

# Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website [www-csc.utt.fr](http://www-csc.utt.fr))

Supervisor's name : Mignot Given names : Emmanuel

Status (prof., assistant prof., ...): Associate professor

Laboratory : LMFA Website address : <http://lmfa.ec-lyon.fr/>

Institution : INSA Lyon Website address : <https://www.insa-lyon.fr/>

Scientific competence of the supervisor:

The supervisor dedicates his research to investigate the environmental natural disasters associated to water (mostly floods) and river ecology. The approach is experimental taking benefit from large flumes and advanced measurement technics. His research aims at better understanding the flow characteristics under complex situations and addresses these data to operational team dealing with the evaluation of level of risk, of ecology, biology etc...

Two major publications in the field proposed for the PhD :

1. Mignot E., Riviere N – 2010. Bow-wave-like hydraulic jump and horseshoe vortex around an obstacle in a supercritical open channel flow, *Physics of Fluids*, 22, 117105.
2. Mignot E, Moyne T., Doppler D. and Riviere N. (2016) "Clear-water scouring process in a flow in supercritical regime", *Journal of Hydraulic Engineering*, 142 (4).

Website address of the personal page : <http://lmfa.ec-lyon.fr/spip.php?article310>

Supervisor's email : [emmanuel.mignot@insa-lyon.fr](mailto:emmanuel.mignot@insa-lyon.fr)

Description of the research work proposed for a PhD

Topic # (see list) : V-15

Title : Experimental assessment of the forces exerted by a tsunami-like flow on buildings and associated scour at the foundation of the building

Subject :

As a Tsunami or a torrential flood invades the flood-plain, the flow is in supercritical regime. As this flow approaches urban areas or isolated buildings, it can generate two major damages to the building: it either generates scour at the base of the building, with a risk of collapse of the building or it can generate a hydrodynamics force on the upstream face of the building that can set the building in motion. The PhD work aims at better understanding the processes associated with the formation of scour and the force on the building as a function of the characteristics of the flow (approaching velocity, depth etc...) and the building (typical size, orientation with regards to the flow...).

The scour and forces exerted on mounting obstacles in open-channel flows have been studied for long times in the context of bridge piles in rivers, but received much less attention in the context of Tsunamis and torrential floods. The supercritical regime exhibits two major flow structures (a horseshoe vortex at the base of the obstacle and a detached hydraulic jump in the near-surface region) that strongly affect the scour and forces exerted on the obstacle. The PhD student will benefit for specific installations available at INSA Lyon - LMFA where controlled supercritical flows can be reproduced, where a specific hydrodynamic balance permits to measure the force exerted by the flow on mounted obstacles and where specific technics permit to measure the evolution of scour fields at the base of the obstacles.

Keywords :

Tsunami - torrential floods - Building stability and damage - Hydrodynamics forces - Scour - Metrology - Experimental work

Expected collaborations :

1. CNR is a French company working on the stability of bridge piles encountered in supercritical river flows (due to Typhoons for instance). CNR owns very large scale installations and a great knowledge on the bridge pile stabilities
2. University of Concepcion in Chile where Prof. Oscar Link dedicates his research to evaluate the stability of bridges in supercritical river flows AND is among the many experts in scour forming at the base of bridge piles. Recently, Profs O. Link and E. Mignot created an international group of research dedicated to review all available works on the topic.

Background required from the applicant :

The main requirement for the applicant is to have solid knowledge in fluid mechanics and, if possible, in experimental methods. The applicant must also be ready to perform advanced experimental works in the field of natural disasters, combining several measurement technics: he/she will have to be persistent and enthusiastic.

Existence of a PDF file detailing the proposal ("yes" or "no") : yes

(see guidelines on the website [www-csc.utt.fr](http://www-csc.utt.fr))