

# PhD proposal

## Object tracking for the study of sediment transport in mountains

### Context

Many natural flows in mountain are composed of solid particles in a fluid, particularly bedload sediment transport, where particles always remain in contact with the bed. These flows are a source of damage (especially torrential floods in the Alps) and have wider implications in terms of ecology (salmonid reproduction) and landscape.

The main objective of this work is to better understand the segregation of sediments responsible for complex morphological structuring.

The originality of this PhD is to combine expertise from two different areas: granular flow mechanics provided by Irstea (ex Cemagref) - Grenoble, ETNA research unit (P. Frey) and image processing provided by Hubert Curien laboratory, Univ. St Etienne / CNRS UMR 5516 (C. Ducottet).



Fig A : River armoring

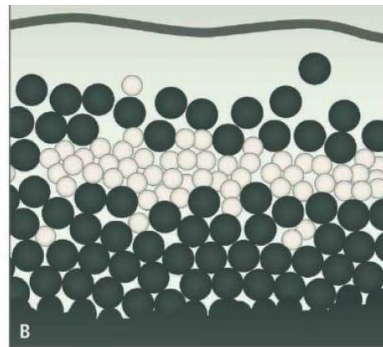


Fig B : Segregation in a flume  
(Frey and Church, Science, 2009)

### Subject

The first objective is to develop new tracking algorithms to determine bead trajectories more accurately and more efficiently compared to existing ones. The second objective is the experimental study of the segregation phenomena in an experimental steep and narrow flume. The sediment (glass beads) trajectories are acquired by high speed video camera and processed by image analysis. Both of these objectives will be more or less developed depending on the candidate's profile.

### Contacts

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<http://www.irstea.fr/en/research/research-units/etgr/narrow-flume-tool-studying-steep-slope-bedload-transport>
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**Position:** Grant from the Rhône-Alpes region (3 years). Research will take place in Grenoble or in Saint-Etienne depending on the candidate's profile (mechanics or image processing).

### Candidate profile

Two different profiles are possible:

1. Image processing or computer science or applied mathematics with skills in C/C++ programming and interests in environmental mechanics.
2. Fluid Mechanics or physics of fluid and / or granular media with skills and interests for image processing and C/ C++ programming.

**Required:** Experience in application development, strong academic background, good command of both spoken and written English (writing of scientific publications), and basic French desired.

**Documents required to apply:** resume, cover letter, master transcript, contact details of two referents.