



PhD position in UAV thermal remote sensing for assessing river temperature

Closing date: 25th May 2018

Location: Aberdeen, UK

Project Description

This project will evaluate unmanned aerial vehicle (UAV or drone) thermal remote sensing for characterisation of river temperature. Temperature exerts a primary control on physical, chemical and biological processes within rivers and is a key variable in terms of understanding climate change and other human-induced impacts. Water temperature is usually measured through point-based observations, which can be applied over a range of scales. However, this is labour intensive, and is limited to discrete observations which may fail to capture effects of more localised processes (e.g. water abstraction, upwelling, point pollution). Although other thermal measurement approaches can deliver detailed characterisation (e.g. fibre optics), these necessitate direct interaction with the water body. UAVs are increasingly being utilised to explore environmental processes, and enable flexible data capture at high spatial resolution. Low-cost, lightweight thermal cameras are now available for UAVs. Advances in spatial resolution (<10 cm pixel size) now makes them viable for investigating fine-scale processes.

The aim of this project is to explore the potential of thermal UAV remote sensing for quantifying fluctuations in river temperature under differing fluvial settings, and to understand how this can complement existing measurement approaches. Significant challenges exist in terms of calibration and establishing the relationship between surface temperature and depth-variable processes. The project offers potential to improve calibration and validation of physically based temperature models for assessing future climate and management scenarios. Specific objectives are:

- Develop a robust methodology for UAV thermal image acquisition, addressing radiometric calibration, georeferencing and other aspects
- Validate measurements using in-situ temperature sensors at an existing test site, identifying and minimising uncertainties
- Upscale UAV observations by targeting sub-reaches of an upland river, exploring physical influences (depth, seasonality, exposure, etc.)
- Demonstrate contribution to hydrological process understanding by linking temperature measurements to other river/catchment variables and trends

Person Specification: applicants should possess an MSc or BSc (First Class) or equivalent, in a relevant subject, such as remote sensing, geomatics/geodesy, hydrology, physical geography, computing science, etc. This project requires strong numerical and analytical skills, and relevant programming experience (e.g. Python, R, Java, etc.). A full driving licence is essential. Applicants must be comfortable in undertaking field work, including UAV surveys (full training will be provided).

Funding Notes: this 3.5 year studentship is jointly funded by the Macaulay Development Trust (through the James Hutton Institute) and the School of Geosciences, University of Aberdeen. The PhD will commence in September 2018 (or as soon as possible thereafter), and the student will be

based between the James Hutton Institute (supervisor: Dr Pauline Miller) and the University of Aberdeen (supervisor: Dr Josie Geris), both Aberdeen, UK. The PhD is fully funded and includes an annual stipend commensurate with current RCUK rates, UK/EU tuition fees, and a research training support grant. Full funding is available to UK and EU citizens only. Applicants from outside the EU are not eligible for funding.

Application process: in the first instance, please contact Hutton supervisor Dr Pauline Miller pauline.miller@hutton.ac.uk to express interest, supplying a CV and covering letter.

Closing date for applications: Friday 25th May, 2018