

Project title: Where do contaminants go? Tracking contaminant fate during extreme-weather events

Ref: OP2450

Keywords: Drought and flooding events; emerging contaminants and heavy metals; bioavailability; biogeochemistry

One Planet Research Theme:

Climate & Climate Change | Earth System Processes | Anthropocene | Environmental Informatics

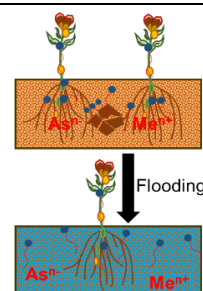
Lead Supervisor:

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Key Research Gaps and Questions:

Areas particularly vulnerable to flooding events can act as contaminant sinks. Hence, the main research questions are:

1. What are the critical contaminants susceptible to speciation changes during flooding events?
2. Where do those contaminants partition in the environmental media, i.e. soils vs water?
3. How do resuspension and transport affect contaminant fate?
4. Does changes in contaminant influence their bioavailability?



Project Description: Estuary, river mouths and other coastal areas act as contaminant sinks where heavy metal and organic contaminants deposit after being transported from inland. Moreover, pollution sources have been traditionally located nearby water bodies, building legacy contamination, including heavy metals, pesticides, and other emerging pollutants, including per- and polyfluoroalkyl substances (PFAS), in those environments. The retention or accumulation of contaminant in environment will be determined by physicochemical and biological processes. These contaminants will interact with indigenous mineral phases and organic matter, microorganisms, and local biota. Environment changes to pH, salinity, oxidation state, and the addition of other contaminants will influence the contaminant stability during extreme weather events, including periods of drought followed by increased precipitation events. Predicting their fate and bioavailability requires a comprehensive understanding of the mechanisms for metal-organic contaminant interaction, their effect/reaction on biological systems, and their association with mineral and organic phases. The **overarching goal** of this project will investigate the fate of contaminant mixtures in flooding-vulnerable coastal areas in the United Kingdom impacted by legacy contamination, with focus in heavy metal, pesticides/herbicides and PFAS. Environmental sampling will be complemented with microcosm and column studies in which the student will use a combination of molecular ecology, water chemistry and spectroscopic techniques to investigate the changes in contaminant concentration, speciation and bioavailability during periods of drying, wetting and resuspension. The proposed work will provide a holistic understanding of the fate and transformation of mixture of contaminants within the various environmental compartments in coastal areas, and it will inform future adaptation strategies and exposure prevention alternatives.

Prerequisites:

The project requires a background in environmental chemistry, geochemistry, soil science, or a related discipline, with experience in the laboratory. For more information, please contact Lucia Rodriguez-Freire (lucia.rodriquez-freire@newcastle.ac.uk).

