

REFERENCES

- Armanini, A., & Gregoretti, C. (2005). Incipient sediment motion at high slopes in uniform flow condition. *Water Resources Research*, 41(12), 1–8. <https://doi.org/10.1029/2005WR004001>
- Bagnold, R. A. (1954). Experiments on a gravity-free dispersion of large solid spheres in a Newtonian fluid under shear. In *Proceeding of the Royal Society*. London: Royal Society. <https://doi.org/https://doi.org/10.1098/rspa.1954.0186>
- Bathurst, J. C. (1987). Critical Condition for Bed Material Movement in Steep, Boulder-bed Streams. In *Erosion and Sedimentation in the Pacific Ris* (pp. 309–318). IAHS Publ.
- Beven, K. J., & Kirkby, M. J. (1979). A physically based, variable contributing area model of basin hydrology. *Hydrological Sciences Bulletin*, 24(1), 43–69. <https://doi.org/10.1080/02626667909491834>
- BNPB. (2016). 9 Trucks Swept by Lahar, About 25 MCM Sediment Deposit Exists in Merapi. Retrieved from <https://www.bnpb.go.id/9-truk-tersapu-lahar-hujan-masih-ada-25-juta-meter-kubik-lahar-di-merapi>
- BNPB (National Disaster Management Board). (2011). No Title. Retrieved April 6, 2017, from <Http://geospasial.bnpb.go.id/>
- Caine, N. (1980). The rainfall intensity–duration control of shallow landslides and debris flows. *Geogr Ann A*, 62, 23–27.
- Cheng, N., & Chiew, Y. (1999). Incipient sediment motion with upward seepage Incipient sediment motion with upward seepage Mouvement de sediment sous l ’ effet d ’ une infiltration ascendante par le fond. *Journal of Hydraulic Research*, 37(5), 665–681. <https://doi.org/10.1080/00221689909498522>
- Chorley, R. . (1989). The Hillslope Hydrological Cycle. In M. J. Kirkby (Ed.), *Hillslope Hydrology*. New York: John Wiley & SOns Ltd.
- Chow, V. Te. (1988). *Applied Hydrology*. Mc Graw Hill.
- Cook, R. J., Barron, J. C., Papendick, R. I., & Williams, G. J. (1981). Impact on Agriculture of the Mount St . Helens Eruptions. *Science, New Series*, 211(4477), 16–22.
- Coussot, P., & Meunier, M. (1996). Recognition, classification and mechanical description of debris flows. *Earth-Science Reviews*, 40(3-4), 209–227. [https://doi.org/10.1016/0012-8252\(95\)00065-8](https://doi.org/10.1016/0012-8252(95)00065-8)

- Cui, P., Guo, X. J., & Zhuang, J. Q. (2014). Determination of the runoff threshold for triggering debris flows in the area affected by the Wenchuan Earthquake. *Natural Hazards and Earth System Sciences Discussions*, 2(7), 4659–4684. <https://doi.org/10.5194/nhessd-2-4659-2014>
- CVGHM (Center for Volcanology and Geological Hazard Mitigation). (2014). Basic Data of Volcano. Retrieved April 6, 2017, from <Http://www.vsi.esdm.go.id/index.php/gunungapi/data-dasar-gunungapi/542-g-merapi?start=1>
- Daag, A. S. (2003). 90-6164-218-3, *Modelling the Erosion of Pyroclastic Flow Deposits and the Occurrences of Lahars at Mt. Pinatubo, Philippines*. Retrieved from file://localhost/Users/Pat K./Documents/Bookends/Attachments/Daag 2003.pdf
- De Bélizal, E., Lavigne, F., Hadmoko, D. S., Degeai, J. P., Dipayana, G. A., Mutaqin, B. W., ... Aisyah, N. (2013). Rain-triggered lahars following the 2010 eruption of Merapi volcano, Indonesia: A major risk. *Journal of Volcanology and Geothermal Research*, 261, 330–347. <https://doi.org/10.1016/j.jvolgeores.2013.01.010>
- Dibiyosaputro, S., Dipayana, G. A., Nugraha, H., Pratiwi, K., & Valeda, H. P. (2015). Lahar at Kali Konto after the 2014 Eruption of Kelud Volcano , East Java : Impacts and Risk. *Forum Geografi*, 29(July), 59–72.
- Directorate General of Water Resources. (2001). *Review master plan study on Mount Merapi supporting report [C] regional development and sustainable sand mining*. Jakarta.
- Duhita, A. D. P. (2020). *The Effect of Slope Gradient on Infiltration Capacity and Erosion Rate in Bare Hillslope of Mount Merapi (in Indonesian)*. Yogyakarta.
- Dumaisnil, C., Thouret, J., Chambon, G., Doyle, E. E., Cronin, S. J., Magmas, L., ... Ird, O. (2010). Hydraulic , physical and rheological characteristics of rain-triggered lahars at Semeru volcano , Indonesia, 1590(June), 1573–1590. <https://doi.org/10.1002/esp.2003>
- Egashira, S. (2011). Prospects of debris flow studies from constitutive relations to governing equations. *Journal of Disaster Research*, 6(3), 313–320. <https://doi.org/10.20965/jdr.2011.p0313>
- Entwisle, D. C., Hobbs, P., Jones, L. D., Gunn, D. A., & Raines, M. (2005). The Relationships between Effective Porosity, Uniaxial Compressive Strength and Sonic Velocity of Intact Borrowdale Volcanic Group Core Samples from Sellafield. *Geotechnical and Geological Engineering*, 23(6), 793–809.
- Ferguson, R. (2007). Flow resistance equations for gravel- and boulder-bed streams. *Water Resources Research*, 43(March), 0–12. <https://doi.org/10.1029/2006WR005422>

