

Project: “Delving into leaching in karst regions”

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| Role title | Leaching in karst regions: GIS assessment and hydrogeological modelling | Level | Post-Doctoral Researcher |
| School | Civil, Structural and Environmental Engineering | Location | Trinity College Dublin, Ireland with occasional travel to Syngenta Jealott’s Hill, Berkshire, England |

1. Role purpose

Syngenta and iCRAG, (Irish Centre for Research in Applied Geosciences) in partnership with the Trinity College of Dublin, are funding an exciting 36-month research position as a Postdoctoral fellow to address groundwater protection needs in karst regions at a continental level, developing a robust conceptual model of the main drivers for leaching and reliable environmental indicators to quantify them. The successful candidate will work on a multi-disciplinary project that aims to build a comprehensive geodatabase of karst features in Europe and China, along with all data required to address the complexities of karst areas, which will overlap with different land uses and agriculture practices across regions. This tool will help in developing conceptual approaches and new models, specific to karst, to describe and understand the leaching mechanism in this complex environment. The Postdoctoral fellow will also implement methods to address aquifer vulnerability and specific leaching hazards at different scales, working collaboratively with other teams and external partners. The job will include: (i) performing literature reviews; (ii) preparing peer-reviewed scientific publications and presentations for scientific conferences, (iii) gathering and interpreting field measurements, and data mining.

This project brings together the expertise of iCRAG and Trinity College Dublin in hydrogeology, modelling and karst dynamics, with the Syngenta background in agriculture, soil science and environmental fate (e-fate) of chemical compounds, to shed light on the leaching of anthropogenic compounds in karst environments. The Postdoctoral fellow will represent the bridge of this collaboration, being responsible for the research project, for the delivery of the outcomes and the intermediate steps, and for keeping the project schedule on track. The Postdoctoral fellow will be fully employed and managed by Trinity College, although Syngenta will fund a portion of the fellowship.

The research activities will be guided and co-supervised by the two principal investigators in the project: Prof Laurence Gill (Trinity College, Dublin, Ireland) and Dr Fabrizio Rama (Syngenta, UK). However, the postdoctoral researcher will engage in wider scientific exchanges and activities with all partners in the project across the Science Foundation Ireland (SFI) and Syngenta R&D network. The successful candidate will be mainly based in the Department of Civil Engineering (Environmental Engineering research group) at Trinity College Dublin but will have the opportunity (i.e. once/twice a year) of short visits and dissemination experiences abroad (e.g. 2 to 4 weeks to Jealott’s Hill International Research Centre, Berkshire, UK). The role will offer a unique opportunity to collaborate with hydrogeologists, environmental scientists, and risk assessors in an international and multi-disciplinary research group, dealing with challenging real-world issues related to the leaching of anthropogenic compounds in karst regions.

2. Accountabilities

- Extensive data research and gathering of relevant environmental datasets for spatial analysis of the leaching process (e.g. meteorological data, land use, hydraulic parameters, soil compositions), and specific karst features from regional and local databases (e.g. springs, sinkholes, caves).
- Data mining of large datasets and advanced spatial analysis in a GIS environment (i.e. raster and vector) using different formats and software.
- Implementing methods (i.e. index & rating, process-based, or statistical) to assess aquifer vulnerability, specifically in karst regions, validating it against field data.



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- Interpreting a wide range of field data from monitoring programmes to extract meaningful conceptual models for karst regions.
- Developing and running process-based hydrological/hydrogeological models (e.g. flow and transport of dissolved compounds, the interaction between compartments, leaching models) for karst environments.
- Developing environmental risk indicators for groundwater protection in karst areas, which capture the main drivers for leaching in different karst networks and regions.
- Investigating interactions between specific agriculture practices and the leaching of compounds.
- Performing and updating an extensive scientific literature review on the research topic
- Preparing peer-reviewed scientific publications and presentations for relevant conferences, and material for internal training.
- Working collaboratively within a multidisciplinary team and with external partners.

3. Background & advisable capabilities

3.1 Background

- A PhD degree in a project-related field (e.g. Contaminant hydrology, Hydrogeology, Environmental sciences/engineering, Geosciences, Geography)
- At least five years of previous trackable experience in one or more project-related fields (e.g. Contaminant hydrology, Hydrogeology, Environmental sciences/engineering, Geosciences, Geography)

3.2 Advisable capabilities and skills

- Advanced knowledge of GIS environment (QGIS/ArcGIS)
- Proven expertise in handling large geodatabases, spatial analysis, data mining, image analysis and remote sensing
- Expertise in analysing, interpreting, and processing field and modelling data in the hydrogeology/environmental science fields (in both spatial and temporal domains)
- Good natural process understanding in hydrogeology and geosciences
- Good quantitative and computer-based numerical skills
- Knowledge of coding and scripting (e.g., Python, MATLAB, R) for environmental sciences, and some experience in developing groundwater and vadose zone models
- High motivation to publish in peer-reviewed journals and scientific conferences
- Proactivity, creativity, problem-solving and commitment to a goal
- Flexibility to manage the project, adapt to change and to meet deadlines
- Very good communication skills in English (written and verbal)



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4. Contract specifications

The postdoctoral fixed-term contract has a duration of 3 years and is co-funded by Syngenta and iCRAG / SFI.

The position provides a gross salary at Point 6 of the IUA PD1 of €51,313 per annum), rising to Point 1 of the PD2 scale in year 2 and Point 2 of the PD2 scale in year 3 (€54,198 per annum) in addition to PRSI and pension contributions.

5. Application procedure

Applicants should submit a Cover Letter and full Curriculum Vitae to include the names and contact details of two referees (including email addresses), to both:

Prof. Laurence Gill email: laurence.gill@tcd.ie

Dr Fabrizio Rama email: Fabrizio.Rama@syngenta.com

CLOSING DATE FOR APPLICATIONS IS 30TH JUNE 2024