



The PhD student will also explore the combination and assimilation of 2D hydrodynamic simulations on lidar data to account for hydraulic connectivity and extrapolate the data in places where the water was too deep for a backscattered signal to be measured. His work will also be applied during his phd to another type of complex data (multibeam sonar+ mobile terrestrial lidar) acquired by colleagues at the University of Southampton (a 3-6 months stay in UK is planned).

The algorithms developed in this project will be **implemented in existing open source platforms**, and tested on other types of natural environments and 3D data. At the end of his phd, the candidate is expected to have a unique set of skills that will allow him to **continue an academic career**, or to work in the **private sector** where the topo-bathymetric lidar only starts to be used.

---

**Required skills:** advanced training in machine learning (algorithm development) and remote sensing, image processing, proficient in programming (ideally C++), excellent communication skills in english. Candidates with an expertise in signal processing could also be considered. No previous knowledge on fluvial environments or lidar technology is needed. Speaking French is not mandatory.

**Host department: Geosciences Rennes/IRISA.** The phd candidate will work with specialists of lidar acquisition and fluvial environments (D. Lague, J. Leyland (Southampton)), and specialists of remote sensing and machine learning (Th. Corpetti (IRISA/LETG), S. Lefevre (IRISA)).

**Host teams:** Quantitative Geomorphology (Geosciences Rennes, Univ. Rennes 1) & OBELIX team (IRISA, Univ Rennes 1)

The Quantitative Geomorphology team is specialized in the application of terrestrial and airborne lidar to study earth surface processes, and in particular extreme events (floods, landslides,...). It combines data acquisition in France and New-Zealand with the development of innovative 2D numerical models of landscape evolution. It consists of physicists, geologists, hydrologists and remote sensing specialists. It has numerous international collaboration (UK, New-Zealand, US) and is in charge of operating the topo-bathymetric lidar instrument.

The Obelix team of IRISA ([www.irisa.fr/obelix](http://www.irisa.fr/obelix)) is specialized in analysis and processing of images, machine learning and data mining, coupling between data and physical models, big data processing and tool development for decision making. Its developments in computer science, signal processing and mathematics are applied to remote sensing of the environment

**Phd Advisors:** **Dimitri Lague** (Senior Researcher, CNRS, geophysicist specialist of Lidar and numerical modelling of river evolution), **Thomas Corpetti** (Senior Researcher, CNRS, remote sensing and machine learning), **Sebastien Lefevre** (Professor, IRISA/Univ. Vannes, remote sensing and machine learning)

**Enquiries :** [dimitri.lague@univ-rennes1.fr](mailto:dimitri.lague@univ-rennes1.fr) or [thomas.corpetti@univ-rennes2.fr](mailto:thomas.corpetti@univ-rennes2.fr)

**Start date :** October 2016, **duration :** 3 years, **salary :** 1350 €/month

**Deadline for application :** 30 june 2016

**Administrative requirements:** the candidate must own a master degree (master 2 in France) or equivalent at the beginning of the PhD.

Lague, D., Brodu, N. and Leroux, J., Accurate 3D comparison of complex topography with terrestrial laser scanner: application to the Rangitikei canyon (N-Z), *ISPRS journal of Photogrammetry and Remote Sensing*, 80, p. 10-26, 2013.

Brodu, N. and Lague, D., 3D Terrestrial LiDAR data classification of complex natural scenes using a multi-scale dimensionality criterion: applications in geomorphology, *ISPRS journal of Photogrammetry and Remote Sensing*, 68, p. 121-134, 2012.