Bog Dating

Analyses of Uranium 234 and Radium 226 values of average Uranium bogs show the topography of North America is less than 4,700 years old.

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Abstract

The age of a Uranium bog can be determined by the relative abundance of the daughter products of Uranium 234 in the bog. The author was made aware of that fact in the early 1980s during a state licensing of a Uranium bog mining company. More accurate than individual bog data are the federal averages on the activity levels of Radium 226 in Uranium bogs nationwide—12 picocuries per gram (pCi/g). The Uranium 234 levels can be calculated from published values, and the age of the bogs can be modeled. The result is the age of the bogs nationwide which is less than 4,700 years. This is considerably less than recent datings of the ice age.

Introduction

The significance of this paper is that radioactive dating of Uranium bogs shows them to be much younger than current dating of the ice age.

In the work of Gordon L. Ziegler as Radiation Health Physicist for the State of Washington years ago, he stumbled across some data which might date Uranium bogs nationwide. His calculations put the ice age at less than 4,700 years ago, as opposed to 18,000 to 60,000 years ago as held commonly. (1, 2)

At the Washington State office of Radiation Control Section, Joseph S. Stohr interested the author in the dating calculations. Initial assumptions for calculating the age of the bogs were:

Comparing the activity of the daughter products to the parent Uranium is a way of dating the deposit. Thorium is much more insoluble than Uranium, so most of the Thorium may have been left behind when the Uranium migrated to the bog. This phenomenon approximately resets the nuclear clock to zero, because Thorium 230 is a daughter of Uranium 234 which in turn is a distant daughter of Uranium 238. Radium 226 is a daughter of Thorium 230. The Radium 226 half-life is only 1602 years. (3) (p. 112). Most Radium 226 that washed down with the Uranium would be decayed by now. The current Radium 226 would have to come from ingrown Thorium 230. Since the half-life of Thorium 230 is 8.0×10^4 y, or 50 times that of Radium 226, the Radium 226 would keep up well with the ingrowing Thorium 230 in a transient equilibrium. So the Radium 226 activity would be the same as the Thorium 230 activity.

Thorium 234, Palladium 234m and Palladium 234 have very short half-lives. So they would be in secular equilibrium with the Uranium 238. Since Uranium 234 and Uranium 238 are the same element, they would have the same chemical and solubility properties. Therefore the Uranium 234 would not be separated from the Uranium 238 in the migration process. Thus the clock for Uranium 234 would not be set back to zero like the Thorium 230. The Uranium 234 would be old—in secular equilibrium with the Uranium 238. Therefore all we have to be concerned with is the ingrowth of Thorium 230 into Uranium 234, as the Radium 226 will follow the Thorium 230.

To illustrate the above decay chain, we present it in graphical form in Chart 1.

$^{238}_{92}U$ **Nuclide**	**4.51×10^9 y** **Half-life**
↓	
$^{234}_{90}Th$	24.1 d
↓	
$^{234}_{91}Pa^m$	1.17 m
99.87% ↓ 0.13%	
↓ (99.87%) ↓ (0.13%) $^{234}_{91}Pa$	6.75 h
↓	
$^{234}_{92}U$	2.47×10^5 y
↓	
$^{230}_{90}Th$	8.0×10^4 y
↓	
$^{226}_{88}Ra$	1602 y

Chart 1: (Taken from (3).) This chart illustrates the decay scheme relationships between Uranium 238 and its daughter products down to Radium 226 together with the respective half-lives.

There are several inaccuracies in the initial assumptions. [a] Some Radium 226 undoubtedly washed down with the Uranium 234, and has not all decayed away. This would make the true age of the bog younger than calculated by the initial assumptions. [b] While Radium 226 activity would be the same as Thorium 230 activity after 100,000 years, unfortunately this is not true a few thousand years after a clock reset. In the early years, the Radium 226 would be high compared to the Thorium 230. This would make the true age of the bog younger than calculated by the initial assumptions. We will first calculate according to the initial inaccurate assumptions, then comment.