- Flint, L. E., & Selker, J. S. (2003). Use of porosity to estimate hydraulic properties of volcanic tuffs. *Advances in Water Resources*, 26(5), 561–571.
- Fox, G. A., Chu-Agor, M. L. (Maria), & Wilson, G. V. (2007). Erosion of Noncohesive Sediment by Ground Water Seepage: Lysimeter Experiments and Stability Modeling. *Soil Science Society of America Journal*, 71(6), 1822. <https://doi.org/10.2136/sssaj2007.0090>
- Franks, C. A. M. (1999). Characteristics of some rainfall-induced landslides on natural slopes Lantau Island. *Quarterly J. of Eng. Geology and Hydrogeology*, 32(3), 247–259.
- Gonda, Y., Legono, D., Sukatja, B., & Santosa, U. B. (2014). Debris flows and flash floods in the Putih River after the 2010 eruption of Mt. Merapi, Indonesia. *International Journal of Erosion Control Engineering*, 7(2), 63–68.
- Gregoretti, C. (2000a). The initiation of debris flow at high slopes : Experimental results. *Journal of Hydraulic Research*, 38(2), 83–88. <https://doi.org/10.1080/00221680009498343>
- Gregoretti, C. (2000b). The initiation of debris flow at high slopes: Experimental results. *Journal of Hydraulic Research*, 38(2), 83–88. <https://doi.org/10.1080/00221680009498343>
- Guo, C.-X., Zhou, J.-W., Cui, P., Hao, M.-H., & Xu, F.-G. (2014). A theoretical model for the initiation of debris flow in unconsolidated soil under hydrodynamic conditions. *Natural Hazards and Earth System Sciences Discussions*, 2(6), 4487–4524. <https://doi.org/10.5194/nhessd-2-4487-2014>
- Guzzetti, F., Peruccacci, S., Rossi, M., & Stark, C. P. (2007). Rainfall thresholds for the initiation of landslides in central and southern Europe. *Meteorology and Atmospheric Physics*, 98(3-4), 239–267. <https://doi.org/10.1007/s00703-007-0262-7>
- Horton, R. E. (1933). The role of infiltration in the hydrological cycle. *Trans. Am. Geophys. Union*, 14, 446–460.
- Horton, R. E. (1940). An Approach Toward a Physical Interpretation of Infiltration Capacity. In *Proceeding Soil Science of America* (pp. 399–417).
- Hu, W., Xu, Q., van Asch, T. W. J., Zhu, X., & Xu, Q. Q. (2014). Flume tests to study the initiation of huge debris flows after the Wenchuan earthquake in S-W China. *Engineering Geology*, 182(PB), 121–129. <https://doi.org/10.1016/j.enggeo.2014.04.006>
- Iverson, R. M. (1997). The Physics of Debris Flow. *Rev. Geophys.*, 35(3), 245–296.
- Iwata, S., Tabuchi, T., & Warkentin, B. P. (1994). *Soil-Water Interaction. Mechanism*

and Applications. Taylor & Francis.

