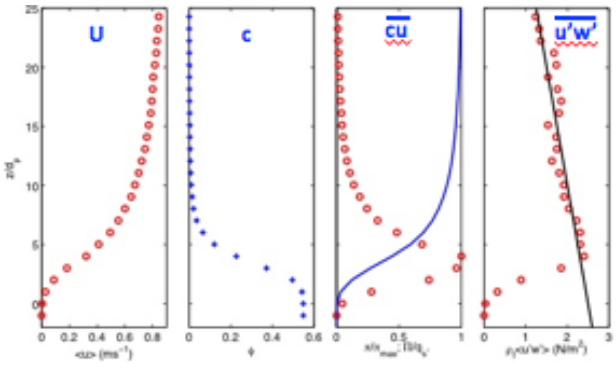


Sheet flow experiment at LEGI

Advances in flow controlled sediment transport physics and modelling still suffer from the lack of High-Resolution flow measurement technologies providing process oriented data of turbulent flow-particle interactions in Benthic Boundary Layer (BBL) flows. This is particularly true in high Reynolds number geophysical flows driven by energetic gravity currents in rivers or by surface gravity waves in the coastal marine environment. Over the past years, a novel hydro-acoustic measurement tool developed at LEGI as the Acoustic Concentration and Velocity Profiler (ACVP, Hurther et al. 2011, Thorne et al. 2011, Thorne and Hurther 2014) has provided new insights into a variety of BBL sediment transport processes (Naqshband et al. 2014a, 2014b, Revil-Baudard et al. 2015, 2016, van der Zanden 2016, 2017). The DGA funded ANR Astrid project MESURE (2017-2019) aims the development of a commercial version of the ACVP intrument by the French company UBERTONE. A first instrument prototype, the UB-MES, has been designed during the initial phase of the research project. The present master internship is devoted to its experimental validation in highly controlled and energetic particle-laden flows using the laboratory flume facility of LEGI. An intensive measurement campaign combining the UB-MES prototype and the ACVP instrument (as the reference tool) will be carried out by the candidate under well-known sheet flow conditions (Revil-Baudard et al. 2015). A detailed comparative analysis of the collected UB-MES and ACVP data will be undertaken in terms of mean and time-resolved 2C velocity, particle concentration, flow bed position and particle transport rate decomposed into suspended and bedload contributions. A specific attention will be given to the measurement accuracy of turbulence driven quantities and dynamic interactions between turbulent coherent flow structures and the flow bed dynamics (Hurther and Lemmin 2003, Hurther et al. 2007, Revil-Baudard et al. 2016).

We are seeking for a motivated master student with a master level education in underwater acoustics, fluid mechanics or sediment transport, and interested in an intensive experimental work involving data collection, processing, analysis and their interpretation. The participation to a measurement campaign in a large-scale european research facility (Spain or Germany) can be envisioned (see Hydralab+ project at www.hydralab.eu). Candidates eligible and motivated in a PhD project on underwater sediment acoustics will be considered.





Hydro-acoustic ACVP measurements