豪雨による表層崩壊および土石流の予測と動的ハザードマッピング
Prediction of shallow landslides and debris flow by rainstorm: dynamic hazard mapping toward disaster mitigation

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This study demonstrates a strategy for predicting location, timing, and magnitude of rainfall-induced shallow landslides and areas affected by subsequent debris flows. Spatial distribution of soil layers was modeled for evaluating thickness of sliding material on hillslopes, which provides a basis for predicting source area and volume of shallow landslides and simulating subsurface hydrological processes. Soil accumulation in hollows was calculated on a geographic information system using a 1 m-meshed digital terrain model with soil production by bedrock weathering and transport by soil creep. The output was validated by a ground-based survey in the actual terrain in a selected watershed. The shear strength of the bulk soil was evaluated by direct shear tests using undisturbed specimens, and quantification of soil reinforcement by tree roots through an in-situ survey at soil pits. Hydrological monitoring was carried out at representative hillslopes for modeling fluctuation in subsurface pore-water pressure by rainwater infiltration. By coupling all of those data and modeling, we analyzed the hillslope instability, and then compared the output with a landslide inventory map to confirm the accuracy and precision of the prediction. Time-series change in areas of debris flow runout was estimated based on assumed equivalent coefficient of friction as a function of hillslope wetness in the watershed. Such dynamic mapping of geohazard fills a demand in disaster mitigation in local communities for increasing events of heavy rainfall.

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