Applications are invited from suitably qualified candidates for a

Fully funded PhD Opportunity

at University College Dublin, Ireland, on the topic of

Monitoring Irish Peatland Restoration with Satellite-based Synthetic Aperture Radar

Supervisor:	Assoc. Prof. Eoghan Holohan, UCD School of Earth Sciences
Project Collaborators:	Dr Shane Regan, National Parks and Wildlife Service of Ireland
	Dr Raymond Flynn, Queens University Belfast
	Assoc. Prof. Shane Donohue, UCD School of Civil Engineering
	Dr Hugh Cushnan, RPS Consultants
	Prof. Chris Evans, UK Centre for Ecology and Hydrology
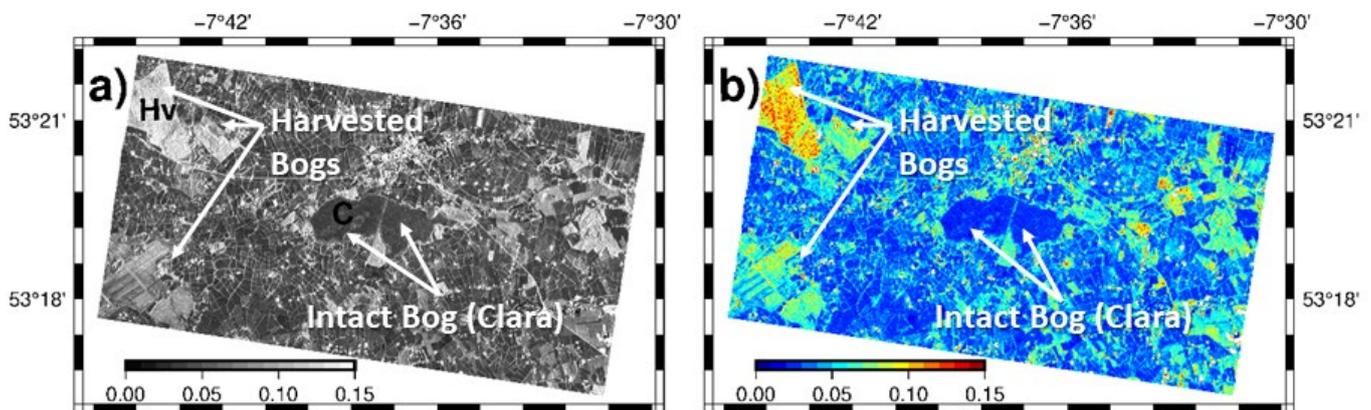
Sentinel-1 Synthetic Aperture Radar data for some peatlands in the Irish midlands. Figure by Dr Alexis Hrysiewicz, UCD/iCRAG.

Project Overview

Peatlands are one of Earth's largest reservoirs of carbon, collectively storing twice that of global forests. Anthropogenically-induced damage to peatlands causes carbon emission, biodiversity loss, water quality issues and landslides. Protection and restoration of peatland is central to Irish and EU environmental regulations, to climate action, and to multiple UN Sustainable Development Goals. A challenge is to monitor the progress and effectiveness of peatland restoration at the large scales of peatland landcover (regional, national, and ultimately global).

This PhD project aims to understand in detail how satellite-derived Synthetic Aperture Radar (SAR) data relates to in-situ characteristics of the main types of temperate peatlands in Ireland: raised bogs and blanket bogs. The project will entail a systematic comparison of SAR and InSAR time-series data to a suite of eco-hydrological variables measured continuously at several well-studied and well-instrumented raised and blanket peatlands located across Ireland. These peatlands span a range of initial condition, from intact to heavily degraded. The non-intact cases are subject to recent, ongoing or near-future restoration works.

Project Goals

- Investigate if SAR intensity can be linked robustly to spatio-temporal changes in ecology, soil moisture and groundwater level across the diversity of Irish peatlands
- Ground validate InSAR surface displacement data through installation of novel camera-based sensors for peatland surface motion at several selected study sites.
- Test if SAR intensity can be used as a quantitative measure to track peatland restoration progress.
- Examine and explain any quantifiable differences in SAR/InSAR responses of Irish blanket bogs and raised bogs.
- Determine if, and explain how, SAR/InSAR responses of Irish peatlands differ for C-Band (Sentinel-1 mission) and L-Band (NiSAR mission) radar wavelengths.

Success in these objectives will lay the basis for national-scale monitoring of peatland condition and restoration, and for understanding of how these highly sensitive ecosystems react to climate change.

Student Profile

- Highly motivated, with keen interest in linking earth observation data to environmental processes.
- Evidence of independent thinking, problem solving and self-driven accomplishment.
- A BSc degree, and ideally a MSc degree, in a project relevant discipline (e.g. earth science, environmental science, remote sensing, geophysics, applied mathematics, engineering etc.).
- Proficiency in spoken and written English (note UCD requirements), with strong presentation skills.
- EU citizenship or eligibility for EU student fee rate (though Non-EU applicants will be considered).
- Advanced numerical skills and proficiency in programming (e.g. Matlab, Python).
- Previous experience in SAR or InSAR data processing would be highly advantageous.
- Enthusiasm for travel, for teamwork and for collaboration.

Research Facilities and Support

The successful candidate will enrol in a 48-month structured PhD program at UCD, within which they can take taught modules in project-relevant subjects and numerous training courses in transferable research skills. PhD students also receive priority for on-campus accommodation.

UCD School of Earth Sciences is Ireland's largest academic geoscience department and is host to iCRAG, the Irish centre of excellence for research in applied geosciences. UCD has licences for project relevant software such as MatLab, ArcPro, etc., as well as a perpetual licence for the GAMMA SAR processing software and a dedicated high-end InSAR processing server. The student will also have the chance to undertake training on the IPTA InSAR time-series processing module at GAMMA. The candidate will join a growing research group that has conducted substantial preliminary work in the topic area. The wider project team has a deep expertise in peatland ecohydrological research and is drawn from academia, government and industry.

Application Procedure

Please use this **online form** to upload: (1) a CV, including the names of two referees, and (2) a cover letter of maximum two pages. The cover letter must clearly outline your suitability and motivation for this project. In line with UCD Equality, Diversity & Inclusion policy, applications from persons of all backgrounds and identities are welcome. For any enquiries, please contact: Eoghan Holohan (eoghan.holohan@ucd.ie).

Closing date: Review of applications will begin on **Friday September 9th, 2022,** and will continue thereafter until a suitable candidate is appointed.

Start date: must be **before** **1st January 2023.**