Assessing the impact of groundwater contamination on stream water quality by multiple approaches at the groundwater-surface water interface (Invited Presentation)

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127-6: ASSESSING THE IMPACT OF GROUNDWATER CONTAMINATION ON STREAM WATER QUALITY BY MULTIPLE APPROACHES AT THE GROUNDWATER-SURFACE WATER INTERFACE (Invited Presentation)

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Contaminants such as chlorinated solvents and pesticides, as well as new classes of compounds or emerging micropollutants are extensively produced, utilized and then discarded in society and subsequently released to streams from multiple point and diffuse sources. Sustainable management of water resources requires assessment of multiple contamination sources within a watershed in order to assess their direct impact on water quality. Determination of flow paths and groundwater fluxes are essential for evaluating the transport, fate and potential impact of contaminant plumes discharging to streams. This implies that investigators have the tools to evaluate the governing parameters, including an appreciation of the scale of variability, as well as conceptual and numerical models that incorporate the various mechanisms affecting flow and transport.

A major multidisciplinary field scale investigation of the Grindsted stream area including geology, hydrogeology, geophysics, environmental chemistry, ecology and environmental engineering was carried out in 2012-2017, to develop the scientific basis for conducting risk assessments for contaminated sites impacting surface waters. The Grindsted stream area is a well-studied site, affected by many polluting sources including the plume from a former pharmaceutical factory. Our overall aim of the field investigations was to (i) test the applicability of different methods for mapping groundwater pollution as it enters streams at a complex site, and (ii) perform a source identification and risk assessment of the stream's chemical and ecological status.

The study included development of a geological and hydrogeological model, numerical modeling of the flow and transport, mapping of the contaminant plume, and detailed field investigations at the main entry point of the plume. We quantified the contaminant mass discharge and attenuation of the plume at the groundwater-surface interface by different approaches (control planes at stream bank, in the hyporheic zone and in the stream using traditional and innovative tools and models for determination of flow and contaminant fluxes).

The field methods and key findings regarding contaminant mass discharge, and challenges with respect to multiple stressor impact on streams will be discussed in the presentation.

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