

Geomorphology 2 - lab report example

[Science](#), [Geography](#)



Geomorphology 2

Introduction The onset of radio-carbon dating has made it possible to precisely determine the age of an organism which formerly lived. Through taking the ratio of carbon-12 to carbon-14 in a particular sample and then benchmarking it to the living organism's ratio, an individual is able to determine the age. In which case, another important aspect applied is half-life, which is the time taken by half of the sample to decay and is denoted by $t_{1/2}$.

Objective

This lab was designed specifically, with a major objective of developing a more comprehensive and hands-on understanding of radiocarbon dating.

From this, the specific goals are as follows:

Understand half-life and radio-carbon dating

Know the difference between radiocarbon ages and calibrated ages

Learn how to build sedimentation models in MS Excel and make meaningful geomorphic interpretation .

Results

Data table

Data from the above table were used to plot a graph of Age vs Depth as follows:

Figure 1: Radio-Carbon dating curve

The graph gives a line of best fit which depicts relationship between age and depth. It shows that as depth increases so does the age of the sample increases.

Figure 2: Calibration curve

The graph of Med_Prob vs Depth also gives a line of best fit with the first one. This illustrates that depth affects both Med_Prob and age in the same way.

Discussion

The sedimentation curve plotted allowed for understanding the difference between radiocarbon ages and calibrated ages. The sedimentation rate for radiocarbon age-depth curve is 116.77 cm/year while for calibrated age-depth curve is 116.77 cm/year. Even though there was no difference observed, the ages given by radiocarbon dating were a bit unrealistic. The radiocarbon age-based sedimentation rate is considered unrealistic and cannot be relied upon because of the fluctuations witnessed in the rate of production of carbon 14 at the top of the atmosphere. This carbon 14, older and younger, changes the apparent age of the samples.

Questions

1. What are the sedimentation rates for radiocarbon age-depth curve and calibrated age-depth curve

From the gradient of the curve,

The sedimentation rate for radiocarbon age-depth curve is 116.77 cm/year

For calibrated age-depth curve is 116.77 cm/year

2. Based on your scatterplot, what time range does calibration have a significant effect on age estimate? What might cause this effect?

Time range = between 5420 and 5410 years.

It is this time range because it gives an "age plateau" whereby a wide span of real time is covered. The significant effect occurs at this point because of the combination of large influx of ^{14}C -depleted, carbon from the oceans, and

decrease in the rate of ^{14}C production from the atmosphere causes the “age plateau”

3. What is the percentage change in the sedimentation rate from radiocarbon age based sedimentation and calibrated age-based sedimentation?

Why is the radiocarbon age-based sedimentation rate not realistic?

From the graphs, the percentage change is zero

$$(116.77 - 116.77) / 116.77 \times 100\% = 0$$

However, the radiocarbon age-based sedimentation rate is considered unrealistic and cannot be relied upon because of the fluctuations witnessed in the rate of production of carbon 14 at the top of the atmosphere. This carbon 14, older and younger, changes the apparent age of the samples.

4. Note that the sedimentation rate declined 10000 to 8000 years ago. Can you provide an environmental factor (e.g. climate, vegetation uplift, etc) and process-based source-to-sink explanation as to why this occurred?

Climate is a major environmental factor, which may have contributed to the sedimentation decline. As the result of aridity witnessed during this period, the amount of sediment transported and deposited declined. Rain is an important factor, given that water is used in the transportation of the sediments.