**Table S1** Simulation results for between debris flow characteristics and waves caused by debris flow in high water and flood level cases according to Voellmy rheology parameters change

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameters | | | Debris flow | | | | Water | |
| *μ* | *ξ* (m/s2) | Water level (m) | Maximum flow height1 (m) | Maximum velocity1 (m/s) | Maximum momentum1 (kg·m/s) | Underwater flow distance2 (m) | Amplitude of the first wave3 (m) | Maximum crest amplitude (m) |
| 0.030 | 500 | 118a | 3.72 | 5.61 | 13.82 | 165 | 1.018 | 1.819 |
| 0.035 | 3.56 | 4.70 | 10.68 | 140 | 0.766 | 1.477 |
| 0.040 | 3.38 | 3.89 | 8.19 | 117 | 0.593 | 1.101 |
| 0.045 | 2.75 | 2.89 | 3.98 | 82 | 0.329 | 0.517 |
| 0.050 | 500 | 0.76 | 1.59 | 1.08 | 23 | 0.083 | 0.085 |
| 0.050 | 400 | 0.59 | 1.24 | 0.56 | 17 | 0.042 | 0.045 |
| 800 | 1.24 | 2.49 | 2.37 | 34 | 0.181 | 0.181 |
| 1000 | 1.30 | 2.94 | 2.70 | 37 | 0.191 | 0.204 |
| 1500 | 1.67 | 4.67 | 4.50 | 55 | 0.457 | 0.473 |
| 1800 | 1.70 | 4.97 | 4.86 | 58 | 0.473 | 0.514 |
| 0.030 | 500 | 119b | 7.02 | 3.56 | 17.58 | 183 | 1.420 | 1.883 |
| 0.035 | 6.44 | 3.54 | 13.37 | 148 | 1.160 | 1.481 |
| 0.040 | 5.78 | 3.22 | 9.42 | 117 | 0.881 | 1.093 |
| 0.045 | 4.94 | 2.51 | 5.73 | 84 | 0.584 | 0.702 |
| 0.050 | 500 | 3.52 | 1.09 | 2.06 | 44 | 0.231 | 0.327 |
| 0.050 | 400 | 3.27 | 1.18 | 1.88 | 46 | 0.221 | 0.336 |
| 800 | 4.31 | 1.90 | 3.04 | 61 | 0.284 | 0.477 |
| 1000 | 4.33 | 1.74 | 2.74 | 59 | 0.237 | 0.440 |
| 1500 | 5.08 | 2.06 | 3.83 | 68 | 0.420 | 0.593 |
| 1800 | 5.30 | 2.01 | 4.07 | 69 | 0.452 | 0.664 |
| 1 Observed near the reservoir (a 1391 m; b 1378 m)  2 Measured from the point where the water meets the ground (a 1392 m; b 1379 m)  3 Observed in p1, Fig. 6 (1450 m) | | | | | | | | |