Geophysical Research Abstracts
Vol. 17, EGU2015-15380, 2015
EGU General Assembly 2015

Development of models to inform a national Daily Landslide Hazard Assessment for Great Britain

Tom A Dijkstra, Helen J Reeves, Claire Dashwood, Catherine Pennington, Katy Freeborough, Jonathan D Mackay, Sebastian S Uhlemann, Jonathan E Chambers , and Paul B Wilkinson

British Geological Survey, Environmental Science Centre, Keyworth, Nottingham, NG12 5GG, United Kingdom (tomdij@bgs.ac.uk)

The British Geological Survey (BGS) provides landside hazard information as part of its strategic role. This includes, among others, the issuing of a national Daily Landslide Hazard Assessment (DLHA) one of the hazards assessments issued by the Natural Hazard Partnership. A range of tools are currently under development to further develop reliability and enhance the granularity of these assessments.
The BGS has three datasets that support and underpin this research; the National Landslide Database (NLD), the DiGMap mass movement layer and GeoSure. The NLD holds more than 16,500 records of landslides across Great Britain (GB) stored in an Oracle database that is accessible through an ESRI ® ArcGIS interface. DiGMap comprises a digital map layer with outlines of all landslides recorded by field geologists. GeoSure is a BGS product that assesses the potential for ground movement across GB in six layers, one of which is landslide potential. The GeoSure landslide potential layer incorporates information on conditioning factors, such as local geology, geotechnical parameters and topography. These are combined within a GIS to derive a map showing where a landslide may occur under favourable conditions (e.g. persistent wet conditions due to adverse weather).
Different types of terrain will be affected by different modes of landsliding and a series of hierarchical landslide domains have been established capturing the spatial consistency of slope deformation response. Each landslide domain represents an area of similar physiographic and geological characteristics which has shaped the style of landsliding (recognising relic, active and potentially active processes). In turn, this enables development of regional thresholds that are relevant to characteristic landslides in these domains.
The wet period from summer 2012 into early spring 2013 resulted in a surge of recorded landslides, particularly in SW England and S Wales. Approximations of regional effective precipitation were combined with records of observed landslide events to establish which antecedent effective precipitation (AEP) signatures of different duration could be used as a pragmatic proxy for the occurrence of landslides. It was established that 1, 7, and 90 days AEP provided the most significant correlations and these were used to calculate the probability of at least one landslide occurring. The method was then extended over the period 2006 to 2014 and the results evaluated against observed occurrences. It is recognised that AEP is a relatively poor proxy for simulating effective stress conditions along potential slip surfaces. However, the temporal pattern of landslide probability compares well to the observed occurrences and provides a potential benefit to assist with the DLHA. Further work is continuing to fine-tune the model for landslide type, better spatial resolution of effective precipitation input and cross-reference to models that capture changes in water balance and conditions along slip surfaces. The latter is facilitated by intensive research at several field laboratories, such as the Hollin Hill site in Yorkshire, England. At this site, a decade of activity has generated a broad range of research and a wealth of data. This paper reports on one example of recent work; the characterisation of near surface hydrology using infiltration experiments where hydrological pathways are captured, among others, by electrical resistivity tomography. This research, which has further developed our understanding of soil moisture movement in a heterogeneous landslide complex, has highlighted the importance of establishing detailed ground models to enable determination of landslide potential at high resolution. In turn, the knowledge gained through this research is used to enhance the expertise for the daily landslide hazard assessments at a national scale.