Hydrol. Earth Syst. Sci. Discuss., 5, S421–S424, 2008
www.hydrol-earth-syst-sci-discuss.net/5/S421/2008/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Discharges of past flood events based on historical river profiles" *by* D. Sudhaus et al.

D. Sudhaus et al.

Received and published: 21 May 2008

As authors of the manuscript, we would like to thank the referees and the editor for the helpful comments, which allowed us to improve the manuscript. In this reaction, we discuss the comments of the referees and the editor.

Referee #1, comment 1:

The discharges are not reconstructed using the energy line instead of the water surface, they were calculated for both. It is not meant, that the reconstructed water surface accords more to the energy line, but the kinetic term could be the maximum. The historical data have potentially a higher uncertainty, because the method of measuring the water level is not always documented very well. To compensate this uncertainty we also used the energy line for the discharge reconstruction. So the "real" water surface

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can either be the quoted water level or be in-between the quoted water level and the energy line for maximum. But we do focus our analysis to the water surface and therefore we did the analysis for this value with three different roughness values. We will point this out more clearly in the revised manuscript at the end of section 3.

Referee #1, comment 2 and editor comment 2:

We didn't add a section about the changes in the river morphology because it has not been the main focus of our article. A detailed analysis of the changes of the river morphology in the time span of our analysis presupposes that adequate historical information is available. That wasn't the case, neither for the cross profiles analysed in our work, nor for the length profiles. But a lot of hydraulic engineering measures from the 19th century are known, especially such as bank fixation and meander cut-offs. These data are, in spite of intensive archive research, not sufficient for a hydraulic analysis. The comparison between the results from LARSIM and HEC-RAS shows, that the discharges for the 1824 and 1882 floods are within similar ranges. This suggests that changes in the river morphology of the Neckar might not have had a crucial influence on discharges during these extreme events. Since we only focused our work on extreme events, a thorough study of the changes on river morphology would go beyond the aim of the paper. We will add a section about this aspect in the discussion.

Referee #1, comment 3:

The surveys from the historical sources might differ from the current national system, but all data used refer to an altitude above sea level. Furthermore, the historical data are consistent since they originate from one major source. A transformation to the current altimetry might be possible but this is not necessary, since the discharge calculations can be carried out within the historical system.

Referee #1, comment 4:

The precipitation for both events was reconstructed based on historical data sources.

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The spatial rainfall patterns are known for both events. The reconstructed precipitation pattern for the 1824 flood is published in Bürger et al. 2006. The reconstruction of the hydrometeorological causes for the 1882 event were presented at the EGU meeting in Vienna by Seidel et al. 2008 and a corresponding paper is currently in preparation (for NHESS). Furthermore, these results will be published in a German paper (Hydrologie und Wasserbewirtschaftung) which is due in summer 2008. Precipitation was reconstructed for the whole catchment and the discharges were simulated for the Neckar river as well as for its tributaries. The discharge increments from the tributaries shown in figure 5 and 6 result from LARSIM simulation and the contemporary historical sources. The catchment area can not be stated in table1 because there is no information about this in the historical sources.

Editor comment 1

We see no shortcomings in the Bürger et al. 2006 paper. The presented paper is meant as a supplement and verification to the reconstruction and simulation based hydrometeorological data and to compare these independent approaches. We will bring out the differences more detailed in the introduction.

Editor comment 3

Against the background of current discussions about extreme events and climate change, there's a need for long-term and reliable information about discharges of extreme flood events. In our case study, the results can contribute to a better flood risk management because the discharges of the 1824 flood in the lower reach of the Neckar River are higher than the discharges for the probable maximum flood in the current flood risk management system. The flood event of October 1824 was the most extreme large scale event in the Neckar catchment for the last 300 years. Therefore it can be consulted as extreme design flood for the flood hazard maps of the Neckar catchment. In general, the knowledge of occurrence, causes and discharges of the highest flood in historical times can support flood protection as well as a reliable haz-

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ard assessment.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 5, 323, 2008.