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Establishing effective sentinels - Setting the baseline for shale gas

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The public has multiple and deep concerns about the potential and perceived impact of shale gas exploitation. The UK has a nascent shale gas industry and, unlike the US we have the opportunity to establish structures both physical and regulatory to reassure the public that any impact of a developing shale gas will be .properly licensed, regulated, monitored and, if necessary, mitigated. To assess and indeed demonstrate an impact of any activity, let alone those of shale gas exploitation, it is necessary to show, within a reasonable level of certainty, that the industry has changed a environmental state over and above that which was true without the activity present. The need for demonstrating impact not only means that a baseline, or pre-intervention control, needs to be established but that the baseline needs to be robustly established within a statistical and probabilistic framework so that certainty of impact can be demonstrated.

A number of technologies have been proposed for monitoring the water quality impacts of shale gas developments, however, to be an effective and robust sentinel of change the parameter should have several properties: it should be a lead indicator and not a lag indicator of change; it should have a high contrast with the normal or background activity; it should show a high specificity for the activity of concern and not be associated with other activities; and it should readily deployed in time and space. By far the greatest difference between the waters arising from a shale gas well pad and surface waters is nothing more than salinity or its associated determinands, eg. conductivity or chloride. The salinity of flowback water and deep formation water can be many times greater than seawater let alone greater than the salinity of most UK surface waters. Therefore, we have built a probabilistic model of the salinity of English surface waters.

The results show that we could model salinity at river sites down to the natural variation at the monthly time step. The model could predict at sites included in the analysis but did not work well within the currently available covariates to predict at unknown sites. The approach can be used to assess whether an observation is unusual. The model shows that most rivers could readily absorb leaks of fracking fluids