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Article on Chinese flood of 4,000 years ago (with some reference to the resulting actions of the leader Yu, who lives on in Chinese mythology):

It's said the flood looked like "endless boiling water," surging across the landscape. A wave as tall as a 30-storey building would have crashed over the banks of the Yellow River, demolishing everything in its path. It soaked the streets of ancient China's nascent cities and washed away the surrounding farmland.

"The flood is pouring forth destruction. Boundless and overwhelming, it overtops hills and mountains," goes a quote attributed to the legendary Emperor Yao. "Rising and ever rising, it threatens the very heavens."

If civilization was to survive, the people needed a hero who could tame the floodwaters and restore the land. That man was Yu, founder of China's first dynasty, the Xia. Over the course of decades, Yu organized a dredging campaign, dug channels that would carry the water back to its source, and pioneered a tradition of great Chinese public works.

"He brings order out of the chaos and defines the land, separating what would become the center of Chinese civilization," said David Cohen, an anthropologist and early Chinese history expert at National Taiwan University. "He is essentially establishing the political order and the ideologies of rulership."

It's a powerful foundation myth, but many believed that's all it is. Some 4,000 years after the flood was supposed to have happened, historians had found no archaeological evidence of its impact or first-hand accounts of its destruction. There are no historical artifacts left over from Yu, or the Xia dynasty he founded. All researchers had to go on were stories written long after the fact, dramatized and politicized to justify the ends of those who wrote them.

Until Wu Qinglong, a geologist at Nanjing Normal University, found signs of the flood in the sediments beneath his feet. In a new paper published in the journal "Science" on Thursday, Wu and his colleagues describe geological evidence for a catastrophic flood on the Yellow River in roughly 1900 B.C. – right around the time that the Great Flood was said to have taken place.

"This expands our understanding," said Andrew Sudgen, deputy editor of "Science", "not only of civilization's origins, but also the environment in which ancestral societies emerged."

In 2007, while conducting research on rock around the Yellow River, Wu noticed deposits that looked suspiciously like "outburst flood sediments." Bits of green schist – a type of rock found in the mountains far upstream – and mudstone were uncovered at sites all along the river. The sediments appeared in layers much thicker than was normal for the Yellow River, indicating that they'd been deposited swiftly by a massive flood.

Realizing what he might be looking at, Wu quickly assembled a team of archaeologists, geologists and historians. If he was going to investigate this ancient disaster, he'd need the expertise from all three.

At a nearby archaeological site, Lajia (home of the world's first known noodles), they discovered flood deposits mixed with broken pottery inside collapsed cave dwellings. And upstream, in the mountains of Jishi Gorge, they uncovered evidence that a massive mountain lake once formed there, presumably because the river had been blocked by debris.

Eventually, a picture of the past came into focus. Thousands of years ago, a huge earthquake shook the region, toppling the homes at Lajia. Radiocarbon dates of children's bones from the site timed the disaster to 1922 B.C., give or take 28 years. Upstream, in the mountains to the west, an avalanche tumbled into the mouth of the Jishi Gorge, creating an artificial dam that prevented the river from flowing through. Backed-up water began to fill the gorge, rising ever higher with each passing month.

The people living downstream would have seen the Yellow River slow to a trickle, then stop. It's not clear whether they would have been aware of the disaster that was looming.

Roughly nine months later, the lake spilled over the top of the dam. The blockage came crashing down, and water spilled into the river valley below. Using a standard engineering equation to determine flood discharge, the scientists calculated that the waters would have surged forward at a rate of 300,000 to 500,000 cubic meters per second. The damage would have extended as far as 2,000 kilometers downstream.

“To put that into perspective,” said Darryl Granger, a geologist at Purdue University, “that’s roughly equivalent to the largest flood ever measured on the Amazon River, the world’s largest river. It’s among the largest known floods to have happened on Earth during the past 10,000 years, and it’s more than 500 times larger than a flood we might expect on the Yellow River from a massive rainfall event, so this cataclysmic flood would have been a truly devastating event for anyone living on the Yellow River downstream.”

It’s difficult to carbon date flood deposits – by their nature, floodwaters mix up materials and jumble the record. But analysis of organic material laid down with the flood sediments timed the flood to roughly 2000 B.C., close to the dates indicated by the bones from Lajia and the historical record. Flood sediments are found inside cracks from the earthquake, indicating that the two events occurred within a year of one another. The timing of the flood also coincides with a major avulsion – a change in the course of the river – that could account for the decades of sustained flooding described in the Yu myth.

Shortly after the era of the flood, sites associated with a culture called Erlitou began to emerge. To archaeologists, they signal the start of China’s bronze age: The communities are 10 times as big as the ones that existed previously, and their technology is much more sophisticated. So far, no evidence has been found to definitively link the Erlitou to the mythical Xia. But if the Xia dynasty really did exist, it’s thought that the Erlitou sites would have been the lands they ruled.

“The outburst flood provides us with a tantalizing hint,” said Cohen, the anthropologist. He hesitated to make a connection between the flood, the Xia and the Erlitou sites, but called the correlation of the dates for all three “quite interesting.”

The Erlitou communities are also farther downstream from the dam than the areas the researchers examined; it’s not clear whether the floodwaters would have made it so far. “That’s the next phase of research that needs to be done,” Cohen said, surveying the areas around Erlitou for evidence of the flood and signs that it could have been the trigger that gave rise to this more advanced society.

In an accompanying analysis for "Science", University of Washington geomorphologist David Montgomery wrote that Wu and his colleagues offer compelling evidence for the historicity of the Great Flood myth. He also noted that anthropologists have found that flood myths from cultures around the world often reflect the environments in which they’re set. Societies living in tectonic subduction zones tell stories of giant tsunamis; those living in mountainous and polar areas evoke the failure of glacial dams.

“It increasingly seems that fundamental elements of the global tapestry of great flood stories mirror the geography of tsunamis, glacial outburst floods, and catastrophic lowland flooding,” Montgomery wrote. Now that we know China’s Great Flood seems to be real, “how many other ancient stories of intriguing disasters might just have more than a grain of truth to them?”

But historians may require more evidence before signing on to the team’s thesis. It is not so clear how a folk memory of the flood could have been accurately maintained for at least 900 years, as Wu’s team suggested, given that elements in the texts may begin as early as 1,000 years ago. There were probably many floods, which may have been conflated in popular memory, said Sarah Allan, a historian of ancient China at Dartmouth College. In her view, the Great Flood described in the ancient texts is a myth to explain how the world was made, not a historical event.

“The story begins with water everywhere and the problem is how to make the world habitable,” she said. Even if the

myth was centered on a real event, it is a reach to associate this with the Jishi Gorge flood or the flood with the Erlitou culture, she said.

Paul Goldin, who studies China's Warring States period at the University of Pennsylvania, also sees the stories of Yu and the Great Flood as unlikely to represent historical events. And they date mostly to the fourth century B.C., long after the Jishi Gorge flood. "These are relatively late legends that were propagated for philosophical and political reasons, and it's inherently questionable to suppose that they represent some dim memory of the past," he said.