Geophysical Research Abstracts
Vol. 20, EGU2018-9457, 2018
EGU General Assembly 2018

Numerical Simulation of Surface Tension Crack on Riverbank Stability

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During high flow season, the rise and fall of river water level could induce riverbank instability and threaten structural safety of flood-protection facilities on floodplains. It was observed that tension crack appeared in riverbank failure cases due to the fall of river water level. Moreover, a review of existing numerical simulation models for riverbank stability assessment indicated that there is no model currently available considering integral effect on riverbank stability due to all forcing factors acting upon the failure plane and the presence of tension crack. Thus, this paper presents an improved riverbank stability analysis model that explicitly incorporates the integral effect of all forces acting upon the failure plane and tension crack. The prediction accuracy of the improved model is examined by using field data of the Hotophia Creek in the USA and the Sieve River in Italy. For practical application of the improved riverbank stability model, two empirical formulas for estimating tension crack location and failure plane angle were examined and modified to enhance their appropriateness in riverbank stability simulation. Finally, the improved model with the modified empirical formulas was verified to show its good prediction in riverbank stability analysis.