Geophysical Research Abstracts, Vol. 9, 00898, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-00898

A numerical approach for identifying the optimal cross-section distance in one-dimensional hydraulic models

G. Di Baldassarre (1), A. Castellarin (1), M.S. Horritt (2), P.D. Bates (3) and A. Brath (1)

(1) Faculty of Engineering, University of Bologna, Italy, (2) Department of Civil Engineering, University of Bristol, United Kingdom, (3) School of Geographical Sciences, University of Bristol, United Kingdom

It is well know that choosing a suitable set of cross-sections for the discrete representation of the natural geometry of the river is critical to the efficiency of one-dimensional (1D) hydraulic models. This choice is part of the art of river modelling. It is unlikely that two experts would select the same exact location of the cross-sections. The scientific literature provides some rules for the optimal cross-section distance, obtained by theoretical analyses and experience (see e.g., Cunge et al., 1980; Samuels, 1990). The aim of this study is to investigate this topic by an innovative numerical approach. The approach was applied to a 55km-reach of the River Po (Italy) and a 16km-reach of the River Severn (United Kingdom), of which high quality laser scanning altimetry were available. The high-resolution digital terrain models (DTM) of the two river enabled us to generate hypothetical topographical ground surveys by extracting cross-sections from the DTM. These surveys were characterised by different resolution, for instance different cross-section distances. We used all surveys to build different 1D hydraulic models, which were then used for simulating historical and synthetic flood events for the two rivers. Then, we tested the efficiency of each model and we assessed the detriment of the performance of each model associated with the decrease of the survey resolution. Finally, we compared the results of the numerical experiments to the guidelines reported in the scientific literature (see e.g., Cunge et al., 1980; Samuels, 1990), which are mainly empirical rules about the maximum distance between cross-sections.