

iCrag-GSI Environmental Geosciences Postgraduate Programme 2018

The impact of organic matter on heavy metal bioavailability in urban soils: experimental and field-based approaches

Heavy metal (HM) contamination in urban soils is a major global geohazard, but data on this issue in Ireland is lacking, particularly the extent to which the amount and type of soil organic matter affects the bioavailability and chemical state of HM. The proposed research will resolve these issues using a powerful dual approach combining the first systematic survey of urban soils in southern Ireland, focussing on soils in recreational areas, and innovative laboratory experiments exploring the impact of different sources of organic matter on heavy metal solubility, oxidation state and local chemical environment. The study will provide baseline data on the extent and toxicity of HM contamination in Irish urban recreational soils, guiding planning and bioremediation, and will serve as a platform for developing research capacity on the fate of HM in the geosphere. Diverse dissemination activities will ensure visibility of the research amongst academics, policymakers and the public.

Dr Maria McNamara, UCC maria.mcnamara@ucc.ie

Assessing the response of the AMOC during times of abrupt climate change

Our limited understanding of how the climate system will respond to future climate change is linked to the difficulty in constraining the response of the AMOC during abrupt climate events. Here the PI proposes to investigate abrupt transitions in climate that occurred during the transition between warm interglacial to cold glacial conditions of previous glacial cycles of the past 500 kilo annum to test the hypothesis that the slowdown of the AMOC is responsible for the abrupt onset of North Atlantic cooling at the beginning of a glacial cycle. A key methodological strategy is to assess the climate response of the surface and deep branch of the AMOC within the same samples that were taken from an exceptionally high resolution climate archive (DSDP 610). This will allow us, for the first time, to constrain the temporal structure and mechanisms of abrupt climate events associate with the AMOC during inceptions.

Dr Audrey Morley, NUIG audrey.morley@nuigalway.ie

Spatiotemporal multiscale Modelling of Antimicrobial Resistance in The Irish subsurface Environment (SMARTIE)

Groundwater users are at an increased risk of infection due to persistent microbiological contamination accredited to inefficient rural waste water treatment and the ubiquitous agriculture density associated with rural Ireland; both of which are sources of Antimicrobial

Resistant (AMR) bacteria. To date, only one spatiotemporally limited study has assessed the levels of AMR in Irish groundwater. Building on previous work, this frontier research blends traditional hydrogeological fieldwork, geo-referencing, molecular microbiology, analytical chemistry and hydrological catchment simulation to elucidate environmental and anthropogenic drivers of AMR in groundwater and the risk to public health. Results of this project will bridge the gap between water, geoscience and health, promote capacity building and facilitate in the development of efficacious policy for groundwater management into the future.

Dr Jean O'Dwyer, UCC Jean.ODwyer@ucc.ie