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Fugitive methane emissions, and their source, detected from dissolved fluvial methane concentration profiling

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A challenge in identifying fugitive GHG emissions is that, unless there has been background monitoring of an area prior to any abstraction, one cannot be certain that the fugitive emission detected is associated with a new activity, such as unconventional hydrocarbon extraction. Indeed, there has been little consideration of what fugitive methane emissions exist, and if present, from what source they are derived. The problem is that, unless the temporal variability of unplanned and unregulated methane emissions is known, and those which are currently hidden are detected and quantified, it will be impossible provide robust answers to industry and regulators about the GHG impact of a land use change that could generate methane.

We need to understand the processes by which methane is generated in the landscape to be able to differentiate these emissions from that which may be released fugitively by new developments. Here we shall present the results of three years of sampling of a drainage system in the UK, where catchment scale sampling found methane present at concentrations above background in the river water and allowed us to identify nearby sources of fugitive methane emissions. The river drains a catchment which has abandoned underground and open cast coal mining and the fugitive methane efflux is released to the atmosphere from springs that have arisen from hydrological rebound as a result of flooded mining systems. We will discuss the spatial and temporal variability of the fugitive methane emissions (and associated significant carbon dioxide efflux), and our understanding of where we think the source is of these GHG emissions. Crucially, the water chemistry analysis, particularly radiocarbon-dating of the methane and dissolved inorganic C pool, does not support the interpretation the methane and carbon dioxide are derived from abandoned mine degassing, but comes from a much younger source, which must be biologically produced.