PHD IN FLOOD MODELLING, REMOTE SENSING AND DATA ASSIMILATION (M/F)

REFERENCE : ERIN-2018-017
Type: PhD Student
Contract type: Fixed term contract
Duration: 3 years (+ potentially 1-year extension)
Place: Belvaux

CONTEXT

With an objective of assessing flood hazard at large scale, there is currently a growing interest for regional to global scale flood models. However, predicting flood hazard at high resolution and over large areas remains challenging due to (i) the lack of in situ hydrological data in many parts of the world, (ii) the often high computing demand of large scale numerical models and (iii) the (often large) model uncertainty.

DESCRIPTION

In this context, the PhD is expected to focus on one main research question: **How to optimally integrate large collections of satellite derived flood information for parameterizing and controlling large scale hydraulic models over data scarce areas?**
The PhD will therefore leverage recently developed innovative hydraulic modelling approaches (subgrid river routing, porosity-based models) that allow for large scale applications. In particular, one main objective of the PhD will be to develop an efficient framework for optimally integrating remote sensing derived flood information to compensate the lack of observations related to riverbed bathymetry and river discharge.

Two modelling options will be envisaged: Lisflood-FP (developed by Bristol University, UK) and the porosity-based version of SW2D (developed by University of Montpellier, France). Both models run on a 2-Dimensional basis and are computationally efficient. Lisflood-FP is a raster based model including a subgrid channel flow routing that allows for defining grid cells larger than the river. SW2D model is based on an irregular triangular mesh and integrates porosity concepts in combination with traditional shallow water equations. In such a model, defining porosity as a function of the water depth allows for the representation of a more detailed floodplain and riverbed geometry even when adopting comparatively large cell sizes. One objective will thus be the evaluation of the two envisaged modelling alternatives for application at large scale.
Moreover, the effective integration of remote sensing-derived flood information into hydraulic models remains a critical issue. The candidate will therefore investigate new ways for making use of satellite earth observation data (i.e. flooded areas and water level estimates derived from SAR data collections) for retrieving uncertain model parameters and boundary conditions. The method will be developed and validated using synthetically generated data sets as well as real-event data retrieved from the European Space Agency's archives. Extensive testing will be carried out in a number of high magnitude events recorded over the Severn (United Kingdom) and Zambezi (Mozambique) floodplain areas.

The PhD study will rely on a close collaboration with remote sensing scientists and hydrodynamic modellers from both LIST and the University of Montpellier. The PhD student will be enrolled at the University of Montpellier, employed by LIST and will carry out his research jointly at LIST (0.67 FTE) and University of Montpellier (0.33 FTE).

PROFILE

Education
- Master's degree in applied mathematics or environmental engineering, preferably with a focus on hydraulics.

Required seniority
- Master of Science

Competencies
- Very good programming skills and strong mathematical/statistical background
- Should be knowledgeable of Matlab (or similar software) and GIS software

Language
- Fluent in English
- French in an asset

CONTACT

Candidates interested in the position can apply online on the LIST website:
https://www.list.lu/en/jobs/phd-candidates/job-offer/erin-2018-017/

The application file should include:
- a CV (with the undergraduate marks)
- a motivation letter

For any questions regarding the internship you can contact Dr. Renaud Hostache (renaud.hostache@ list.lu) and Dr Carole Delenne (carole.delenne@umontpellier.fr).