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Assessment of Debris Flow Barrier as Countermeasure using SPH method

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Barriers which can reduce the energy of debris flows are frequently constructed as a mitigation measure against debris flow hazards. However, examination of physical effect by barriers on characteristics of the debris flow is a difficult task. This research investigated the interactions between the debris flow and barriers and analyzed the effect of barrier location along a channel using the smoothed particle hydrodynamics (SPH) method. We chose a site in Yeoju, Korea, as the model site, where a debris flow event occurred. The volume and soil properties were acquired from the site investigation, and the calibration of the rheological properties was conducted in reference to the deposit area of the debris flow. In the numerical model, the closed-type barrier was installed at different four locations from upstream to downstream of a flow channel, respectively; and the debris flows were then simulated while observing the velocity and volume of debris flows. Upon installing the barrier, the velocity and volume of the debris flow decreased significantly, compared to the case with no barrier. In particular, installation of the barrier at downstream of the channel resulted in the greatest reduction in the kinematic energy. Because debris flows occurred at multiple locations (or the multiple sources) in our model case, we found that installing the barrier at the downstream was the most effective. The obtained results contribute to better understanding of the debris flow behaviors in association with the barriers as a mitigation measure, and the presented methodology can be used for the optimum and efficient design of the debris flow barriers.