

British Geological Survey

Gateway to the Earth

Antecedent precipitation as a potential proxy for landslide incidence in SW UK + recent developments on DLHA

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National Landslide Database

National Landslide Database 17000+ records Continuously updated

- Commissioned newspaper search
- Twitter and other forms of social media
- Fieldwork mapping and other studies
- Report a landslide
- Literature searches

IGS Landslide Pro-Forma P1



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Landslides and antecedent precip.

Based on analysis of the National Landslide Database:

- a) known events (date, place)
 - c) evaluate correlations

UK Rainfall and Landslides: August 2016

b) add antecedent data (P,T)d) establish probability of occurrence

N.B. Data collection incorporate Twitter from August 2012 onwards



Burton Bradstock – June 24 2012



St Bees – 30 August 2012

PH St Bees Fairladies Fm 98 Moor Platt 45 How Man CH

Credit: ITV Border





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Barrow upon Soar – 27 December 2012





Stob Coire Sgriodain - 28 June 2013



Antecedent rainfall as a proxy...



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Antecedent rainfall as a proxy...

- How much is P_a affecting landslide incidence?
- 1 event/day large spread
- 6+ events/day better signal ۰
- Minimum threshold curves •
- Many '1 per day' events poor P_a signal.
- Plot antecedent P_a sequence
- Signatures of days with failures
- Evaluate seasonality

minimum antecedent rainfall required to trigger slope failures for events occurring between 01/11/12 and 3/01/13 in SW England and S Wales 1000 100 antecedent rainfall [mm] 10 120 days - 90 davs 60 days + 30 days 1 + 7 days + 1 day 2 davs 0 0 1 3 5 q 10 2 number of slope failures

antecedent effective rainfall - monthly average values 1990-2013 LTA





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Landslide 'seasons' 2006-2013

- Wet/dry based on comparison of actual with LTA (1981-2012).
- At risk periods become apparent



Effective or total precipitation?

- Water budget approach to derive P_{eff}, but other methods/indicators are available
- Below is a stretched fit of simple water balance P PET with an 85% threshold
- Conversion factors can be used to adjust P_{tot} for seasonality to determine P_{eff}
- Quite considerable effect on P_{tot}





Antecedent rainfall as a proxy...

- Combine effective rainfall with landslide database
- interesting discussions about importance of non-observed landslides
- Antecedent signal, statistically, 1, 7, and 90 days signals most relevant
- Use to calculate probability of at least one landslide occurring
- '1 landslide/day' not a good indicator many mechanisms can lead to failure
- high degree of simplification
- poor granularity in weather
- poor process-response



Further work to develop the NHP DLHA forecast

- evaluation of response to weather event sequences
- water balance model linked to shallow translational model
- simple models run with inputs characteristic of test region





Further work to develop the NHP DLHA forecast

- inspired by meeting with NVE April 2016
- further simplification of water balance model
- 1km² pixels populated with parameters
- implemented into GIS
- evaluation of use of G2G model to derive near surface soil moisture
- connect with soil moisture network (COSMOS), satellites (HYDEOMEX)





Further work to develop the NHP DLHA forecast

- Forensic analysis of observed landslides
- develop thresholds + understand pathways to failure







Further work to develop the NHP DLHA forecast

- Testing of model in parallel with standard DLHA
- Looking at weather regimes for longer outlooks
 - warnings v outlooks
- Evaluation the options to represent uncertainty in forecasts
- Output formats to be discussed with stakeholders





Soil moisture model



next day precipitation



DLHA areas only Each LAU+GeoSure



+ Parent material

Thank you and please get in touch and 'follow'!



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