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# Seismic monitoring at the Hollin Hill Landslide Observatory

Jim Whiteley (1,2), Sebastian Uhlemann (2), Jonathan Chambers (2), and Michael Kendall (1)

(1) University of Bristol, Bristol, United Kingdom (jim.whiteley@bristol.ac.uk), (2) British Geological Survey, Nottingham, United Kingdom

The Hollin Hill Landslide Observatory is an ongoing geophysical monitoring research site at an active landslide in North Yorkshire, UK. Due to the periodic rainfall-induced reactivation of this complex rotational-translational earth-slide/earth-flow, the site has become a testbed for geophysical monitoring technologies over the past decade. Movement and environmental data gathered from point sensors and weather stations have allowed for high resolution spatial and temporal monitoring of the response of the landslide to periods of prolonged or intense rainfall. Previous studies have revealed the complex relationship between landslide movement, geophysical measurements and climatic influences.

In recent times, seismic monitoring methods have been utilised alongside existing resistivity and self-potential monitoring systems present at the observatory. In particular, the resistivity monitoring system on the site has been able to monitor significant changes in subsurface hydrogeological properties associated with the annual climatic cycle. This poster presents findings from the program of seismic monitoring that has been undertaken at the Hollin Hill Landslide Observatory since October 2016. The seismic monitoring aims to inform on the subsurface geomechanical condition of the landslide prior to, during and after periods of reactivation.

Both active and passive seismic methods have been used to characterise and monitor the site, alongside the existing environmental and geophysical data. Initial results from active shear-wave refraction surveys undertaken every six to eight weeks at the site show a correlation between changes in the elastic properties of the subsurface and the annual climatic cycle. These repeat seismic refraction surveys are able to deliver a high degree of spatial resolution when monitoring the condition of the landslide, however, the frequency of acquisition is such that shorter term variations in subsurface properties are not always captured. Passive seismic methods are able to deliver a much higher temporal resolution of monitoring, and their applications to landslide monitoring are explored through the data collected by three broadband seismometers located at the Hollin Hill Landslide Observatory. The results from these seismic investigations highlight the potential for further integration with the other geophysical monitoring methods used at the Hollin Hill Landslide Observatory, which in turn has implications for the use of geophysical monitoring methods in slope-scale early warning systems.