

A Compilation of Basal Radiocarbon Ages from Post-Glacial Lakes and Bogs in Western New York

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INTRODUCTION

Radiocarbon ages collected from basal lake and bog sediments have conventionally been used to constrain the transition from ice covered to ice free land. In Ohio and Indiana, Glover et al (2011) have shown this to be true. However, recent work in eastern and southern New York has revealed a gap of several millennia between the end of Last Glacial maximum (LGM) and the beginning of organic matter accumulation in lakes and bogs Petee et al (2012). The retreat of the southeastern margin of the Laurentide Ice Sheet from its LGM position has been widely dated and is generally accepted to have an age of 26-21 cal. ka (Balco et al. 2002; Balco 2012; Ridge et al. 2012)

Our study focuses on compiling basal radiocarbon ages in western New York.

AN AGE OLD PROBLEM

The phenomenon of lagging radiocarbon ages was stumbled upon by Muller and Calkin 1993 in their review of ages for the Pleistocene of New York. They quote:

“Crowl and Sevon (1980) inferred from a dozen, mostly bog bottom, ages that the marginal ice had not begun to withdraw from the terminal moraine until as late as 15,000 BP. This age seems too young to comfortably accommodate the subsequent history of retreatal fluctuation of the ice margin in New York. It is younger, too, than several ages in New Jersey that relate to recession from the terminal moraine. At Francis Lake, New Jersey, about 45 km from the New York State boundary, pollen bearing bottom sediments below peat yielded an age of 18,570 BP for sedimentation that could not have begun until glacial retreat was underway.”

OBJECTIVES

We aim to reconstruct environmental and climatic conditions of western New York after the LIS began its retreat from its LGM position and before the warming of the Bølling-Allerød (~15-14 ka) period. See posters by Guild et al. and Whiteside et al. This poster focuses on the basal ages from western New York.

METHODS

Basal sediment ages were compiled along a longitudinal transect in western New York between latitudes 41° N and 43° N. The first terrestrial macrofossils apparent in the sediment cores were targeted for radiocarbon dating. 11 basal radiocarbon ages along the transect were compiled from literature. In addition to the existing ages we obtained two of our own from southwestern New York. 50 miles south of Buffalo, NY, Allenberg bog is situated on the northwestern boarder of the Salamanca reentrant, just inside the LGM margin of the LIS. The second bog, Dragonfly kettle, is 35 miles northeast of Allenberg in Java, NY, and is part of the Lake Escarpment Moraine, equivalent to the Valley Heads ice limit.

New York and the LGM

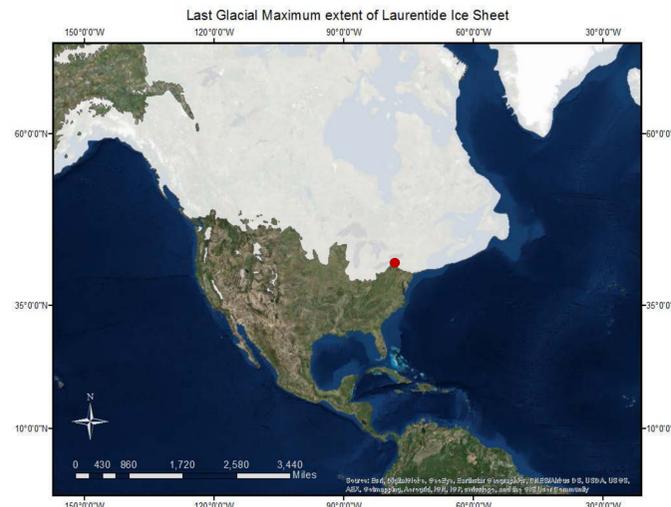


Figure 1: United States and Canada during the Last Glacial Maximum. Western New York is represented by the red dot.

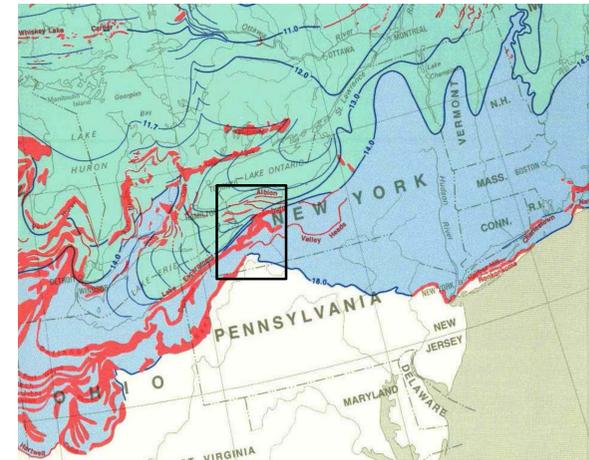


Figure 2: Extent of the LIS in New York during the Last Glacial Maximum. Our area of study is within the black frame. Map from Dyke et. al (2002).

