

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2
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Comment on hess-2021-320

Libor Elleder (Referee)

Referee comment on "Enhanced flood hazard assessment beyond decadal climate cycles based on centennial historical data (Duero basin, Spain)" by Gerardo Benito et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-320-RC2>, 2021

General comments:

The article "Enhanced flood hazard assessment beyond decadal climate cycles based on centennial historical data" presents very a complex study on extreme floods of the Duero River in Zamora. 69 floods including 15 catastrophic ones were identified for time span of 651 years (1250–1871). This count of 15 catastrophic floods represents one catastrophic flood per 41 years on average, which is a realistic assessment. The count of 16 extraordinary floods with discharge maximum over $1900 \text{ m}^3 \cdot \text{s}^{-1}$ (perception threshold until 1871) were identified. In other words, in 1250–1871 this discharge was exceeded on average every 20 years. The largest floods were identified before onset of LIA (1258) and on the end of LIA (1860).

The authors used complex statistical analyses. The flood frequency analyses based on Expected Moments Algorithm (EMA) and Maximum Likelihood Estimator (MLE) methods were combined with five datasets (based on various temporal frameworks). The authors discussed the meteorological framework as well. They present the major floods in context of NAO oscillation. With special interest I have read the chapter on atmospheric rivers influence.

Specific comments

I have noticed a very interesting similarity in condition in old Zamora city and Prague regarding the flood reconstruction.

1/ For both cities, Prague and Zamora, the data gaps occur before the onset of LIA.

2/ For both cities the pictorial documentations were made by (various) Dutch painters (Anton van der Wyngaerde and Egidius Sadeler) in the 16th century.

3/ The hydrological situation was stable from ca 13th or 14th century to the 1870s.

4/ The perception threshold of ca 1900 m³ · s⁻¹ is similar for period before systematical records.

5/ For Both Zamora and Prague the negative NAO is important.

6/ Some important flood marks were destroyed.

7/ Is the old one bathygraphy of the river channel from 19th century in Zamora at disposal?

8/ Some articles with similar topic should be noticed, discussed and referenced to:

Macdonald, N. 2013. Reassessing i-flood frequency for the River Trent, Central England, since AD 1320. Hydrol. Res. 44 (2), 215–233.

Elleder, L., Herget, J., Roggenkamp, T., and Nießen, A.: Historic i-floods in the city of Prague – reconstruction of peak discharges, Hydrol. Res., 44, 202–214, 2013.

Wetter, O., Pi-ster, C., Weingartner, R., Luterbacher, J., Reist, T. & Trösch, J. 2011 The largest i-floods in the High Rhine basin since 1268 assessed from documentary and

instrumental evidence. Hydrol. Sci. J. 56, 733–758.

Aldrete, G. S., 2007. Floods of the Tiber in ancient Rome. Baltimore: Johns Hopkins University Press 338 s. ISBN 0-8018-8405-5

England, J. F. Jr., Jarre, R. D., Salas, J. D., 2003. Data-based comparisons of moments estimators using historic and paleoflood data. Journal of Hydrology 278, s. 72–196. ISSN 0022-1694

Minor comments

1/ Line 20: AEP is without explanation.

2/ Please consider if the "land mark" (first time line 235) expression is suitable: "Might be" "flood mark" should be more clear.

3/ The authors use 2 categories of floods, i.e. catastrophic and extraordinary. Please, use it also in Table 1.

4/ Line 580 LIE. What does it mean?

5/ Please, check the figures and enlarge the letters to make the figures better readable.

7/ Abbreviation FFA (flood freq. an.) is explained on line 630, but mentioned earlier for the first time. Please, revise.