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Changes in O_3 and NO_2 due to emissions from Fracking in the UK.

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Poor air quality is a problem that affects millions of people around the world. Understanding the driving forces behind air pollution is complicated as the precursor gases which combine to produce air pollutants react in a highly non-linear manner and are subject to a range of atmospheric transport mechanisms compounded by the weather. A great deal of money has been spent on mitigating air pollution and so it's important to assess the impacts that new technologies that emit air pollutant precursors may have on local and regional air pollution. One of the most highly discussed new technologies that could impact air quality is the adoption of wide-scale hydraulic fracturing or "fracking" for natural gas. Indeed in regions of the USA where fracking is commonplace large levels of ozone (O_3 - a key air pollutant) have been observed and attributed directly to the fracking process.

In this study, a numerical modelling framework was used to assess possible impacts of fracking in the UK where at present no large scale fracking facilities are in operation. A number of emissions scenarios were developed for the principle gas phase air pollution precursors: the oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). These emissions scenarios were then used in a state-of-the-art numerical air quality model (the UK Met Office operational air quality forecasting model AQUM) to determine potential impacts related to fracking on UK air quality. Comparison of base model results and observations for the year 2013 of NO_x, O_3 and VOCs from the UK Automatic Urban and Rural Network (AURN) showed that AQUM has good skill at simulating these gas phase air pollutants (O_3 r=0.64, NMGE=0.3; NO_2 r=0.62, NMGE=0.51). Analysis of the simulations with fracking emissions demonstrate that there are large changes in 1hr max NO_2 (11.6$\pm$6.6 ppb) with modest increases in monthly mean NO_2, throughout the British Isles (150$\pm$100 ppt). These results highlight that stringent measures should be applied to prevent deleterious impacts on air quality from emissions related to fracking in the UK.