

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

Anonymous Referee #1

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The paper presents a case study on the Neckar river, related to the discharge assessment of historical floods during the 19th century. Standard hydraulic calculation is provided by the HEC-RAS model, using river cross profiles from the 19th century. A sensitive analysis is presented, based on minimum and maximum values of the Manning coefficient, and considering either the energy line (EL) or the water surface (WS). The authors give a comparison between their discharge assessment of the 1824 and 1882 floods and previous one by other authors.

The paper is interesting and is based on a detailed historical investigation of the 1824 and 1882 floods. I have four comments on the hydraulic calculation :

û The use of the energy line instead of the water surface elevation is not straightforward;

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regarding the proposed explanation. Because the profiles are not associated to gauging stations, the indicated historical water level could potentially represent the level of the wash of the waves (energy head) and therefore overestimate the actual water level. Usually flood marks are based on the maximum extent of the flood prone area. Therefore there is no reason to consider that such maximum elevation is related to the water level + the kinetic term $V^2/2g$. It could occur only if such flood marks have been collected on a point located inside the main channel with a large velocity (e.g. on the upstream side of a bridge pillar). The authors should explain where the available flood marks are located. It could be interesting to add a section on the historical variations of the river morphology. The aim is to understand if the bed river and the section form have been stable or not, in order to be able to decide if a historical survey at a specific date could be extended to another one. In the case of sediment transport, a sensitive analysis could take into account such variation of the river morphology. No information is provided on the history of the survey in Germany. Usually in many countries in Europe, national systems have been developed during the 19th century, with a progressive and coherent spatial extent. It means that the former surveys are usually based on relative elevations (to a specific point) as the later surveys are related to a national reference. Therefore, a additional work is usually necessary when using old surveys, to be able to convert relative elevations to a specific point to the current survey system. As the studied area is about 300 km long (82.5 to 344 Kilometric Point), several tributaries have to be considered. The authors should explain how they choose the contribution of such rivers (proportionality to the catchment area ?), and if they have information of the homogeneity/heterogeneity of the rainfall within the Neckar catchment. The various scenarios could induce a additional uncertainty on the discharge assessment. Information on the catchment area at the different Kilometric Point of table 1 could be added.

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