Geophysical Research Abstracts
Vol. 18, EGU2016-7635, 2016
EGU General Assembly 2016

The Potential for Quantum Technology Gravity Sensors

Daniel Boddice (1), Nicole Metje (2), and George Tuckwell (3)

(1) School of Civil Engineering, University of Birmingham, Birmingham,United Kingdom (d.boddice@bham.ac.uk), (2) School of Civil Engineering, University of Birmingham, Birmingham,United Kingdom (n.metje@bham.ac.uk), (3) RSK group, Hemel Hempstead, Hertfordshire,United Kingdom (gtuckwell@rsk.co.uk)

Gravity measurements are widely used in geophysics for the detection of subsurface cavities such as sinkhole and past mine workings. The chief advantage of gravity compared to other geophysical techniques is that it is passive method which cannot be shielded by intervening features or ground giving it no theoretical limitations on penetration depth beyond the resolution of the instrument, and that it responds to an absence of mass as opposed to a proxy ground property like other techniques. However, current instruments are limited both by their resolution and by sources of environmental noise. This can be overcome with the imminent arrival of gravity sensors using quantum technology (QT) currently developed and constructed by the QT-Hub in Sensors and Metrology, which promise a far greater resolution. The QT sensor uses a technique called atom interferometry, where cold atoms are used as ideal test-masses to create a gravity sensor which can measure a gravity gradient rather than an absolute value. This suppresses several noise sources and creates a sensor useful in everyday applications. The paper will present computer simulations of buried targets and noise sources to explore the potential uses of these new sensors for a range of applications including pipes, tunnels and mine shafts. This will provide information on the required resolution and sensitivity of any new sensor if it is to deliver the promised step change in geophysical detection capability.