



**Trinity College Dublin**

Coláiste na Tríonóide, Baile Átha Cliath

The University of Dublin

## **PhD call for ISO-TAISE: Isotopic tracing of atmospheric rivers and Irish storm extremes**

We are currently seeking applicants for a fully-funded PhD student to join the EPA-funded ISO-TAISE project to begin in autumn 2024. This student will be enrolled in the Geography doctoral program in the School of Natural Sciences at Trinity College Dublin, Ireland, where the research component of their PhD will fulfill the goals laid out in the ISO-TAISE project. The deadline for shortlisting applicants for this PhD position is **15 Apr 2024**.

### **Background: The ISO-TAISE project**

Anthropogenic climate change is intensifying the global hydrological cycle and precipitation events as atmospheric water vapor concentrations rise in a warming Earth. Building Irish resilience to intense precipitation and storms is founded in understanding the natural processes that produce and power these events. 'Atmospheric rivers' (ARs) are narrow corridors of very strong atmospheric water vapor transport that carry >80% of all poleward moving water vapor at any given moment. Extreme precipitation events are often fuelled by the deep moisture supplied by an AR, and the latent heat carried by ARs can initiate and power explosive cyclogenesis. Although the climatology and impact of ARs on Ireland has been much less studied than elsewhere, ARs have been linked to extreme Irish precipitation events such as 2015's Storm Desmond. With climate change predicted to intensify future ARs, we must gain a much better understanding of the climatology of Irish-impacting ARs.

In project ISO-TAISE (in reference to the Gaelic word for moisture), we will gain unprecedented field-based insight into the origin and transport of water vapor during Irish ARs through a 3+ year isotopic monitoring program for water vapor, precipitation, and streamflow based in Dublin. Water isotopes are valuable environmental tracers for tracking where the water in a storm originated and how it evolved in transport because water molecules containing different stable isotopes of oxygen ( $^{18}\text{O}$ ,  $^{17}\text{O}$ ,  $^{16}\text{O}$ ) and hydrogen ( $^2\text{H}$ ,  $^1\text{H}$ ) will be preferentially transferred and separated during phase changes according to their mass. These isotopic changes are strongly influenced by environmental parameters such as air temperature and relative humidity, and, as a result, the isotopic composition of water vapor or rain sampled in the field will reflect a cumulative history of the weather and environmental conditions that the water has experienced. For ISO-TAISE, we will combine our water isotopic observations with climate modeling and air mass back-trajectory analysis to create an isotopic climatology of Irish ARs and other extreme precipitation events. A critical component of ISO-TAISE will also be to provide outreach and open data access to inform the public and policymakers on project findings.

The four main objectives of ISO-TAISE are:

1. Collect a 3+ year continuous water vapor isotope record in Dublin and use this record to develop a regional Irish water vapor isotope climatology.
2. Develop a moisture sourcing climatology for severe atmospheric river events from 1981-2019 through back-trajectory modelling and climate reanalysis data.
3. Determine how the water vapor isotope climatology is transferred to precipitation and surface waters through coinciding sampling of local rain and stream water.
4. Capture the isotopic evolution of a landfalling Irish atmospheric river by field deploying a water vapor isotopic analyser and precipitation collectors.

### **PhD student role in ISO-TAISE**

The PhD student will be an integral component of ISO-TAISE and work closely with the other members of the project team (the PI and a MSc student). The PhD component covers the majority of the field and laboratory analyses, including collecting field samples and performing water isotope analysis with two cutting edge CRD laser spectrometry isotope analyser systems housed at TCD. The PhD will use climate reanalysis and back-trajectory models to interpret isotopic results and perform historical climatology investigations using archived precipitation isotope data. In the latter half of ISO-TAISE, the PhD will also take part in the field deployment of an isotopic analyser to intercept a landfalling AR event in Ireland. Finally, the PhD student will provide project outreach to the scientific community, public, and policymakers, with the funded opportunity to attend at least one conference per year and support for open-access publishing, alongside their PhD thesis.

### **Qualifications**

A high 2.1 or 1<sup>st</sup> class degree (or equivalent) at undergraduate level in geography, geoscience, atmospheric science, environmental science or an affiliated area is essential. A relevant Masters degree is desirable.

The successful candidate will have:

- Experience collecting and analysing qualitative and quantitative data in both a field and laboratory setting.
- Knowledge of the broad parameters of climatology, geochemistry, and environmental science that pertain to hydrology and climate change.
- Experience conducting an independent empirical research project as evidenced through a dissertation or thesis.
- Excellent written and oral communication and interpersonal skills.
- Ability to work independently and collectively as part of the ISO-TAISE project team.

Additionally, it is desirable if a candidate can exhibit any of the following:

- A working knowledge of statistical programming (e.g., R, Python) and GIS.
- Prior experience with stable isotope analysis and environmental tracing.
- Prior experience with climate or weather modelling.

### **Application Procedure**

Applicants should submit in one document:

- A cover letter setting out your motivation for applying for the role and how your skills meet the requirements set out in this document
- A full curriculum vitae
- The names and contact details of 2 referees (including email addresses and affiliation to the applicant)

### **Contact information**

The application and any inquiries regarding the position should be sent by **15 Apr 2024** to:  
Dr. Pete D. Akers, Asst. Professor of Physical Geography                      Email: [pete.akers@tcd.ie](mailto:pete.akers@tcd.ie)