

Precipitation Thresholds for Debris Flow Initiation in the Southern Coast Mountains of British Columbia

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Cycles of debris flow activity commonly occur during periods of prolonged, heavy frontal rainfall in the southern Coast Mountains, the most recent cycle occurring in November 1990. Although this general correspondence between rainfall and debris flows is well established, relatively little quantitative work has been conducted in the region to elucidate the details of this linkage. Only one detailed study has been conducted to date on precipitation antecedents to debris flows in this region (Church and Miles). An outstanding anomaly noted was the tendency for debris flow cycles to occur during storms of relatively low return period. However, the analysis was hampered to some extent by the general lack of precipitation data close to debris flow source areas.

In this paper, we report preliminary results from Coquitlam River basin on the meteorological conditions responsible for the November 1990 debris flows, for which we have fairly good rain gauge coverage. Back-analyses of selected debris slides which triggered debris flows in November 1990 are conducted to reconstruct the groundwater conditions at failure. Antecedent precipitation records are then used as input to a rainfall-recharge model to predict these same groundwater levels. The hydrologic model is calibrated with field permeability tests and actual records of soil-water recharge under natural rainfall conditions. We discuss the applicability of a similar model recently proposed by Keefer et al. for debris flow prediction in coastal California. The complications introduced by macro-pores (e.g. pipes) in triggering failures in Coquitlam basin are also discussed.