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Radon anomalies associated with UK earthquakes which occurred in the summer and autumn of 2002.

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During the period from late June to mid-December 2002, two continuous, real-time radon detectors were being operated in Northampton in the English East Midlands region, in order to compare hourly readings of radon with short and long-term integrated testing methods (e.g. track-etch and charcoal) for a DEFRA project. Long-term cycles in the atmospheric indoor radon data were noted and the project team then looked for causes. We were able to take account of variability due to the affects of weather, human activity (e.g. occupancy – which produces short-term changes) and building works etc. The two real-time detectors were in basements (in terraced houses) 2.25km apart which meant that it was possible to filter out localized and short-term radon changes (radon in the ground is highly variable).

Two time-series of hourly radon readings were obtained, one from each detector. The time-series were examined for simultaneous anomalies, as evidence of big disturbances occurring at big distances by cross-correlating over periods of 1-30 days duration, rolled forward through the time-series at 1-hour intervals. Both ‘as-logged’ and 3-7-hour moving-averaged data were investigated.

Simultaneous similar anomalies occurred at two points in the time series, with some evidence of a third period of simultaneous anomaly. One of the two corresponded to an English Channel earthquake which occurred at 23:41 on the 26^{th} August 2002, with a

magnitude of 3 and 250 km from the measurement location. The other corresponded to the Dudley event which occurred at 23:53 on the 22^{nd} September 2002, 90 km west of Northampton and which was a magnitude 5.0. The third, less clear anomaly corresponded to the larger initial events within the Manchester earthquake swarm – a series of earthquakes during the period 19^{th} – 21^{st} October 2002 ranging from magnitude 2.5 to 4.3. Note that the Manchester events took place 160 km north-west of the measurement centre.

Despite these distances from the place of measurement, the impact of these events was noted in the form of short radon pulses. The Dudley and English Channel earthquake events are characterised by 6-9 hour in-phase spikes in the radon time-series which both precede and follow the earthquake event itself.

We have identified radon anomalies temporally associated with several UK earthquakes. If such observed precursors are generally observable, then simultaneous real-time monitoring of radon levels – for short-term simultaneous anomalies – at several locations in earthquake areas might provide the core of an earthquake prediction method.