- Jones, R., Thomas, R. E., Peakall, J., & Manville, V. (2017). Rainfall-runoff properties of tephra: Simulated effects of grain-size and antecedent rainfall. *Geomorphology*, 282, 39–51. <https://doi.org/10.1016/j.geomorph.2016.12.023>
- Lamb, M. P., Brun, F., & Fuller, B. M. (2017). Direct measurements of lift and drag on shallowly submerged cobbles in steep streams: Implications for flow resistance and sediment transport. *Water Resources Research*, 53, 89–157. <https://doi.org/10.1002/2017WR020883>
- Lamb, M. P., Dietrich, W. E., & Venditti, J. G. (2008). Is the critical shields stress for incipient sediment motion dependent on channel-bed slope? *Journal of Geophysical Research: Earth Surface*, 113(2), 1–20. <https://doi.org/10.1029/2007JF000831>
- Lavigne, F., & Suwa, H. (2004). Contrasts between debris flows , hyperconcentrated flows and stream flows at a channel of Mount Semeru , East Java , Indonesia. *Geomorphology*, 61, 41–58. <https://doi.org/10.1016/j.geomorph.2003.11.005>
- Lavigne, F., & Thouret, J. (2002). Sediment transportation and deposition by rain-triggered lahars at Merapi Volcano , Central Java , Indonesia, 49, 45–69.
- Lavigne, F., Thouret, J. ., Voight, B., Suwa, H., & Sumaryono, A. (2000). Lahars at Merapi volcano, Central Java: an overview. *Journal of Volcanology and Geothermal Research*, 100(1-4), 423–456. [https://doi.org/10.1016/S0377-0273\(00\)00150-5](https://doi.org/10.1016/S0377-0273(00)00150-5)
- Lavigne, F., Tirel, A., Floch, D. Le, & Veyrat-Charvillon, S. (2003). A real-time assessment of lahar dynamics and sediment load based on video-camera recording at Semeru volcano , Indonesia. In D. Rickenmann & C. Chen (Eds.), *Debris Flow Hazard Mitigation: Mechanics, Prediction, and Assessment* (pp. 871–882). Rotterdam: Millpress.
- Legono, D., Jayadi, R., Rahardjo, A. P., & Hairani, A. (2016). Snake Line Characteristic Triggering Lahar Flow Occurrence At Mt . Merapi Area. In *IAHR APD Congress in Srilanka* (pp. 2–8). Colombo.
- Major, J. J. (2004). Post-eruption suspended Sediment transport at Mount St . Helens : Decadal- scale relationships with landscape adjustments and River discharges Posteruption suspended sediment transport at Mount St . Helens : Decadal-scale relationships with landscape adju. *Journal of Geophysical Research Atmospheres*, 109. <https://doi.org/10.1029/2002JF000010>
- Miyata, S., Gomi, T., Sidle, R. C., Hiraoka, M., Onda, Y., Yamamoto, K., & Nonoda, T. (2019). Assessing spatially distributed infiltration capacity to evaluate storm runoff in forested catchments : Implications for hydrological connectivity. *Science of the Total Environment*, 669, 148–159. <https://doi.org/10.1016/j.scitotenv.2019.02.453>

