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Doctoral dissertation review of MSc Babak Ghazi thesis *The occurrence and causes of floods in Polish lands from the 11th to 18th centuries*

The submitted doctoral dissertation of MSc Babak Ghazi was prepared at the Department of Meteorology and Climatology University of under the supervision of Prof. dr hab. Rajmund Przybylak and dr Aleksandra Pospieszyńska. The dissertation consists of a 41-page introduction and four articles, three of which have already been published in international journals and the fourth has been submitted. All articles are co-authored, with four to six authors. MSc Babak Ghazi is the first author of all. The dissertation was created as a part of the project entitled „The occurrence of extreme weather, climate and water events in Poland from the 11th to 18th centuries in the light of multiproxy data" founded by National Science Centre (2020/37/B/ST10/00710).

The main research objective was to fill the gaps in knowledge about flood occurrences and their spatio-temporal changes in Poland in the pre-instrumental period (11th – 18th centuries). To achieve this, MSc Babak Ghazi defined five secondary goals:

- Investigation of temporal changes in the frequency of floods in Poland,
- Assesment of temporal changes in the intensity of floods, including the extreme ones,
- Investigation of temporal changes in the genesis of floods,
- Comparison of floods in the historical period (1001-1800) and the instrumental one (1801-2000),
- Comparison of floods in Poland and other Central European countries.

All three published articles were published in high impact factor journals (6.4 , 4.7 and 4.7) and have a similar structure. The introductions present the importance of historical data for reconstructing flood occurrence, a review of the literature containing data on previous flood reconstructions, and the purpose of the work. The

next chapter contains a presentation of the research area, which is Poland in its current borders, a description of the attached data set and the methodology used. The first two additionally contain a scheme of data elaboration procedure. The results chapter is usually relatively short and contains simple graphs showing the temporal course of flood frequencies, their distribution between the six distinguished geographical regions and the intensity categories distinguished according to the two classifications proposed by Brazdil et al. (2006) and Barriendos and Coeur (2004) and the genetic categories distinguished by Lambor (1954). This chapter also includes tables comparing the floods considered in this work with the results of other studies concerning Poland or other European countries. Last two chapters contain discussions and summaries. The differences between the articles are mainly that the research covers a different period. In the first, it is the period 1001-1500, in the second, the 16th century, and in the third, the 17th and 18th centuries. Each publication is accompanied by a data set - a set of floods with information about the location, intensity and genesis of the flood and the source of the data. These sets are included in the UMK repository in open access. Articles contain links to these datasets. All three articles passed the peer review procedure and were accepted by experts, however, there are a few things that make me question them.

The first problem is the lack of a definition of flood. According to the International Glossary of Hydrology (WMO-No.385) flood is: (1) rise, usually brief, in the water level of a stream or water body to a peak from which the water level recedes at a slower rate. (2) Relatively high flow as measured by stage height or discharge;and flooding is: (1) Overflowing by water of the normal confines of a watercourse or other body of water, (2) Accumulation of drainage water over areas which are not normally submerged. In all three papers authors stated that they distinguished the „flood" and „high water" events and events classified as „ordinary flood" by Barriendos and Coeur (2004) treated as high water events, which is not entirely consistent with the WMO definition. The lack of a clear definition means that it is not entirely clear what this database actually contains. The second issue is also related to the definitione. For classification of origin of floods, authors used the method given by Lambor (1954). The category „winter" was divided into ice jam and shuga. The previously mentioned International Glossary of Hydrology states, that "an ice jam flood including debris is defined as an accumulation of shuga including ice cakes, below ice cover. It is broken ice in a river which causes a narrowing of the river channel, a rise in water level and

local floods". My question is, how did you differentiate between these two categories and how your definition of ice jam differs from the one given in the WMO glossary?

In the third publication, concerning the 17th and 18th centuries, "flood rich periods" were also distinguished for the whole of Poland, two river basins: the Vistula and the Oder, and three geographical regions with the highest number of floods. Unfortunately, it is not stated anywhere on the basis of what criteria these periods were distinguished.

In the same position, Figure 7 shows frequency of floods in the 17th-18th centuries in Central Europe. The authors stated that only in two 20-year periods was the number of floods higher in Poland than in Germany, however the figure shows that there were four such 20-year periods.

The fourth paper, currently under review, concerns flood occurrences and characteristics in Poland in the last millennium. It is also accompanied by a flood database, this time from the years 1001-1800. The collection has been expanded, it contains more events than the three previous collections combined. There is no information about where they come from. Many of the figures and tables described in it are in supplements, which unfortunately were not attached to the dissertation, and since the article has not been published yet, the reviewer does not have access to them. And that is a pity.

In this study, floods collected on the basis of historical data (11th-18th centuries) were compared with those from the instrumental period. The comparison mainly covered the period from the 16th century, when the number of collected floods was close to contemporary ones. However, estimating trends requires that the data be relatively homogeneous. And here, there was no broader discussion on this subject. The occurrence of an increasing (or decreasing) trend was estimated using the Mann-Kendall test. Additionally, linear trend coefficients were also calculated (Figures 13 and 14), but unfortunately, it was not mentioned what method was used to determine them.

In Poland, two items by Ryszard Girguś have been published under the titles: „Wyjątki ze źródeł historycznych o nadzwyczajnych zjawiskach hydrologiczno-meteorologicznych na ziemiach polskich w wiekach od X do XVI" (1965) and „Wyjątki ze źródeł historycznych o nadzwyczajnych zjawiskach hydrologicznych i meteorologicznych na ziemiach polskich w latach 1601-1920" (2022). Both were

published in Polish, so they were inaccessible to the PhD student, but the flood databases were created in co-authorship. None of the databases mention these items and only the first article mentions this item in one place. My question is, were the flood data sources mentioned by Girguś used in the development of the database? If so, why is there no mention of this in the publications? If not, why not?

In summary, Mr. Babak Ghazi is the first author of four co-authored articles, three of which have been published in highly rated international scientific journals, and the fourth is in the review. Additionally, he is the co-author of a unique database on floods in Poland in the years 1001-1800. These are undoubtedly the achievements of the PhD student. Therefore, the main goal and all partial goals of the dissertation have been achieved, and the doctoral dissertation is an original scientific achievement. MSc. Babak Ghazi has demonstrated extensive theoretical knowledge on the subject of floods and has demonstrated the ability to conduct scientific work. The critical remarks in this review suggest that there are still some issues that the author should work on, but it does not change the fact that he has extensive knowledge and is able to conduct research independently.

In addition to the above-mentioned articles, Mr. Babak Ghazi published 10 other works indexed in the Scopus database. All of them were co-authored, but in more than half of them he was the first author. In total, his works were cited 108 times, and the Hirsch index is 5.

Final conclusion

Based on a detailed analysis and evaluation of the doctoral dissertation of Babak Ghazi, MSc. entitled ***The occurrence and causes of floods in Polish lands from the 11th to 18th centuries***, I conclude that it constitutes an original solution to the current scientific problem and meets the conditions specified in the Art. 187 of the Act of 20 July 2018 – The Law on Higher Education and Science. Taking the above into account, I submit a motion to admit MSc. Babak Ghazi to the next stages of the doctoral process, including the public defense.

Joanna Wibig

Podpisany elektronicznie przez Joanna Wibig

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