

A combined model of sediment production, supply and transport

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Abstract In previous sediment-runoff models, the sediment production rates of mountain slopes, and the sediment supply rates to streams typically have been developed using empirical methods. A process-based model for sediment production and supply is, however, required for more exact simulations of sediment runoff. In this study, we develop a method to calculate the sediment production rate due to both freeze-thaw action and the sediment supply rate (i.e. erosion rate of talus). These numerical models were then connected to an existing sediment transport model. The integrated model presented here was applied to a small mountainous watershed. We found that the calculated sediment production rate was within the range of values typically observed for this region. Additionally, the estimated annual sediment discharge using the model agreed with observational results. Lastly, we found that the model can be used to qualitatively characterize typical features of the actual sediment routine in mountainous watersheds.

Key words sediment production; sediment supply; sediment transport; freeze-thaw action