- Mizuyama, T. (1977). *Bedload Transport in Steep Channels*. Kyoto.
- MLIT Japan (Ministry of Land Infrastructure and Transportation). (2004). *Guidelines for Construction Technology Transfer Development of Warning and Evacuation System against Sediment Disasters in Developing Countries*.
- Mu, W., Yu, F., Li, C., Xie, Y., Tian, J., Liu, J., & Zhao, N. (2015). Effects of rainfall intensity and slope gradient on runoff and soil moisture content on different growing stages of spring maize. *Water (Switzerland)*, 7(6), 2990–3008. <https://doi.org/10.3390/w7062990>
- Mukhlisin, M., Kosugi, K., & Mizuyama, T. (2005). Temporal and spatial variations in the probability of debris flow initiation in volcanic watersheds. *Journal of the Japan Society of Erosion Control Engineering*, 57(5), 3–14. https://doi.org/10.11475/sabo1973.57.5_3
- Nassif, S. H., & Wilson, E. M. (1975). The influence of slope and rain intensity on runoff and infiltration. *Hydrological Sciences Bulletin*, 20(4), 539–553. <https://doi.org/10.1080/02626667509491586>
- Nikora, V., Goring, D., McEwan, I., & Griffiths, G. (2001). Spatially averaged open channel rough bed. *Journal of Hydraulic Engineering*, 127(2), 123–133. [https://doi.org/10.1061/\(ASCE\)0733-9429\(2001\)127](https://doi.org/10.1061/(ASCE)0733-9429(2001)127)
- Ningsih, S., & Purnama, I. L. S. (2010). Study of Soil Infiltration Capacity and Local Groundwater Recharge in Gendol Watershed after Merapi Volcano Eruption in 2010. *Jurnal Bumi Indonesia*, 1(2), 218–226.
- Nitsche, M., Rickenmann, D., Turowski, J. M., Badoux, A., & Kirchner, J. W. (2011). Evaluation of bedload transport predictions using flow resistance equations to account for macro-roughness in steep mountain streams. *Water Resources Research*, 47(8). <https://doi.org/10.1029/2011WR010645>
- Ogawa, Y., Daimaru, H., & Shimizu, A. (2007). Experimental study of post-eruption overland flow and sediment load from slopes overlain by pyroclastic-flow deposits, Unzen volcano, Japan. *Geomorphology*, 13, 237–246.
- Osanai, N., Shimizu, T., Kuramoto, K., Kojima, S., & Noro, T. (2010). Japanese early-warning for debris flows and slope failures using rainfall indices with Radial Basis Function Network. *Landslides*, 7(3), 325–338. <https://doi.org/10.1007/s10346-010-0229-5>
- Pierson, T. C., & Hungr, O. (2005). Hyperconcentrated flow- transitional process between water flow and debris flow. In *Debris-flow Hazards and Related Phenomena* (pp. 159–202). Praxis: Springer Berlin Heidelberg. <https://doi.org/10.1007/3-540-27129-5>

- Pistolesi, M., Cioni, R., Rosi, M., & Aguilera, E. (2014). Lahar hazard assessment in the southern drainage system of Cotopaxi volcano, Ecuador: Results from multiscale lahar simulations. *Geomorphology*, 207, 51–63. <https://doi.org/10.1016/j.geomorph.2013.10.026>
- Prancevic, J. P., Lamb, M. P., & Fuller, B. M. (2014). Incipient sediment motion across the river to debris-flow transition. *Geology*, 42(3), 191–194. <https://doi.org/10.1130/G34927.1>
- Putra, S. S., Hairani, A. N. I., Musthofa, A., Murti, I., & Gonda, Y. (2018). Flood Early Warnin System in Mt. Merapi Area based on Radial Basis Function Network Generated Critical Line. In *IAHR APD Congress in Yogyakarta*. Yogyakarta: Universitas Gadjah Mada.
- Rickenmann, B. D. (1991). Hyperconcentrated Flow and Sediment Transport at Steep Slopes. *Journal of Hydraulic Engineering*, 117(11), 1419–1439.
- Rose, W. I., & Durant, A. J. (2009). Fine ash content of explosive eruptions. *Journal of Volcanology and Geothermal Research*, 186(1-2), 32–39. <https://doi.org/10.1016/j.jvolgeores.2009.01.010>
- Sanyoto, N. A. S. (2020). *Effect of Ash Fall Thickness to the Infiltration Capacity in Bare Hillslope of Mount Merapi (in Indonesian)*. Yogyakarta.
- Selles, A. (2014). *Multi-Diciplinary Study on the Hydrogeological Behavior of the Eastern Flank of the Merapi Volcano, Central Java, Indonesia*.
- Shields, A. (1936). *Application of similarity principles and turbulence re- search to bed-load movement*, translated by W. P. Ott and J. C. van Uchelen. *Hydrodyn. Lab. Publ.* 167.
- Shinta, N. A. (2020). *The Effect of Volcanic Ash Fall on the Infiltration Capacity of Bare Soil in Mount Merapi Area*. Yogyakarta.
- Singhal, B. B., & Gupta, R. P. (2010). *Hydrogeology of Volcanic Rocks*. Netherlands: Springer.
- Sudarman, K., & Wahyunto. (2013). Kondisi Lahan dan Infrastruktur Pertanian Pasca Erupsi Gunung Merapi. In *Innnovation of Agriculture in Affected Area of Merapi Volcano Eruption [in Indonesian]* (pp. 39–61). Retrieved from <http://www.litbang.deptan.go.id/buku/Erupsi-Gunung-Merapi/>
- Surjono, S. S., & Yufianto, A. (2011). Geo-Disaster Laharic Flow along Putih River, Central Java, Indonesia. *J. SE. Asian Appl. Geology*, 3(2), 103–110.
- Takahashi, T. (1991). Debris Flow. In *Monograph of IAHR*. Rotterdam: AA Balkema.
- Takahashi, T. (2007). Ch2: Models for mechanics of flow. In *Debris Flow Mechanics Prediction and Countermeasures*. London: Taylor & Francis.

