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An Empirical Mode Decomposition Based Signal Process Method for Two-Phase Debris Flow Impact and Its Application

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Impact of debris flow consists of two distinct phases due to its physical composition. One is the dynamic impact of fluid phase and the other is collision from the solid phase. At present, there is no effective way to differential these two phases of impact. An Empirical Mode Decomposition (EMD) based signal process method was proposed by this paper to extract fluid and solid impact force of debris flow. Miniaturized flume tests have been carried out with 14 work conditions and the impact signals were captured by a digital logger. From the experiment, frequencies of fluid phase and solid phase impact signals were identified in the range of 0.05Hz-2Hz and 300Hz-600Hz. The impact signals from solid and liquid phase were reconstructed from the original impact signal using the proposed method. Fluid impact force directly measured from the flume tests and calculated from isolated signals are compared and there was an average derivation of 10%. This proposed method provided an effective tool to study the debris flow impact force in term of slurry and large particles separately. In addition, this method could be used in the mountain hazard monitoring system to identify the types of flow based on its frequency distribution.