PhD position in hydraulic modelling
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Assimilation of satellite Earth Observation-derived
flood extent data into hydraulic models

The Luxembourg Institute of Science and Technology (LIST) is offering a fully paid PhD candidate position in the framework of a newly funded Doctoral Training Unit (DTU) in Water Sciences: Hydro-CSI.

The doctoral programme HYDRO-CSI is funded in the framework of the PRIDE scheme of the Luxembourg National Research Fund (FNR).

The main objective of the DTU is to train a new generation of highly skilled experts with a view to contribute to solving some of the most pressing challenges related to water resources research and management: hydrological system complexity, non-stationarity of boundary conditions, high-frequency monitoring of environmental processes, global change impact assessment. This position is envisaged to start between January 1st 2017 and 1st May 2017 and will extend over a maximum duration of 4 years.

The PhD candidate will be part of the Water Safety and Security Unit at the Department of Environmental Research and Innovation (ERIN) at LIST and will work in the Remote Sensing and Ecohydrological Modelling research group. Furthermore, the PhD candidate will be affiliated with the Technical University Vienna.

A central theme in hydrological modelling sciences is the reduction of predictive uncertainty – a field where progress often comes along with the introduction of new measurement techniques. The last two decades have seen a sharp rise in the wealth of data provided by remote sensing platforms. Synthetic Aperture Radars, in particular, provide a means for monitoring the temporal and spatial variations of floodwaters at large scale. However, the effective integration of such remote sensing-derived flood extent information into hydraulic models remains a critical issue.

Job description:

The PhD candidate will investigate new ways for making use of satellite Earth Observation data (i.e. flooded areas, flood edges and water elevation estimates derived from EO data collections) for calibrating and updating different hydraulic models. A well- established way for reducing predictive uncertainties is to periodically control and correct hydraulic models via external observations. In forecasting mode such data assimilation applications allow keeping the predictions on track. The main objective of this PhD study is thus to improve water elevation and flood extent simulations by correcting a hydraulic model using both microwave and optical remote sensing-derived flood inundation information. To optimally combine observations and simulations suitable filtering methods need to be developed in order to periodically correct the hydraulic models in terms of flood extent water elevation simulations. The method will be developed using synthetically generated data sets as well as real-event data retrieved from the European Space Agency's and the partner organizations' archives. For example, extensive testing will be carried out in a number of high magnitude events recorded over the Severn (United Kingdom) and Zambezi (Mozambique) floodplain areas (other basins may be added). A particular focus will be set on the efficient joint use of Sentinel-1

and Sentinel-2 data acquired in built up environments. Ultimately, the aim is to develop a fully automatic data integration system based on globally consistent and coherent satellite EO data that should significantly improve large scale hydraulic modelling.

Moreover, the candidate will be in charge of:

- making a state-of-the-art analysis relative to the general objectives of the project and the elaboration of the working hypotheses,
- designing and implementing short- to long-term laboratory and field experiments in line with the formulated hypotheses,
- rigorously processing and analyzing collected data for publication in highly ranked international peer-reviewed journals.

Eligibility:

- No restrictions apply as to the nationality of the candidates
- Candidates may not have received a doctorate prior to their application to this position
- Candidates shall be available for starting their position no later than 1st May 2017

Qualifications:

- Applicants should have a MSc degree (or equivalent) in Geosciences, Remote sensing or Environmental engineering
- Expertise in the application and set up of hydraulic models
- Programming skills are essential (e.g. Matlab, Python, IDL)
- Experience with the processing of remote sensing imagery is considered an asset

Place of employment and main place of work:

- **Primary supervisor at degree awarding institution TU Vienna:** Prof. Dr. G. Blöschl
- **Primary supervisor (at LIST):** Dr. P. Matgen
- **Co-supervisors (at LIST):** Dr. M. Chini, Dr. R. Hostache
- **Primary work location:** Luxembourg Institute of Science and Technology (LIST)
- **Duration and location of secondment/s:** Regular stays at the TU Vienna will be mandatory (up to 50% of the total duration of the PhD project)

Application procedure:

The application can be submitted via LIST's job portal: **http://www.list.lu/en/jobs/**. If there are any questions regarding the procedure please contact our HR office (jobs.list.lu). The application must include:

- A motivation letter oriented towards the preferred position and experience
- A current CV, which includes full contact details
- Two reference letters or full contact details of the two referees
- A copy of master (or similar) degree that allows for the enrolment on a doctorate degree

Applications will be reviewed until all positions are filled, with the final date of submission being 31st October 2016. An assessment committee will be appointed to review the applications and candidates selected based on Network-wide guidelines, which aim to ensure equal opportunities. Shortlisted candidates will be invited to interview either in person or by Skype.

The main criterion for selection will be the existing skills, knowledge and research career potential of the applicant, match with the project, and fulfilment of the above mentioned qualifications. Candidates from all backgrounds are encouraged to apply.

The LIST is committed with equality of opportunities and gender balance

All open positions are published and recruitment is performed according to international best practices. All PhD candidates are joining LIST under an employment contract for the full duration of their PhD project.

The HYDRO-CSI DTU subscribes to the principles of research integrity within the framework of the FNR funding scheme (FNR Research Integrity Guidelines). These rules rely on the European Code of Conduct for Research Integrity, the Singapore Statement on Research Integrity and the Montreal Statement on Research Integrity.

PhD candidate mobility will consist in secondments to partner universities, as well as private companies in case of potential for collaboration on applied aspects, technological developments or business opportunities (e.g. in the framework of a Private Public Partnership).