- Takahashi, T. (2009). A Review of Japanese Debris Flow Research. *International Journal of Erosion Control Engineering*, 2(1), 1–14. <https://doi.org/10.13101/ijece.2.1>
- Takahashi, T. (2010). Initiation and development of debris flow. *Debris Flow*, 102–167. <https://doi.org/10.1201/9780203946282.ch3>
- Thouret, J. C., Abdurahman, K. E., Bourdier, J. L., & Bronto, S. (1998). Origin , characteristics , and behaviour of lahars following the 1990 eruption of Kelud volcano , eastern Java (Indonesia). *Bull Volcanol*, 59, 460–480.
- Tribunnews. (2012). Lahar Merapi. Retrieved June 12, 2019, from <http://www.tribunnews.com/images/regional/view/318251/banjir-lahar-hujan-merapi>
- Tsujimoto, T. (1991). Bed Load Transport in Isteep Channels. In *Hydrodynamics Of Steep Channels And Local-Scale Processes* (pp. 89–102). Verlag: Springer.
- USGS. (2016). Ashfall is the most widespread and frequent volcanic hazard. Retrieved May 16, 2019, from <https://volcanoes.usgs.gov/vhp/tephra.html>
- Vallance, W. (2000). Lahars. In *Lahars* (p. 601). McGraw Hill.
- Varnes, D. (1978). Slope Movement Types and Processes. In *Materials Science and Engineering R: Reports* (Vol. 135, pp. 85–100). <https://doi.org/10.1016/j.mser.2018.11.001>
- Watt, S. F. L., Pyle, D. M., Naranjo, J. A., Rosqvist, G., Mella, M., Mather, T. A., & Moreno, H. (2011). Holocene tephrochronology of the Hualaihue region (Andean southern volcanic zone, ~ 42°S), southern Chile. *Quaternary International*, 246(1-2), 324–343. <https://doi.org/10.1016/j.quaint.2011.05.029>
- Yamanoi, K., & Fujita, M. (2016). Risk estimation of multiple hazards related to sediment and water disasters occurring in heavy rainfall. *Jornal of Japan Society of Civil Engineers*, 72(4), 1291–1296.
- Yasin, A. (2012). *Determining the Impact of Volcanic Eruption on the Discharge Using Hydrological Model*. Universitas Gadjah Mada.
- Zhou, G. G. D., Cui, P., Tang, J. B., Chen, H. Y., Zou, Q., & Sun, Q. C. (2015). Experimental study on the triggering mechanisms and kinematic properties of large debris flows in Wenjia Gully. *Engineering Geology*, 194, 52–61. <https://doi.org/10.1016/j.enggeo.2014.10.021>
- Zhuang, J., Cui, P., Peng, J., Hu, K., & Iqbal, J. (2013). Initiation process of debris flows on different slopes due to surface flow and trigger-specific strategies for mitigating post-earthquake in old Beichuan County , China. *Environmetal Earth Sciences*, 68, 1391–1403. <https://doi.org/10.1007/s12665-012-1837-2>