Calculations by the Initial Inaccurate Assumptions

Average data were taken from many Uranium bogs across the United States. Averages for a post glacial Uranium deposit mill are: ore grade U_3O_8—0.10%; Radium 226—12 pCi/g. (4) (p. 22) Two more data points are needed to calculate the date of the Uranium bog. The two are provided by the *Radiological Health Handbook*: U 234—6.19 x 10^{-3} Ci/g—0.0057% abundance. (3) (p. 370.) The pCi/gram of the Uranium 234 in soil in the typical post glacial Uranium bog calculates from the above data:

$$\frac{0.0010 gU_3O_8}{g\, bog\, soil}\,\frac{0.848 gU}{gU_3O_8}\,\frac{0.000057 gU^{234}}{gU}\,\frac{6.19x10^{-3}Ci}{gU^{234}}\,\frac{10^{12}\, pCi}{Ci}\approx\frac{300\, pCiU^{234}}{g\, bog\, soil}$$

There are 12 pCi/g Radium 226 in bog soil. By the above inaccurate assumptions, there would be 12 pCi/g Thorium 230. That is 4.0% ingrowth (0.040).

To date the migration, one may calculate the time of ingrowth, using Equation 8-44 in Ralph T. Overman and Herbert M, Clark, *Radioisotope Techniques*. (5)

$$A_B=\left(A_A\right)_0\left(1-e^{-0.693t/T_B}\right).$$

This equation is for secular equilibrium where half-life of parent is say 1000 times greater than that of the daughter, which is not the case for Thorium 230 ingrowth into Uranium 234 activity. But small ingrowth should make it an acceptable approximation. Note: This is not a close approximation. Because the half-life of the parent is not 1000 times that of the daughter, the activity of the parent is less than we would expect according to the assumption. Relatively speaking, the activity of the daughter is greater than we would expect. The ingrowth is faster in shorter time. The true age of the bog would be younger than calculated using this assumption. But we can still calculate the upper limit of the age of the bog using this assumption.

Solving for t we get

$$t=\frac{T_B}{-0.693}\ln\left[1-\frac{A_B}{\left(A_A\right)_0}\right].$$

For Thorium 230 ingrowth of 4.0% into Uranium 234, we get:

$$t=\frac{8.0x10^4}{-0.693}\ln\left[1-0.040\right]\approx 4,700\, years.$$

Our radio-dating is a little on the long side, but that is to be expected. If any Radium 226 washed down with the Uranium 234, over one eighth of it would still be here. The ingrowth of Radium 226 and Thorium 230 would be somewhat less than we above calculated, and the ingrowth time would be less. Though Thorium is much less soluble than Uranium, some of it could still have been washed down with the Uranium. The ingrowth period would again be shorter. The above error would also make the real age of the bogs and the wholesale reconfiguring of earth's land masses more recent than in our rough simple calculation.

In Conclusion, the Uranium 234 and Radium 226 abundance data in bog soil are typical of Uranium bogs anywhere in North America. The dating, then, is of the very topology of the earth's surface. This study shows that the world-wide topology altering event took place less than 4,700 years prior to 1960 to 1983, when the data were taken. This is much more recent than even the ice age by other dating means. The ice age was simply not as old as it has been thought to be.

References and Notes

1. Christopher R. Scotese, Last Glacial Maximum, The Last Ice Age, Paleomap Project, http://www.scottese.com/lastice.htm.

2. The Last Ice Age, Climate Timeline Tool: Summary of 100000 Years, http://www.ngdc.noaa.gov/paleo/cyl/100k.html.

3. *Radiological Health Handbook*, Revised Edition (Rockville, Maryland 20852: Bureau of Radiological Health and the Training Institute, Environmental Control Administration, U.S. Department of Health, Education, and Welfare, Public Health Service, Consumer Protection and Environmental Health Service, January 1970).

4. Joseph S. Stohr and John L. Erickson, "Regulation of a Post-Glacial Uranium Deposit in the State of Washington," *Sixth Symposium on Uranium Mill Tailings Management*, Fort Collins, Colorado, February 1-3, 1984, Geotechnical Engineering Program, Civil Engineering Department, Colorado State University, Appendix A, Comparative Analysis.

5. Ralph T. Overman and Herbert M. Clark, *Radioisotope Techniques* (New York: McGraw-Hill Book Company, Inc., 1960), p. 305.

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