Abstract

Research efforts on the morphodynamics of bedrock rivers are primarily focused on steep systems and little is known about low slope mixed bedrock-alluvial rivers such as the Mississippi River and the distributary channels of the Wax Lake delta and of the Nile River delta. Here we present the results of laboratory experiments specifically designed to gain novel insight into sediment transport processes in low slope bedrock reaches transporting sand as alluvial bed material, which can be of interest for restoration projects. The experiments demonstrate that at mobile bed equilibrium in the bedrock reach, 1) the flow depth decreases in the streamwise direction, 2) the bedform amplitudes decreases in the streamwise direction in some runs and in other runs they do not significantly change, 3) grain size distribution of the surface material decreases in the runs with no change in bedform amplitudes and stay constant in the runs with the reduction of bedform amplitudes, 4) this different behavior is due to the different sediment regime. By using *Vanoni* [1974] diagram we demonstrated that as the system tends toward the antidune regime the reduction in bedform amplitude is the dominant factor. On the other hand in the systems well in the dune regime the dominant factor is the changes in the grain size of the bed surface. We then validated the *Ashida and Michiue* [1972] bedload relation in the low slope bedrock reaches. Furthermore, we designed and developed a 1D numerical model that is able to capture the flow characteristics and the sediment transport processes in the mixed bedrock alluvial systems. This model has been validated against the present experimental data. Not only the model is able to predict the long term evolution of low slope bedrock rivers, but also enables us to model bedrock reaches in upland areas.