Recurrent displacement of a forested earthflow and implications for forest management, East Coast Region, New Zealand

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Abstract Recurrent movement of a forested earthflow is documented over a 21-year period when two phases of activity were recorded, each separated by an interval of inactivity. Horizontal, vertical, and real-time surface displacements were measured. On both occasions the initiation of movement began in the headscarp region and activity propagated the 700-m length of this flow at times when soil moisture surplus exceeded the long-term winter average. Movement occurred as a series of “surges” followed by periods of deceleration. Our findings suggest that the critical failure threshold leading to the initiation of movement under closed-canopy forest is determined by the duration of antecedent soil moisture surplus and elevated pore water pressure, and is less a response to rainfall. Once initiated, however, surge-like movements are accelerated by heavy rainfall events and activity overlaps with periods of soil moisture deficit. There was no relationship between the initiation of earthflow activity and forest practices.

Key words earthflow; displacement rates; rainfall; soil moisture; forest harvesting