WESTERN NEW YORK RADIOCARBON AGES

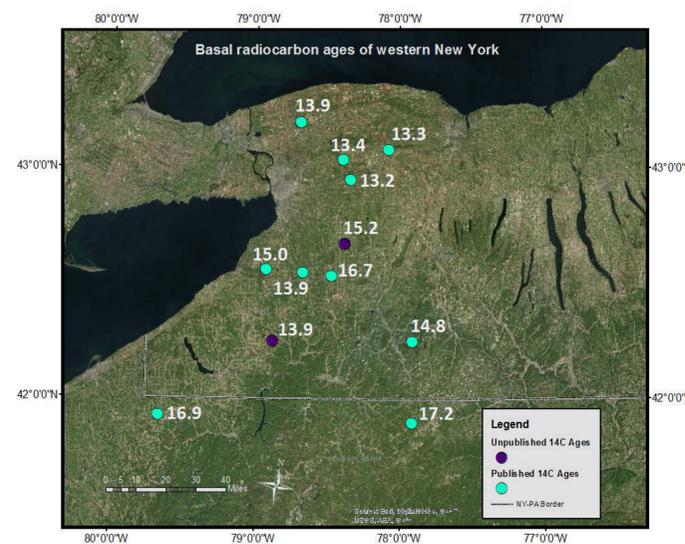


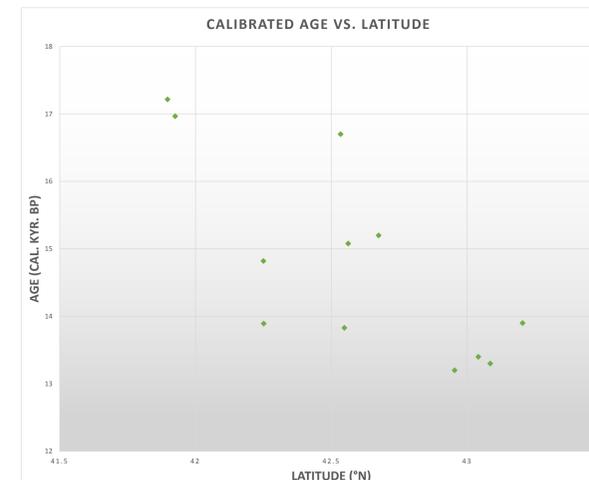
Figure 3: Locations of lakes and bogs from which basal ages were compiled.

Figure 4: Compiled calendar ages (kyr) calibrated using Calib 7.1 (Reimer et al. 2013) from AMS ¹⁴C dates on plant macrofossils from 13 sites, including 2 new bogs that are unpublished. Ages are reported with 2 sigma uncertainty. The two oldest ages (17,216 and 16,966 cal. kyr. BP) fall south of the PA-NY border. In western New York the ages cluster from 13,200-15,200 cal. kyr. BP with one age at 16,701 cal. kyr. BP.

| Site Name | Latitude | Cal. yr. BP |
|------------------|----------|-------------|
| Lockport Lake | 43.204 | 13,900 |
| Hiscock site | 43.085 | 13,300 |
| Diver's Lake | 43.041 | 13,400 |
| Lamb | 42.954 | 13,200 |
| Dragonfly Kettle | 42.674 | 15,200 |
| Winter Gulf | 42.562 | 15,079 |
| Houghton Bog | 42.548 | 13,829 |
| Nichols Brook | 42.534 | 16,701 |
| Allenberg Bog | 42.251 | 13,892 |
| Belmont Bog | 42.25 | 14,820 |
| Corry Pond | 41.925 | 16,966 |
| Rose Lake | 41.897 | 17,216 |

Table 1: Names of the 11 western New York and 2 Pennsylvanian sites listed from north to south and their associated basal ages.

AGE VS. LATITUDE



FINAL THOUGHTS

Unlike in eastern New York, we do see a number of basal radiocarbon ages that pre-date the Bølling-Allerød warm period that began ~15-14 ka. However, south of the Lake Escarpment moraine, we do see a few ages that seem anomalously young to be interpreted as deglaciation ages. The lag of the basal radiocarbon ages presents two possibilities: That western New York experienced delayed deglaciation or that Arctic-like conditions persisted for ~5 millennia after the LIS from its maximum. If the latter, then the freezing conditions prevented organic matter from accumulating in lakes and bogs and rather there was mineral matter deposited in bogs that was difficult to penetrate with coring. Although the ages in western New York are all younger than the LGM, there is no clear gradient to them. The scatter of ages could be a result of large ice masses buried by the LIS. They remained in place as the ice sheet retreated from its LGM. The abandoned ice would have been unable to melt until conditions warmed with the onset of the Bølling-Allerød, they melted at various rates dependent on size.

REFERENCES

- Peteet, D. M., M. Beh, C. Orr, D. Kurdyla, J. Nichols, and T. Guilderson (2012). Delayed deglaciation or extreme Arctic conditions 21-16 cal. kyr at south-eastern Laurentide Ice Sheet margin?, *Geophys. Res. Lett.*, 39
- Muller, E., and Calkin, R. (1993). Timing of Pleistocene glacial events in New York State. *Can. J. Earth Sci.* 30
- Glover, K.C, Lowell, T.V, Wiles, G.C, Pair, D. (2011). Deglaciation, basin formation and post-glacial climate change from a regional network of sediment core sites in Ohio and eastern Indiana. *Quat. Res.* 76 pg. 401-410
- Crowl, G.H, and Sevon, W.D., (1980). Glacial boarder deposit of late Wisconsinian age in northeastern Pennsylvania. *General Geology Report 71*
- Balco, G., Stone, J. O., Porter, S. C., & Caffee, M. W. (2002). Cosmogenic-nuclide ages for New England coastal moraines, Martha's Vineyard and Cape Cod, Massachusetts, USA. *Quaternary Science Reviews*, 21(20), 2127-2135.
- Ridge, J. C., Balco, G., Bayless, R. L., Beck, C. C., Carter, L. B., Dean, J. L., ... & Wei, J. H. (2012). The new North American Varve Chronology: A precise record of southeastern Laurentide Ice Sheet deglaciation and climate, 18.2-12.5 kyr BP, and correlations with Greenland ice core records. *American Journal of Science*, 312(7), 685-722.
- Dyke, A. S., Andrews, J. T., Clark, P. U., England, J. H., Miller, G. H., Shaw, J., & Veillette, J. J. (2002). The Laurentide and Innuitian ice sheets during the last glacial maximum. *Quaternary Science Reviews*, 21(1), 9-31.

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