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Shallow Landslides Survey and Rainfall Induction Mechanism Study for Xiang Xi River Basin of Three Gorges Reservoir

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Abstract: Location of the study area, the Xiang Xi River basin, is belongs to the Three Gorges Reservoir. The geological structure is a monocline and the main strata are Jurassic sandstone-mudstone interbeds. The River flow along the dip direction of the strata which cause one bank is consequent slope and other is transverse slope. The eluvial-declivous materials and ancient landslides are reactivated because of the reclamation of wild lands by the inhabitants moved up, construction of buildings and roads and variation of the hydro geological conditions by the increasing level of the Three Gorges Reservoir. Shallow landslides take place along the consequent slope bank more frequently for the special geological surroundings. The area is one of the heavy rain zones in China and the maximum daily precipitation is up to 386 mm. An amount of landslides take place in May to September because of more than 70 % rainfall of whole year concentrates in the rainy season. The slopes of a constructing road are investigated and a numerical model is formed to study the process of the unsaturated infiltration and the failure phenomena. The unsaturated flow is simulated by Finite Element Method (FEM) and mechanical reaction is study by the Fast Lagrangian Analysis of Continua (FLAC) program. The failure procedure with large deformation during rainfall period has analyzed combined the advantages of the two methods. Some conclusions have obtained from the study of the influence of one single heavy rain on the slope stability. Firstly, the influence of rainfall on the failure mechanism is controlled by the flow field and natural stress field together. Secondly, the impact procedure of heavy rain to the stability of the slope can be divided into four stages: rainfall period,

transition period, main influence period and weak influence period. Another simulation, more similar with actual situation, has been accomplished for the case of an antecedent rainfall existent before the heavy rain. We can find that the decrease speed and degree of the stability of the shallow landslide is faster and higher when the heavy rain happens than former case. This study show the mechanism of the failure procedure of shallow landslides induced by heavy rain and give a hint for prediction study that the process of rainfall should be considered when we make forecast for shallow landslides.