Comment on “Outburst flood at 1920 BCE supports historicity of China’s Great Flood and the Xia dynasty”

Wenxiang Wu, Junhu Dai, Yang Zhou, Quansheng Ge*

Wu et al. (Reports, 5 August 2016, p. 579) reported geological and archaeological evidence about an earthquake-induced landslide dam outburst flood around 1920 BCE and claimed a support to the historicity of China’s legendary Great Flood and Xia dynasty. We argue that the physical evidence is unreliable and their arguments are unconvincing.

It has been challenging to prove the historicity of the semimythological narratives of the Great Flood and the Xia dynasty in the absence of contemporary textual evidence. Wu et al. (1) presented physical evidence about an outburst flood around 1920 BCE and claimed verifications to the authenticity of these historical events. Here, we question the reliability of the physical evidence and soundness of their arguments.

For the first key evidence about the outburst flood, Wu et al. assumed that the time when the dammed-lake sediment began to deposit approximately represented the onset of the flood outburst. However, Wu et al. only dated the middle-upper parts of the lacustrine sections, left huge, thick sediment (e.g., 25 m for P7a and 10 m for P4) for the lower parts undated, and then inappropriately used the date for the middle-upper parts of the lacustrine sections as the beginning date for the outburst flood. Thus, their dated age older than 2000 BCE apparently contradicted their claim that the dam was breached around 1920 BCE. It also violated the sedimentary law because it cannot explain the time it took for the enormous lower thick sediments to be deposited. Actually, previous researchers who systematically dated the whole sequence of the dammed-lake sediments found that the dam was formed before 8.1 thousand years before the present (B.P.) and was either gradually eroded away (2) or suddenly breached (3) before 5.6 thousand years B.P., which considerably predates 1920 BCE.

The second key evidence about the causes of the Lajia ruins was seriously challenged by taphonomic phenomenon. Detailed excavations on the Lajia settlements revealed strong evidence of in situ burial features: (i) human skeletons, animal bones, and pottery vessels were concentratedly distributed in a limited area rather than being widely scattered; and (ii) some human skeletons were grouped together rather than being separated, and others rested on the dwelling floors instead of being lain face down or prostrate (4). These burial features cannot be explained by the flooding burial scenarios. Their reconstructed high-energy overflowing floodwater with a water level more than 10 m above the Lajia settlements and sweeping for at least 8 hours over the already seismically shattered cave dwellings composed of loosely deposited loess would generate off-site burial effects. Competing research indicated that it was an earthquake and immense local mudflows that jointly destroyed the Lajia settlements, which can explain well the in situ burial features (e.g., (5)).

Wu et al.’s further causal links to the historical events are problematic for five reasons. First, Wu et al. inappropriately treated the dating results and created a seemingly precise date for the outburst flood. They (i) used an inverse weighting method to obtain a deceptively accurate date of 3573 ± 181C years with a margin of error even smaller than any of the original three dates on which it is based; (ii) then reduced date accuracy to obtain a calendar date 1922 ± 28 BCE by lowering its dating confidence level from 95% to 68%; and (iii) further simplified dating range as an exactly fixed chronological point 1920 BCE. Thereafter, they used 1920 BCE to subtract 22 years of controlling floods and obtain an exact date of 1898 BCE and then correlated it with a historical exact date of 1914 BCE proposed for the beginning of the Xia dynasty. However, such subtraction is meaningless because the original dating error margin amounts to more than 200 years, much larger than 22 years. One consequence of these dating treatments is that it helped them to exclude a number of other proposed dates for the beginning of Xia (6, 7), which fall well within the original dating range.

Second, Wu et al.’s uncritically taking the 22 years of alleged taming floodwaters as an exact number is unfounded for the following reasons: (i) correct chronological information is not deemed sufficiently important by deep-time oral societies to be accurately memorized and transmitted in the first place; (ii) deep-time oral societies lack the writing and calendrical systems required for absolute, precise, and consistent measurements of time with a uniform temporal unit; and (iii) chronological information in value-laden societies is subject to distortions, inadvertently or deliberately, during the long process of oral transmission and/or textual transcription (8–10). China’s writing and calendrical systems were not firmly established until the late Shang period (~1300 to 1046 BCE), more than half a millennium after the Great Flood (10). Thus the exactness of the 22 years was inevitably subject to high-level uncertainties in the initial collective memorization and subsequent various transmitting errors (10).

Third, Wu et al. overlooked two important physiographical factors in mitigating the putative flood effects. The Yellow River runs through several vast low-lying alluvial plains such as the Yinshuan and Hetao Plains, where much floodwater could easily overflow the low natural levees and be released away. The Xia people mainly inhabited the topographically transitional zone between the Loess Plateau in the west and the vast low-lying alluvial plains in the east (11). This area comprises low mountains, loess tablelands, and rolling hills with a general altitude higher than its eastern counterpart. The putative floodwaters would have been quickly dissipated, unlikely leading to a 22-year flood disaster there.

Fourth, Wu et al. uncritically dismissed historical documents recording that the Great Flood occurred during the reigns of Kings Yao, Shun, and Yu, which lasted at least 100 years (6) rather than just 22 years. Furthermore, the flood occurrence was related to locally abnormal rainfall and resultant waterlogging conditions (12).

Finally, the causal links between the outburst flood and the Erlitou culture formation and Neolithic-Bronze Age transition are also questionable. Recent improvements in dating technique and availability of new radiocarbon dates generated an age 1790 BCE for the beginning of Erlitou culture (33), much later than 1900 BCE. It is highly unlikely that a single short-lived outburst flood could cause such profound and widespread cultural-economic transformations along the Yellow River valley. Wu et al. neglected previous studies that convincingly indicated that this transformation was closely related to the 4.2 to 4.0 thousand years B.P. global climate event (14, 15).

In summary, Wu et al.’s physical evidence for the outburst flood is questionable, and its causal links to the historical events are more generally assumed than convincingly demonstrated. Their claim of support for the historicity of the Great Flood and the Xia Dynasty is thus unfounded.

REFERENCES AND NOTES

Key Laboratory of Land Surface Pattern and Simulation. Institute of Geographical Sciences and Natural Resources Research. Chinese Academy of Sciences, Beijing, China.
*Corresponding author. Email: geqs@igsnrr.ac.cn

Wu et al., Science 355, 1382b (2017) 31 March 2017

1 of 2

Downloaded from http://science.sciencemag.org/ on January 4, 2019

ACKNOWLEDGMENTS

We thank Q. Wu and coauthors for their willingness to have a discussion on this interesting and challenging topic. We thank L. von Falkenhausen for valuable comments and English proofreading of this manuscript. This work was supported by the National Basic Research Program of China (2015CB953800) and the National Science Foundation of China (41672176).

30 September 2016; accepted 15 February 2017
10.1126/science.aal1278
Comment on "Outburst flood at 1920 BCE supports historicity of China's Great Flood and the Xia dynasty"
Wenxiang Wu, Junhu Dai, Yang Zhou and Quansheng Ge

Science 355 (6332), 1382.
DOI: 10.1126/science.aal1278