

SCIENTISTS LOCATE YOUNGER DRYAS FLOOD

Between 12,900 and 11,500 years ago, Earth went through a sudden cooling period known as the Younger Dryas cold interval. The suspected culprit is a catastrophic flood from North America's glacial Lake Agassiz into a northern ocean, which halted the oceanic circulation patterns that kept much of the Northern Hemisphere temperate. To date, scientists had been unable to find any evidence of this flood, and weren't even sure where on the continent it took place. Now, a team thinks it has found the path of that outburst.

Before the onset of the Younger Dryas, Lake Agassiz covered much of what is now Manitoba, as well as parts of Saskatchewan, Ontario, North Dakota and Minnesota. According to James Kennett, a paleoceanographer at the University of California at Santa Barbara, who was not involved in the new research, Lake Agassiz was, by area, the largest lake ever known anywhere in the world.

In 1989, Kennett co-authored a paper proposing that Lake Agassiz broke through an ice dam and drained to the east, pouring catastrophically through the St. Lawrence River into the North Atlantic. Once there, the huge influx of cold freshwater would have disturbed the oceanic conveyor belt. Normally, as warmer salty water makes its way from the tropics northward along the coast of North America, denser, colder water in the high latitudes sinks to the lower depths of the ocean

and the warmer waters flow across the North Atlantic, keeping Europe fairly mild. A sudden influx of freshwater in the northern part of the ocean, however, would create a cap over the cold saline water, which would then fail to sink, shutting down the entire system. Such a shutdown caused the Younger Dryas cold period, or so Kennett and his colleagues proposed.

The theory looked good, but ran into one problem, says Julian Murton, a geologist at the University of Sussex in Brighton, England: There was no convincing evidence of such a flood in eastern Canada. "If

you have a major flood of water, you would expect to find clear erosional features in the landscape: giant waterfalls, huge scour holes, maybe gravel bars," Murton says. "No one's ever found these features in eastern Canada that could be attributed to the beginning of this Younger Dryas event."

For 20 years, Murton has been studying the permafrost and stratigraphy of ice age sediments in the Mackenzie Delta region of northwestern Canada. In the stratigraphy, he found a gravelly layer above a regional erosion surface that he assumed was related to local deglaciation. However, in 2005, after a conference during which a possible Mackenzie flood was discussed, Murton had the sediments systematically dated, and the age range put them at about 13,000 years ago, near the start of the Younger Dryas. The stratigraphy shows that windblown sand dunes that had been accumulating there suddenly stopped forming, and on top of these sediments is gravel, indicative of a river or flood. What this suggests, Murton says, is that the reason no flood evidence was ever found around the St. Lawrence River is because the flood went northwest into the Arctic Sea, not east into the Atlantic. Murton and colleagues published the findings in *Nature*.

"I think that they very likely do have evidence for a flood," says Wallace Broecker, an isotope geochemist at Columbia University in New York who was the lead author of the 1989 paper. But, he adds, it's important to do further research before jumping to conclusions. "In order to knock out the conveyor circulation, that flood has to be fairly large, and their evidence says nothing about how large it was, just that there was a flood." He says that some are arguing that water couldn't have traveled from Lake Agassiz all the way to the Mackenzie River; the elevation and location of the ice sheet would have prevented it.

Furthermore, Broecker says, the dating technique used — optically stimulated luminescence — is not entirely reliable, and not as precise as radiocarbon dating. Unfortunately, by the nature of the flood, there isn't likely to be any organic substance to test in the sediment. Still, he says, it's a reasonably good method. The technique correctly dated a later flood in the same region, whose date was already known.

There's one other consequence of this finding, Kennett says: If it's accurate, it will supplant the Missoula Floods in Montana, Idaho and Washington at the end of the last ice age as "the largest flood that's ever been recorded by earth scientists, anytime, anywhere." This flood, he says, would "make that look like a wimp."

Bernard Langer

Julian Murton



Fieldwork in Canada's Mackenzie Delta region revealed new evidence of a flood. The flood gravel dated to just after 13,000 years ago truncates large sand dunes and occurs just beneath the black peaty layer near the cliff top.